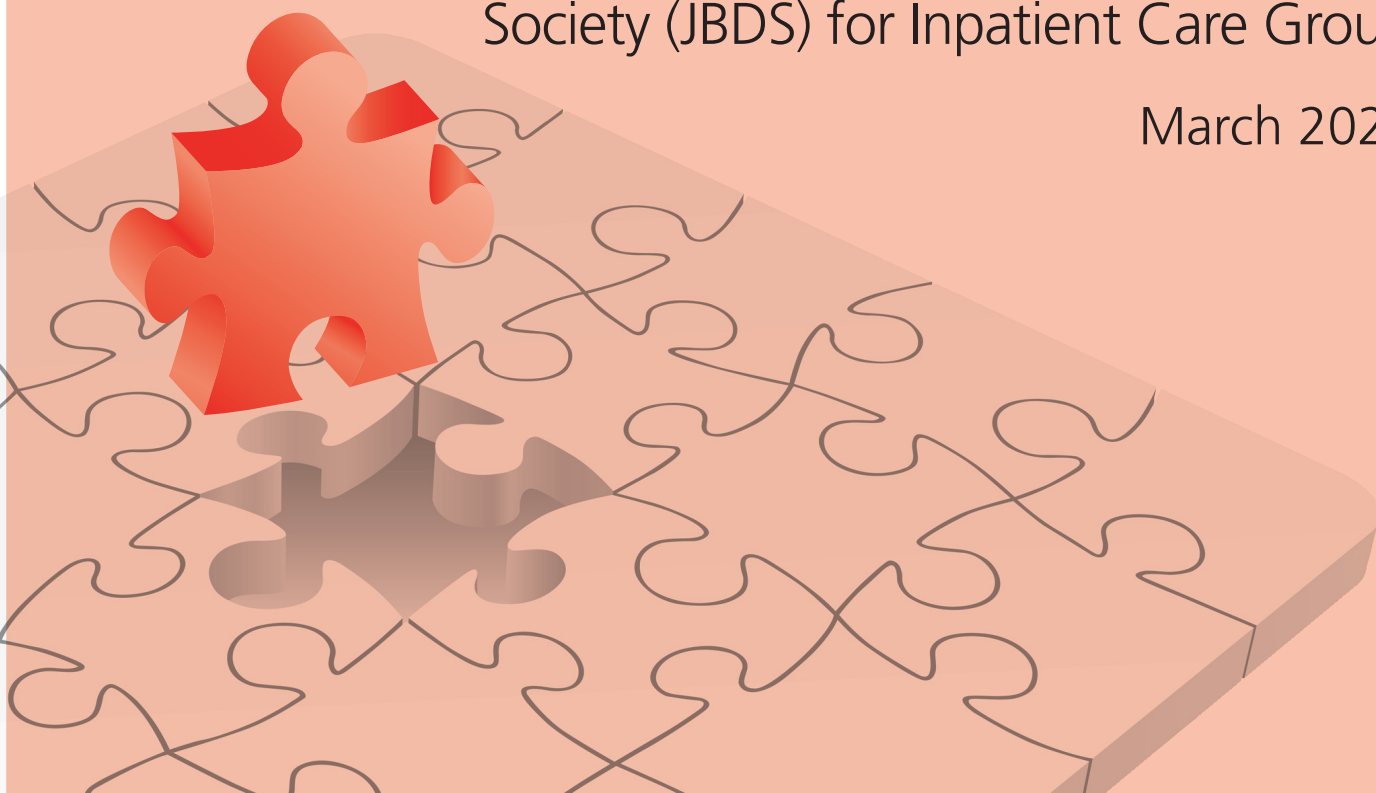


JBDS-IP

Joint British
Diabetes Societies
for inpatient care

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

March 2020



This document is coded JBDS 16 in the series of JBDS documents:

Other JBDS documents:

Inpatient Care of the Frail Older Adult with Diabetes October 2019 JBDS 15

A good inpatient diabetes service July 2019 JBDS 14

The management of diabetes in adults and children with psychiatric disorders in inpatient settings May 2017 JBDS 13

Management of glycaemic control in pregnant women with diabetes on obstetric wards and delivery units May 2017 JBDS 12

Management of adults with diabetes on the haemodialysis unit April 2016 JBDS 11

Discharge planning for adult inpatients with diabetes October 2015 JBDS 10

The use of variable rate intravenous insulin infusion (VRIII) in medical inpatients October 2014 JBDS 09

Management of Hyperglycaemia and Steroid (Glucocorticoid) Therapy October 2014 JBDS 08

Admissions avoidance and diabetes: guidance for clinical commissioning groups and clinical teams December 2013 JBDS 07

The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes August 2012 JBDS 06

Glycaemic management during the inpatient enteral feeding of stroke patients with diabetes June 2012 JBDS 05

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Management of adults with diabetes undergoing surgery and elective procedures: improving standards Revised March 2016 JBDS 03

The Management of Diabetic Ketoacidosis in Adults Revised September 2013 JBDS 02

The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus Revised January 2020 JBDS 01

These documents are available to download from the ABCD website at <https://abcd.care/joint-british-diabetes-societies-jbds-inpatient-care-group> and the Diabetes UK website at <https://www.diabetes.org.uk/joint-british-diabetes-society>

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Foreword

People with diabetes account for nearly a fifth of all inpatients in English and Welsh hospitals; of these, up to ninety percent are admitted as an emergency. Most are admitted for a reason other than diabetes with only eight percent requiring admission for a diabetes specific cause. Healthcare professionals working “at the coalface” experience numerous clinical challenges, not withstanding the need to know whether each individual with diabetes requires urgent admission. This document has been developed by experts in the field and aims to support staff by offering practical advice and tools for effective, appropriate and safe triage. Each section relates to the commonest diabetes specific emergencies and algorithms can be printed off to enable ease of access and use.



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Introduction

Diabetes accounts for around 18% of hospital inpatients with one in six beds occupied by a person with diabetes. People with diabetes in hospital tend to be older, with an average age of 75 years.¹ The National Diabetes Inpatient Audit (NaDIA) measures provide a snapshot on the quality of diabetes care provided to people with diabetes while they are admitted to hospital whatever the cause, and aim to support quality improvement.

According to NaDIA¹ 83-90% of people with diabetes are admitted as an emergency; however, the majority are not admitted for their diabetes per se. In 2017 diabetes specific emergencies only accounted for 8% of the total number of admissions (16,010) audited on a single day in England and Wales.

The commonest reasons for diabetes specific admissions are: foot ulceration, hypoglycaemia, hyperglycaemia, diabetic ketoacidosis, and hyperosmolar hyperglycaemic state.¹ Other reasons for admissions to hospital in the diabetes population include: newly diagnosed diabetes, cardiovascular disease, stroke and end of life care.

