

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

Revised May 2023



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

Other JBDS documents:

<i>The hospital management of hypoglycaemia in adults with diabetes mellitus</i>	<i>JBDS 01</i>
<i>The management of diabetic ketoacidosis in adults</i>	<i>JBDS 02</i>
<i>Management of adults with diabetes undergoing surgery and elective procedures: improving standards</i>	<i>JBDS 03</i>
<i>Self-management of diabetes in hospital</i>	<i>JBDS 04</i>
<i>Glycaemic management during the inpatient enteral feeding of stroke patients with diabetes</i>	<i>JBDS 05</i>
<i>The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes</i>	<i>JBDS 06</i>
<i>Admissions avoidance and diabetes: guidance for clinical commissioning groups and clinical teams</i>	<i>JBDS 07</i>
<i>Management of hyperglycaemia and steroid (glucocorticoid) therapy</i>	<i>JBDS 08</i>
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<i>Management of adults with diabetes on dialysis</i>	<i>JBDS 11</i>
<i>Managing diabetes and hyperglycaemia during labour and birth</i>	<i>JBDS 12</i>
<i>The management of diabetes in adults and children with psychiatric disorders in inpatient settings</i>	<i>JBDS 13</i>
<i>A good inpatient diabetes service</i>	<i>JBDS 14</i>
<i>Inpatient care of the frail older adult with diabetes</i>	<i>JBDS 15</i>
<i>Diabetes at the front door</i>	<i>JBDS 16</i>
<i>The management of glycaemic control in people with cancer</i>	<i>JBDS 17</i>
<i>COncise adVice on Inpatient Diabetes (COVID:Diabetes)</i>	<i>JBDS 18</i>

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These guidelines can also be accessed via the Diabetologists (ABCD) app (need ABCD membership to access the app)



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To enable the guideline to stay relevant, it is envisaged that all of the JBDS guidelines will be updated or reviewed each year. As such these are 'living' documents – designed to be updated based on recently published evidence or experience. Thus, feedback on any of the guidelines is welcomed. Please email christine.jones@nnuh.nhs.uk with any comments, suggestions or queries.

Conflict of interest statement

The authors declare no conflicts of interest

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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 five 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.² Other reasons for admissions to hospital in the diabetes population include: newly diagnosed diabetes, cardiovascular disease, stroke and end of life care.²

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.

The authors appreciate that some of the recommendations in this document are slightly different to that found in those produced by the The National Diabetes Inpatient COVID Response Team - <https://abcd.care/coronavirus>. However, for those without COVID19 infection, we recommend that the recommendations in this document be followed.

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 **4.9 million** people living with a diagnosis of diabetes in the UK, and 90% of those with Type 2. There are almost 1 million more people living with Type 2 diabetes, who don't know they have it because they haven't been diagnosed. Approximately 30% of those diagnosed are insulin treated.³

The 2016 NaDIA reported that hypoglycaemia accounted for 14.7% of hospital admissions in the 15,774 people audited that year.⁴

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 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.⁵

Hypoglycaemia can cause coma, hemiparesis and seizures. If the hypoglycaemia is prolonged neurological deficits may become permanent. Severe hypoglycaemia is associated with increased mortality.⁶

The risk factors associated with hypoglycaemia are shown in Table 1 (below). An example pathway to decide whether someone presenting with hypoglycaemia needs acute hospital admission or not is shown in Appendix 1 (page 20). The recommended treatment of hypoglycaemia is shown in Appendix 2 (page 21).

Table 1 Risk factors for hypoglycaemia

Adapted from JBDS guideline: The hospital management of hypoglycaemia in adults with diabetes mellitus.⁷

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	Reduced carbohydrate intake/absorption
Sepsis	Anorexia, poor appetite / interruption of enteral feeding
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

Recommendations:

- Not everyone reviewed and treated for hypoglycaemia will require hospital admission.
- All should be reviewed for the cause of the hypoglycaemic event and HbA1c 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 HbA1c 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 HbA1c 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.

Appendix 1 (page 20) shows an example decision making tool for deciding who may or may not need admission for hypoglycaemia and Appendix 2 (page 21) shows the treatment of hypoglycaemia

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 12), 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).⁸

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 12), 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).⁹ 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.

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 using this equation: $2 \times \text{serum sodium} + \text{serum glucose} + \text{serum urea}$ (all in mmol/L). If this is > 320 mOsmol/kg, hyperosmolar hyperglycaemic syndrome (HHS) should be diagnosed (see Table 3, page 12), and treated accordingly. Be aware that a mixed picture of HHS and DKA can occur.¹⁰

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'¹¹ and it is recommended that the individual should have a yearly fasting glucose or HbA1c 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 HbA1c should be requested. If the HbA1c is ≥ 48 mmol/mol, the person 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 $<4.0\text{mmol/L}$, then they need to be treated appropriately for hypoglycaemia