This short guide is for healthcare professionals working in acute emergency departments and emergency decision units. It aims to give a quick guide to triage when adults with diabetes attend these departments for diabetes specific problems.

All guidance is aligned to the Joint British Diabetes Societies and Diabetes UK recommendations. Each section of this document includes condition specific algorithms and links to JBDS guidelines and other resources.

1. Hypoglycaemia

Hypoglycaemia is common in people with diabetes and mainly affects people taking insulin and or sulphonylurea agents (SUs) such as gliclazide, glipizide and glimepiride or prandial regulators such as nateglinide and repaglinide. There are 4.7 million people in the UK with diabetes and insulin is used in approximately 30% of them (type 1 and type 2 diabetes).²

The 2016 NaDIA reported that hypoglycaemia accounted for 14.7% of hospital admissions in the 15,774 people audited that year.³

Hypoglycaemia is a lower than normal level of blood glucose. It can be defined as “mild” if the episode is self-treated and “severe” if assistance by a third party is required.⁴

For the purposes of people with diabetes who are hospital inpatients, any blood glucose less than 4.0mmol/L should be treated. The majority attending

emergency units will have experienced a “severe” hypoglycaemic event. The average prevalence of hypoglycaemia in type 1 diabetes is approximately 2 episodes per week, with those requiring 3rd party assistance estimated as 30-40%. In type 2 diabetes the prevalence is lower than in type 1 diabetes but increases in those with long duration of diabetes and in those who are insulin treated.⁴

Hypoglycaemia can cause coma, hemiparesis and seizures. If the hypoglycaemia is prolonged neurological deficits may become permanent. Severe hypoglycaemia is associated with increased mortality.⁵

The risk factors associated with hypoglycaemia are shown in Table 1. An example pathway to decide whether someone presenting with hypoglycaemia needs acute hospital admission or not is shown in Appendix 1 (page 18). The recommended treatment of hypoglycaemia is shown in Appendix 2 (page 19).

Table 1 Risk factors for hypoglycaemia

Adapted from JBDS guideline: The hospital management of hypoglycaemia in adults with diabetes mellitus (Revised January 2020).⁶

| Medical issues | Lifestyle issues |
|--|---|
| Strict glycaemic control | Increased exercise (relative to usual) |
| Previous history of severe hypoglycaemia | Irregular lifestyle |
| Long duration of type 1 diabetes | Alcohol |
| Duration of insulin therapy in type 2 diabetes | Increasing age |
| Lipohypertrophy | Early pregnancy |
| Impaired hypoglycaemic awareness | Breast feeding |
| Severe hepatic dysfunction | No or inadequate monitoring |
| Impaired renal function including those on renal replacement therapy | Anorexia, poor appetite / interruption of enteral feeding |
| Sepsis | Reduced carbohydrate intake/absorption |
| Inadequate treatment of previous hypoglycaemia | Irregular meals |
| Terminal illness | Food malabsorption e.g. gastroenteritis pancreatic enzyme insufficiency, coeliac disease |
| Cognitive dysfunction/ dementia | Bariatric surgery involving bowel resection |
| Frailty | Reduction in steroids |

Appendix 1 (page 18) shows an example decision making tool for deciding who may or may not need admission and Appendix 2 (page 19) shows the treatment of hypoglycaemia

Recommendations:

- Not everyone reviewed and treated for hypoglycaemia will require hospital admission.
- All should be reviewed for the cause of the hypoglycaemic event and HbA_{1c} checked if it was longer than 3 months since the last test. Because results may not be quickly available, it should be clearly documented that the results should be followed up and acted on.
- Ask about recent or recurrent hypoglycaemic events. If these are found, then the specialist diabetes team should be asked to review the person either as in the ambulatory care setting (where admission may or may not be necessary), or urgently as an outpatient.
- BEWARE the low HbA_{1c} and ensure that sulphonylureas (SUs) are not used in frail, older people and those who have pre-filled medicine trays/pill organisers. They and /or their carers will be unable to detect which drug is the sulphonylurea if they are unable or unwilling to eat. Sulphonylureas must be given with food.
- If in doubt whether the SUs or other oral hypoglycaemic agents should be continued or the dose adjusted, consult the BNF and/or ask the specialist diabetes team for advice.
- People with type 1 and those with insulin-treated type 2 diabetes who are usually well, and can self-manage their condition and medication can usually be discharged following insulin dose advice and possible reduction. They and/or their carers should receive education and a leaflet on prevention and treatment of hypoglycaemia. Those who are discharged from the emergency department should be strongly encouraged to inform their diabetes team at the earliest opportunity that they have had an episode of severe hypoglycaemia. If in doubt whether the insulin dose should be adjusted, ask the specialist diabetes team for advice.
- People with type 2 diabetes on SUs and in particular the frail, older person, those with other exacerbation of co-morbidities, those who live alone or people who have sustained an injury e.g. fracture, should be admitted to hospital as they are at high risk of further hypoglycaemic episode in the next 48 hours as SUs even when discontinued are slow to be excreted.
- Ensure the discharge letter states the treatment given, the drugs changed and the follow up plan – and where appropriate, that an HbA_{1c} was taken should also be recorded, and where necessary followed up by the primary care team.
- If the person drives, they must be informed of the appropriate DVLA regulations regarding severe hypoglycaemia. This advice can be found at <https://www.gov.uk/diabetes-driving>. If in doubt call the specialist diabetes team.

2. Hyperglycaemic emergencies: Hyperglycaemia, Diabetic Ketoacidosis and Hyperosmolar Hyperglycaemic State

Any individual with diabetes who presents acutely unwell should have a capillary glucose measurement and blood/urine ketone measurement taken.

If an individual is not known to have diabetes

If in these individuals, the random capillary glucose is ≤ 7.8 mmol/L and they have no additional risk factors for the development of hyperglycaemia (see Table 2, page 11), no further capillary glucose testing is necessary, unless circumstances change and the clinical team feel it appropriate (e.g. the use of high dose glucocorticoids).⁷

If they have an initial capillary glucose concentration of ≥ 7.8 mmol/L at presentation, or if they have any risk factor for developing hyperglycaemia (Table 2, page 11), venous blood gases should be taken to exclude a metabolic acidosis; if these are abnormal then ketone concentrations should be checked to exclude diabetic ketoacidosis (DKA).⁸ Consider requesting antibodies (e.g. antiglutamic decarboxylase autoantibodies and anti-islet cell autoantibodies, if available) if the clinical picture is suggestive of new onset type 1 diabetes, and to help exclude ketosis prone type 2 diabetes.

The feet should be examined for any signs of infection, ischaemia or injury. If DKA is excluded and the feet are fine, then capillary glucose concentrations should be measured every 4-6 hours for the first 24 hours depending on clinical need.⁷

If the glucose is >30.0 mmol/L, and ketones are either negative or '+' on urine, or <3.0 mmol/L, the plasma osmolality should be calculated ($2[\text{Na}^+] + \text{glucose} + \text{urea}$). If this is >320 mOsmol/kg, hyperosmolar hyperglycaemic syndrome (HHS) should be diagnosed (see Table 3, page 11), and treated accordingly. Be aware that a mixed picture of HHS and DKA can occur.⁹

If all of the capillary glucose concentrations during those 24 hours are ≤ 7.8 mmol/L, the testing can be stopped unless circumstances change and the clinical team feel it appropriate to continue testing. The discharge summary should include the fact that admission glucose was raised, but subsequent readings were normal. This is consistent with a diagnosis of 'stress hyperglycaemia'¹⁰ and it is recommended that the individual should have a yearly fasting glucose or HbA_{1c} because they are at increased risk of developing type 2 diabetes over time.

During the first 24 hours after admission, if any of the capillary glucose measurements are ≥ 7.8 mmol/L, then an HbA_{1c} should be requested. If the HbA_{1c} is ≥ 48 mmol/mol, then the patient probably has Type 2 diabetes and should be informed of this. The diagnosis of diabetes should be clearly documented in the hospital notes and in the discharge summary. In addition, it should be remembered that people with newly diagnosed diabetes may present with other primary pathologies and the diabetes is picked up incidentally. The individual should be treated appropriately according to local guidelines and the diabetes specialist team should be informed as necessary.

If an individual is known to have diabetes

If an individual is known to have diabetes and the random capillary glucose concentration is <4.0 mmol/L, then they need to be treated appropriately for hypoglycaemia.⁶

In individuals who are acutely unwell, a venous blood gas measurement should be taken and also capillary blood tested for plasma ketones. Table 4 (page 11) shows the diagnostic criteria for diabetic ketoacidosis (DKA)⁸ – **be aware that DKA can occur with a normal glucose concentration, in particular with SGLT-2 inhibitor use.**¹¹

In addition, the feet should be examined at the time of admission and then daily during admission in all inpatients known to have diabetes.

If an HbA_{1c} has not been measured within the 3 months prior to admission, this should be done. The result should be approached with the individual in mind – i.e. is it appropriate for the person when considering their age and co-morbidities? If in doubt, the specialist diabetes team should be consulted. If the HbA_{1c} is not appropriate for the age and co-morbidities, then capillary glucose concentrations should be measured hourly until a pattern is established and the medication can be adjusted to achieve “safe” glucose concentrations between 6.0 and 10.0mmol/L with an acceptable range of 4.0-12.0mmol/L for most people.

If the glucose is >30.0mmol/L, and ketones are negative then the plasma osmolality should be calculated ($2[\text{Na}^+] + \text{glucose} + \text{urea}$). If this is >320mOsmol/kg, hyperosmolar hyperglycaemic syndrome (HHS) should be diagnosed, and treated accordingly.⁹ **Be aware that a mixed picture of HHS and DKA can occur.** If this is the case, insulin treatment should be started sooner rather than later.

If the individual is eating and drinking normally

Capillary glucose concentration should be checked every 4-6 hours, depending on clinical need. The ideal target range is 6.0-10.0mmol/L, with an acceptable range of 4.0-12.0mmol/L. If the glucose concentration is ever lower than 4.0mmol/L then the medication **MUST** be adjusted to avoid further episodes of hypoglycaemia.

If the glucose concentration is above 12.0mmol/L, it may not be necessary to treat immediately. However, plasma ketones should be checked, and if >3.0mmol/L venous blood gases should be done, if these confirm DKA, a fixed rate intravenous

insulin infusion (FRIII) should be started and local guidelines for the management of DKA must be followed. Capillary glucose concentrations should be measured hourly whilst a FRIII is in use. The ideal target range is 6.0-10.0mmol/L, with an acceptable range of 4.0-12.0mmol/L. The diabetes specialist team should be informed.

If ketones are not present, it may be necessary to wait for 24 hours to check the pattern of dysglycaemia and make the necessary adjustments to the medication on a daily basis to achieve glucose concentrations of between 6.0 and 10.0 mmol/L with an acceptable range of 4.0-12.0 mmol/L. Local guidelines should be used to make the change to subcutaneous insulin, or oral medication when the individual is eating and drinking normally, and no longer requires intravenous insulin.⁸ The diabetes inpatient specialist team should be involved as necessary.

If the individual is not eating and drinking normally and not in DKA

A variable rate intravenous insulin infusion (VRIII) may be required to ensure that glucose concentrations remain between 6.0 and 10.0mmol/L, with an acceptable range of 4.0 to 12.0mmol/L. Capillary glucose concentrations should be measured hourly whilst a VRIII is in use.¹² If the glucose concentration is above 12.0mmol/L, then the plan outlined above in the section for those eating and drink should be followed.

An algorithm for assessment in those with undiagnosed and in those with previously diagnosed diabetes is shown in Appendix 3 (page 20).

A decision tool on the management of hyperglycaemia admissions is shown In Appendix 4 (page 21).

Table 2. Risk factors for developing hyperglycaemia

Adapted from JBDS (2011), The Management of Diabetic Ketoacidosis in Adults⁸

- Aged >40 years old (>30 years in people of South Asian origin)
- Family history of diabetes
- Personal history of gestational diabetes
- Personal history of hypertension
- Personal history of dyslipidaemia
- Personal history of pre diabetes

Table 3. Diagnostic criteria for Hyperosmolar Hyperglycaemic State

Adapted from JBDS (2012), The Management of Hyperosmolar Hyperglycaemic State⁹

- Plasma glucose >30.0mmol/L
- pH >7.3
- Serum bicarbonate >15.0mmol/L
- Plasma ketones <3.0mmol/L
- Serum osmolality >320mOmol/kg

Table 4

Diagnostic criteria for Diabetic Ketoacidosis – Adapted from JBDS DKA guideline⁸

- You need the **'D'**
 - A glucose concentration of >11.1mmol/L or
 - A previous diagnosis of diabetes
- You need the **'K'**
 - Plasma ketones of ≥ 3.0 mmol/L
 - (Urine ketones can be misleading and unhelpful)
- You need the **'A'**
 - A pH of <7.3
 - An anion gap of >12
 - A bicarbonate of <15mmol/L

3. The diabetic foot

The diabetic foot can present in many different formats, chronic or acute ulceration, abscess or collection, gangrene, critical limb ischaemia, and acute Charcot neuroarthropathy. It is estimated that between five and seven percent of people with diabetes will have a diabetic foot ulcer at some point in their lives, at an estimated annual cost of £935 million to the NHS (Diabetic foot care in England).¹³

The annual number of diabetes related amputations in England is now more than 7,000 and the likelihood that someone with diabetes will have a leg, foot or toe amputation is around 23 times that of a person without diabetes.¹⁴ There is variation in the incidence of amputation of the lower limb in England.¹⁵

Admission for the diabetic foot is common, with NaDIA reporting almost 50% of emergency admissions for those with a diabetes specific complication are for foot emergencies.¹⁶ This number has increased year on year.^{16, 17} The National Diabetes Foot Care Audit revealed that people with severe ulcers are 1.5 times as likely to be admitted to hospital and three times as likely to be admitted for foot disease.¹⁷

One fifth of hospital sites do not have a multi-disciplinary foot care team (MDFT) (20 per cent), though this proportion has reduced from 42% in 2011.¹⁷

Not everyone needs to be admitted; the degree of infection can be assessed using the Infectious Diseases Society of America (IDSA) guidelines¹⁸ (see Table 5, page 12). The vascular status of the individual should also be taken into consideration as if there is a non-palpable pulse the individual may require vascular assessment prior to discharge.

- Dressings should always be removed to assess ulcers and shoes should be examined
- Assess the individual for signs of sepsis or toxicity
- Feel the temperature of the feet with the dorsum of the hand. Increased warmth with redness and swelling might indicate inflammation such as cellulitis or acute Charcot foot whereas a cold foot might suggest ischaemia

Table 5. Severity of infection (as defined by IDSA guidelines)¹⁸

Mild infection; presence of 2 or more manifestations of inflammation (purulence, or erythema, pain, tenderness, warmth or induration), but any cellulitis/erythema extends to 2 or less cm around the ulcer and infection is limited to the skin or superficial subcutaneous tissues; no other local complications or systemic illness

Moderate infection; (as above) in a patient who is systemically well and metabolically stable but which has 1 or more of the following characteristics: cellulitis extending greater than 2 cm, lymphangitic streaking, spread beneath the superficial fascia, deep tissue abscess, and involvement of muscle tendon, joint or bone

Severe infection; infection in a patient with systemic toxicity or metabolic instability (e.g. fever, rigors, tachycardia, hypotension, confusion, vomiting, leucocytosis, severe hyperglycaemia)

Which individuals should be admitted?

- People with a life threatening/limb-threatening problem such as foot ulceration with fever or signs of sepsis
- People with ulceration with limb ischaemia
- People with wet gangrene
- Those with suspected deep - seated soft tissue or bone infection, usually indicated by a grossly swollen foot with shiny skin

See Diabetic Foot Assessment Appendix 5 (page 22)

4. End of life Care and Diabetes

In the UK it is estimated that each year half a million people die in the UK and 75,000 of these will have diabetes. The average age expectancy of the population increases year on year and the average age of inpatients with diabetes is 75 years.¹⁶ In 2014, nearly half of all deaths in England occurred in hospitals.¹⁹ This is despite the majority of individuals who when given a preference would prefer to die at home. The possibility of a home death will depend on various factors, such as the illness progression, for symptom control, complications, family support available and access to community based palliative care services and equipment.²⁰ This has possibly led to Acute Emergency Services seeing an increase in those already considered being in the last phase of life and who have been cared for in the home or in nursing homes. The individuals include the frail and people with advanced dementia, some of whom will already have advanced care planning in place.

This may take the form of:

- **An Advance Decision** – this document is legally binding – it should have been signed and witnessed. It informs all those involved in the individual's care e.g. family, carers, health professionals, that the individual has a specific wish to refuse specific treatments in the future and this becomes essential if that individual loses the ability to communicate effectively.
- **An Advance Statement** – this document is not legally binding but sets out the individuals' wishes, preferences and beliefs about future care.
- **Emergency Health Care Planning** – An EHCP makes communication easier in the event of a healthcare emergency. It includes shared decision making and recording around expectations and capabilities of the individual and carers in the event of predictable situations or emergencies. The plan should include a list of regular and PRN medications, and indications for any rescue medications left in the individual's home for emergency use. It could include plan for insulin adjustment or rescue doses of short acting insulin analogues.²⁰

Diabetes management at the end of life centres on symptomatic relief at the right stage of end

of life. It aims to prevent glycaemic emergencies such as diabetic ketoacidosis and hyperosmolar hyperglycaemic state or hypoglycaemia, as well as dehydration and the development of foot ulceration or pressure sores. Hypoglycaemia is common in the dying as appetites reduce and if renal impairment is present, due to the slow clearance of medications such as insulin and sulphonylureas.

Specific recommendations in the care of dying people with diabetes as shown in the Diabetes UK Clinical Care Recommendations (2018) are that:

- Recommended blood glucose targets are 6.0-15.0mmol/L
- HbA_{1c} measurement is not generally recommended unless it is used to estimate long-term hypoglycaemia; fasting blood glucose readings are not required
- Fluids should not be withdrawn unless it is the wish of the individual or if they lack capacity, the family or carer
- **Insulin must not be discontinued in people with type 1 diabetes**
- Insulin regimens in type 2 diabetes should be simplified; these individuals may only require a single injection of intermediate insulin e.g. Insuman Basal, Humulin I, Insulatard
- If hypoglycaemia is a significant risk, long-acting analogue insulin such as degludec and insulin glargine can be given. This is useful if the insulin has to be administered by community nurses
- Insulin and other non insulin injectable treatments such as GLP-1 receptor agonists and oral diabetes therapies may be withdrawn in people with type 2 diabetes if clinically appropriate
- If the individual is transferred to a ward or back to a nursing home or home, a clear diabetes treatment plan must be in place and medication and supplies provided
- Contact numbers for the GP or Diabetes Specialist Nurse Team caring for the individual must be included in the management plan

See Appendix 6 (page 23)

5. Unknown insulin regimen in people with diabetes admitted acutely unwell

People with diabetes admitted to hospital acutely unwell or with chronic confusion/cognitive impairment may not know their usual medications/doses, including insulin. There are several ways the admitting doctor may be able to identify the correct insulin regimen. This section provides a management guide to minimise the risk of hypo/hyperglycaemia in the short term until the individual's usual regimen can be ascertained. In all cases, contact the Diabetes Specialist Nurse Team for on-going management as soon as able.

Identifying person's usual insulin regimen

1. Ask the individual! He or she may not remember the dose, but may know *which* insulin(s) they take, or vice versa
2. Check on in house electronic data bases
3. Ask to see the insulin pen(s), insulin safety card and/or monitoring book: many people document their current insulin doses in their monitoring book
4. Ask a family member: he/she may have the correct information, or may be able to provide the individual's insulin passport/ insulin safety card, detailing which insulin is taken
5. Contact the person's GP surgery: this will allow you to identify *which* insulin is prescribed, but unless the individual has been seen in the GP practice very recently (i.e. within last month), any record of insulin dose cannot be certain
6. Some individuals have their insulin administered by district nurses or nursing home staff: contact these teams for further information

Short-term management when insulin regimen is unknown

Type 1 diabetes

If the person is suspected to have Type 1 diabetes or if this is a possibility, but they are unable to recall either which insulin is taken or the usual dose and if they are acutely unwell and /or unable to eat or drink:

- Start VR88 and monitor capillary blood glucose hourly
- If the person is unwell OR their blood glucose >11.0 mmol/L, a venous blood gas may be necessary. If appropriate measure finger-prick blood ketone level. If DKA is diagnosed, then treat this accordingly. Otherwise, do not stop the VR88 until the patient has recovered, and the usual insulin/dose is known and prescribed and given
- Continue long acting/intermediate acting insulin in addition to the VR88

If the type of insulin is known but not the dose

- Calculate a safe total daily dose (TDD) based on body weight
- This dose should be sufficient to prevent development of ketoacidosis but be very unlikely to cause hypoglycaemia
- Monitor BG levels at least 4 times per day pre-meal and pre-bed, and titrate insulin doses as required

For some worked examples – see below

Type 2 diabetes: where the individual is usually managed on insulin and is acutely unwell

- Test blood glucose and ketones and rule out HHS
- If the blood glucose is more than 12.0mmol/L and the individual is unable to take diet and or fluids commence a VR88

Type 2 diabetes: where the individual is not acutely unwell and able to take diet and or fluids

- Test blood glucose 4 hourly and aim for blood glucose readings of 6.0 - 10.0mmol/L (although a range of 4.0 to 12.0mmol/L is acceptable)

- Commence subcutaneous NPH insulin such as Human Insulatard, Humulin I, and Insuman Basal once daily until the correct insulin has been identified if clinically indicated)
- Titrate dose as necessary
- If the individual is in end of life care aim for blood glucose readings of 6.0-15.0mmol/L with no glycaemic symptoms

Method A: Calculating estimated insulin dose from patient's weight

Worked Example using method A:¹²

| | |
|---|--|
| Patient with CKD Stage 4 weighs 100 kg | 100 kg |
| Total daily insulin requirement (TDD) = 0.3 x body weight | 0.3 x 100 = 30 units |
| Basal bolus insulin regime (MDI)* Give half of TDD as basal insulin and divide the remainder by three for bolus doses with each meal | Basal dose: $30 \div 2 = 15$ units Bolus dose: $15 \div 3 = 5$ units with each meal |
| Twice-daily pre-mixed insulin regime* Give 60% of total daily requirement (TDD) with breakfast and 40% with evening meal | Breakfast dose: 60% = 18 units Evening Meal: 40% = 12 units |

***For specific insulin brands to be used - see local protocols and stock lists or seek advice of your local diabetes team**

Method B: Calculating estimated insulin dose from insulin requirements during the VRIII

An estimate of the daily insulin requirement can be estimated from the last 6 hours of the VRIII as follows:

Divide the total dose of insulin administered in last 6 hours of the VRIII by 6 to calculate average hourly dose of insulin. Multiply this by 20 (not 24,

Insulin requirements for an adult can be calculated from a weight-based formula (see worked example).

- Frail older individuals, those in renal failure (CKD stage 4 or 5) or severe hepatic failure, and those with newly diagnosed Type 1 diabetes:

Total daily insulin dose = 0.3 x body weight in kg

- All other adults **Total daily insulin dose = 0.5 x body weight in kg**

to reduce risk of hypoglycaemia) to estimate the patient's total daily insulin requirement. A further correction may be needed in some patients, depending on individual insulin sensitivity, previous degree of glycaemic control and severity of intercurrent illness.

Worked example using method B:¹²

| | |
|---|--|
| Total dose of insulin administered in last 6 hours (6 times hourly rate) | 12 units |
| Divide by 6 to calculate hourly dose | $12 \div 6 = 2$ units |
| Multiply by 20 (not 24 to reduce risk of hypoglycaemia) to estimate total daily insulin requirement TDD | $2 \times 20 = \mathbf{40}$ units |
| Basal bolus insulin regime (MDI)* Give half of TDD requirement as basal insulin and divide the remainder by three for bolus doses with each meal | Basal dose: $40 \div 2 = \mathbf{20}$ units Bolus dose: $20 \div 3 = \mathbf{7}$ units with each meal. |
| Twice-daily pre-mixed insulin regime* Give 60% of TDD with breakfast and 40% with evening meal | Breakfast dose: $60\% = \mathbf{24}$ units Evening Meal: $40\% = \mathbf{16}$ units |

Appendix 1. An example pathway to decide whether someone presenting with hypoglycaemia needs acute hospital admission or not

Reproduced with kind permission from Dr Kath Higgins University Hospitals of Leicester

Pathway for Adult Patients with Diabetes attending the Emergency Department (ED) with Hypoglycaemia

Patient attends ED

Patient assessed and if CBG <4.0 mmol/l treat hypoglycaemia according to UHL guidelines*

CLINICAL DECISION MADE BY ED STAFF REGARDING DISCHARGE OR ADMIT

Support available from Diabetes Specialist Nurses (DSN) to facilitate discharge daily

Patients who should always be referred to DSN:

- Patients who are pregnant
- Patients using a pump
- Patients on IV insulin

Scenarios when referral to DSN team should be considered:

- Hypo-unawareness
- Prolonged hypoglycaemia
- Patient/carer request
- Nursing/residential home resident
- Multiple attendances to ED with hypoglycaemia

DISCHARGE

1. ED clinical staff to complete hypoglycaemia referral form/fax sheet
2. Inform patient that they will receive telephone follow up within 2 working days
3. Give patient hypoglycaemia treatment leaflet
4. Receptionist to fax 'Hypoglycaemia Referral Form' to 0116 273 4845

ADMIT

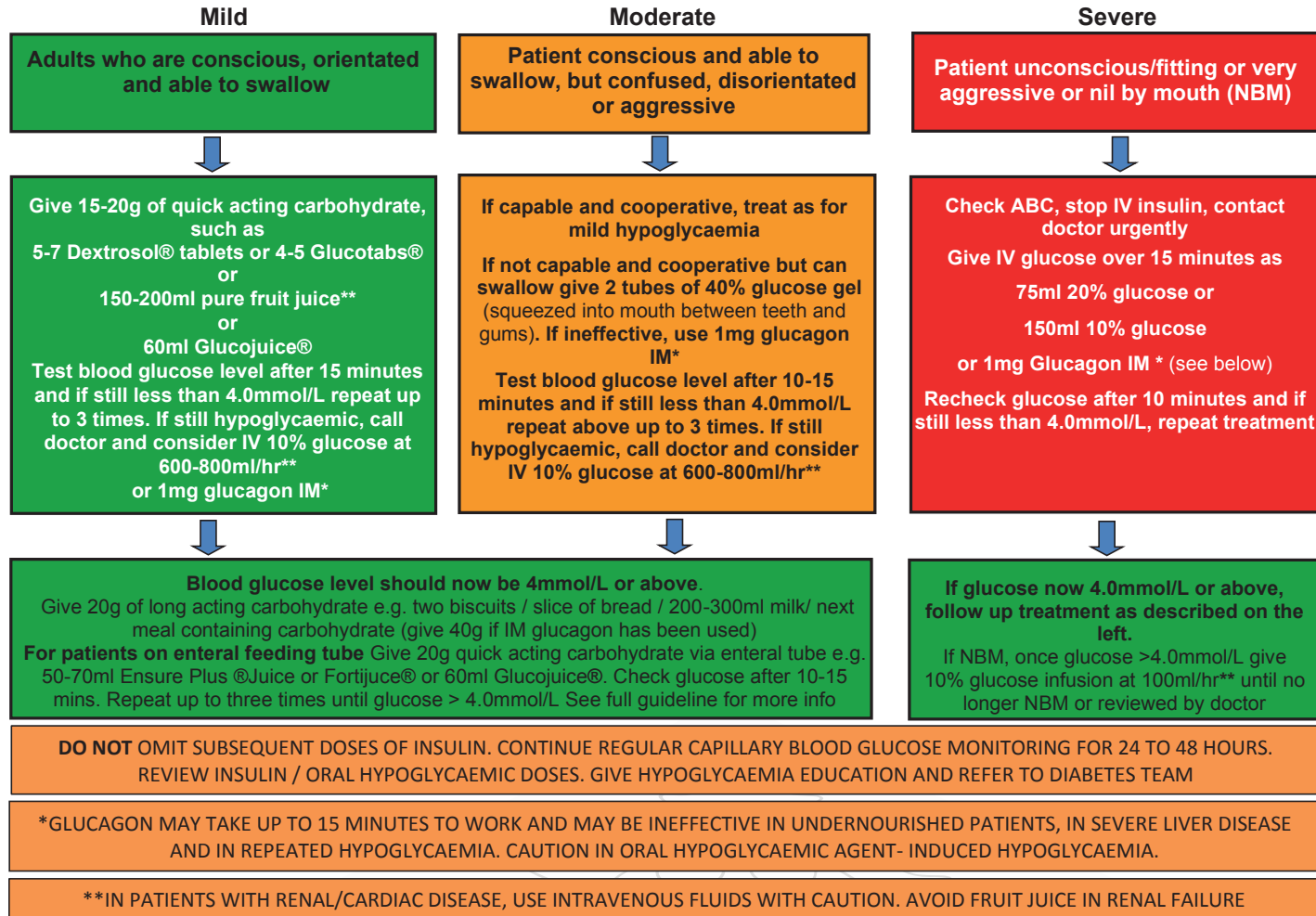
1. See EDU hypoglycaemia Pathway for EDU inclusion/exclusion criteria
2. Refer to LRI DSN team

Appendix 2 – The Treatment of Hypoglycaemia – this is separated in 3 sections depending of the severity of symptoms

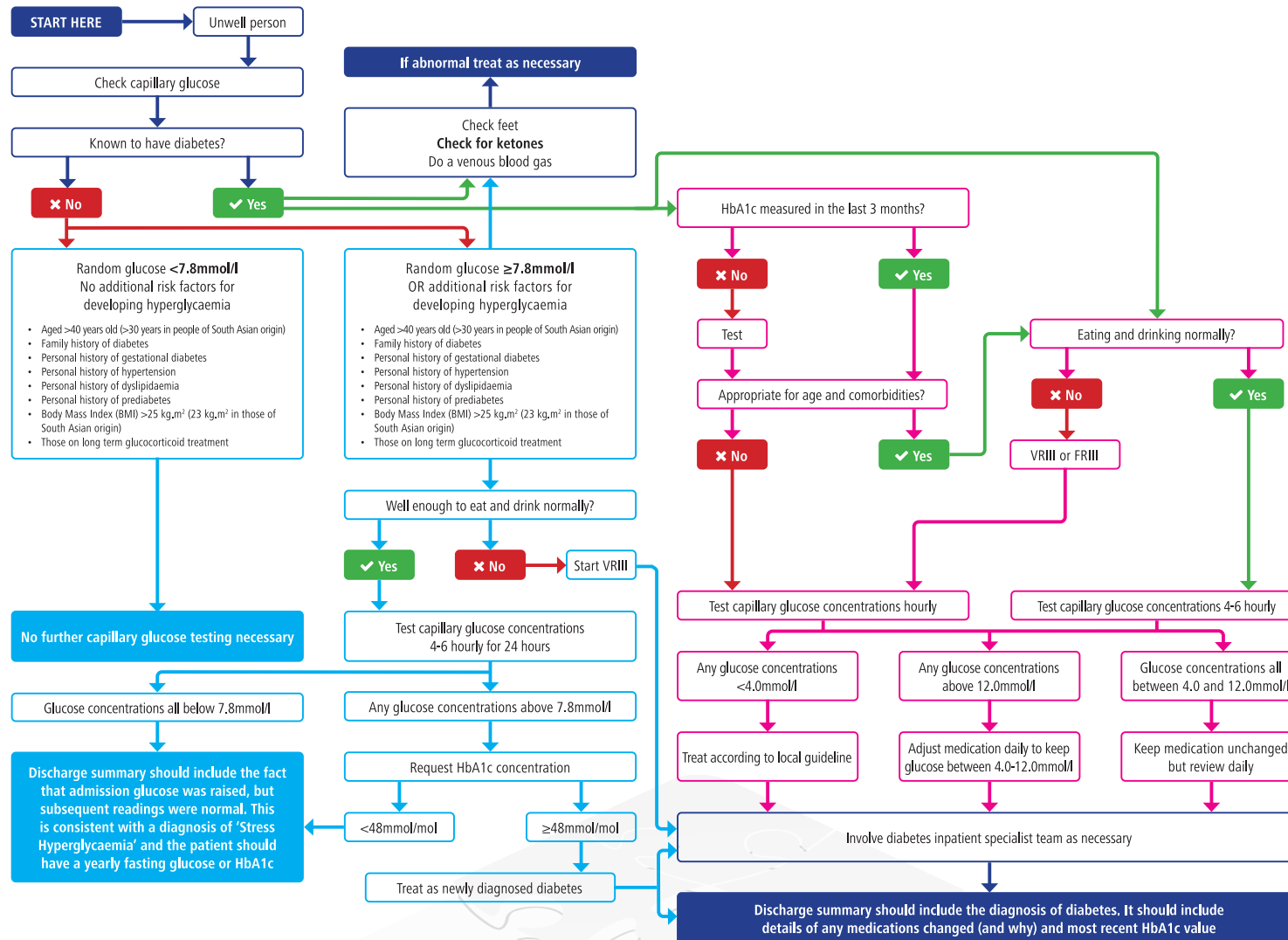
Algorithm for the Treatment and Management of Hypoglycaemia in Adults with Diabetes Mellitus in Hospital

Hypoglycaemia is a serious condition and should be treated as an emergency regardless of level of consciousness. Hypoglycaemia is defined as blood glucose of less than 4.0mmol/L (if not less than 4.0mmol/L but symptomatic give a small carbohydrate snack for symptom relief).

For further information see the full guideline “The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus” at www.diabetes.org.uk/joint-british-diabetes-society



Appendix 3 – Diabetes Assessment in people with known and unknown previous diagnosis of diabetes



Appendix 4 – Diabetes Decision Support tool: Management of hyperglycaemia

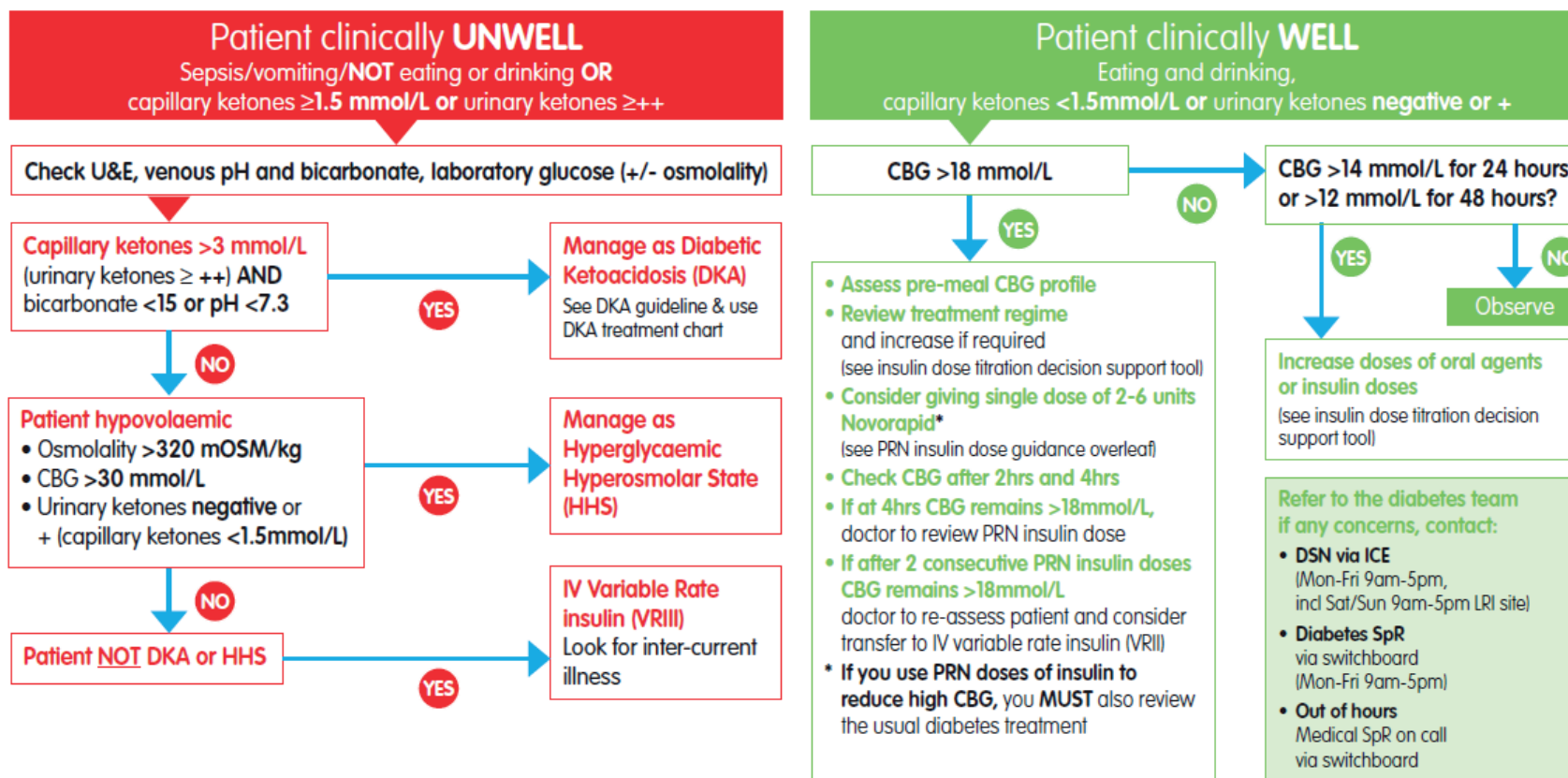
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ADULT INPATIENT

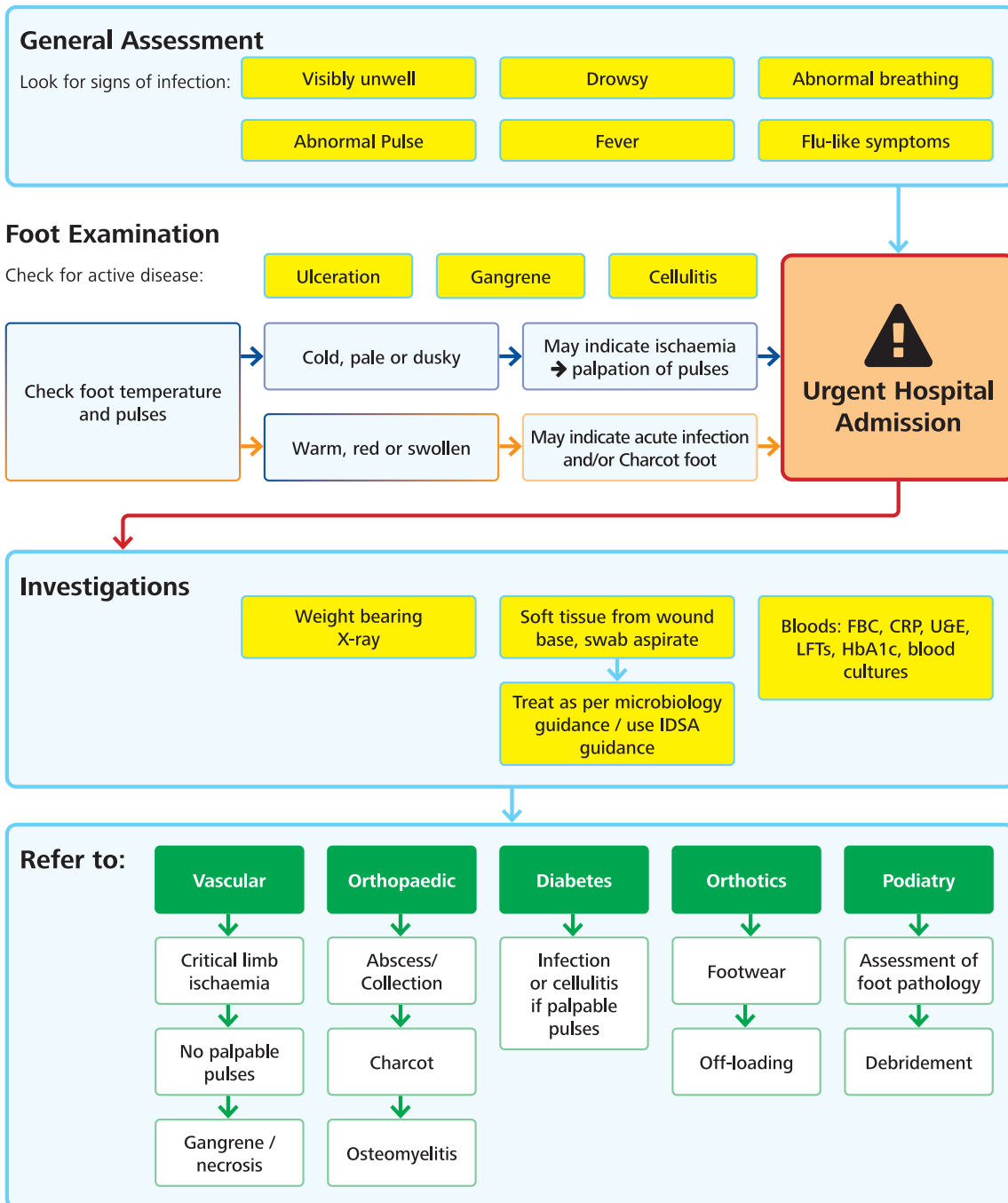
DIABETES DECISION SUPPORT TOOL

Management of Hyperglycaemia - High Capillary Blood Glucose Levels (CBGs) in Patients With Diabetes

- **Pre-meal blood glucose (CBG) >12 mmol/L** – review patient and CBG readings. Check CBG pre-meal and bedtime as minimum
- **Check for ketones (capillary or urine)** in ANY patient known to have diabetes who is clinically unwell or in patients who are clinically well **if CBG >18mmol/L**
- **Look for the cause** – consider inter-current illness, sepsis, missed/incorrect dose of oral hypoglycaemic agents or insulin/steroids/NG feeds
- **Doctor to review patient and advise treatment according to below:**

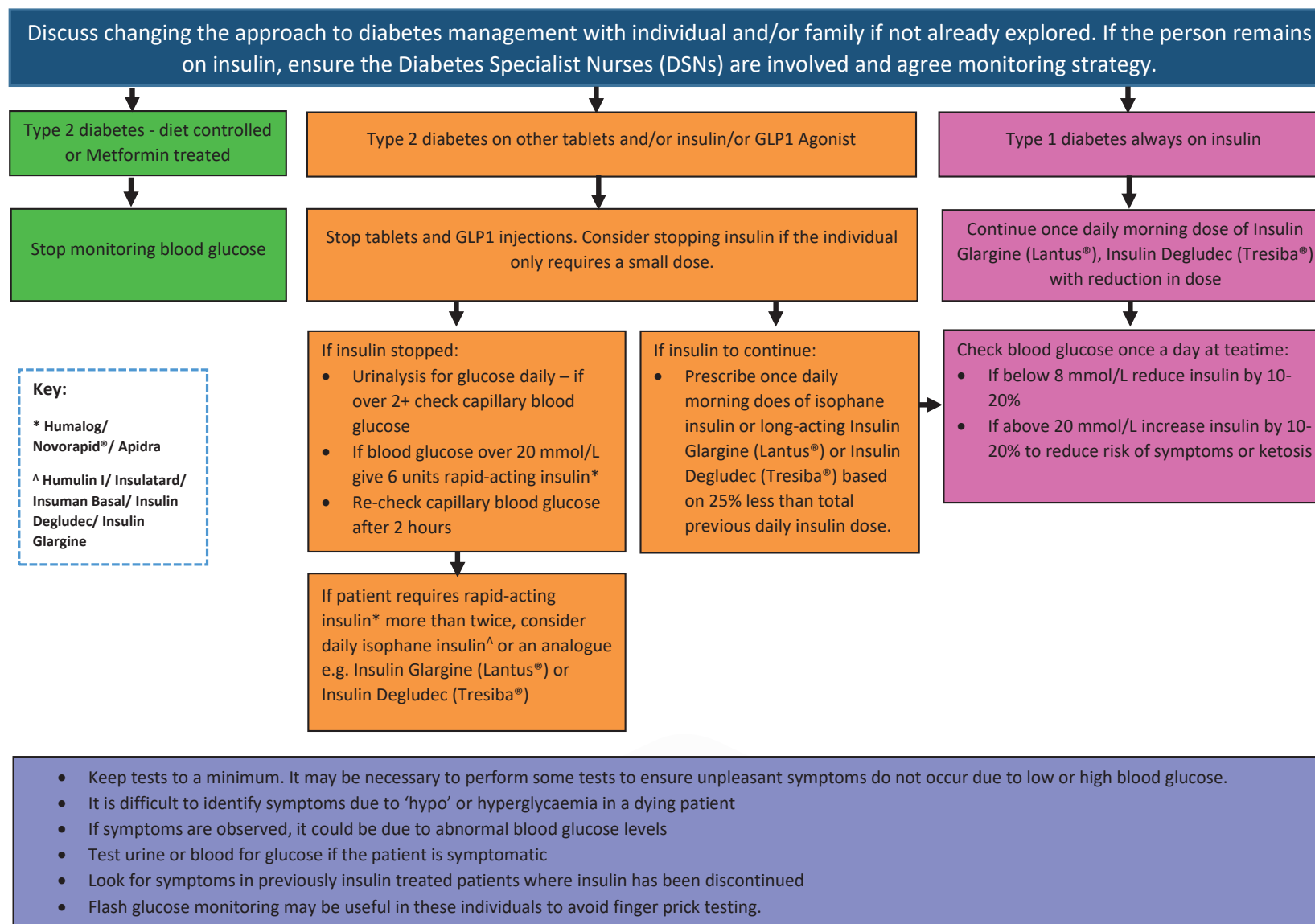


Appendix 5 – Diabetic foot Assessment




Appendix 6 – The management of diabetes during the last days of life

Kindly reproduced by the Diabetes UK End of Life Clinical Care Recommendations 3rd Edition (2018) Working Group)



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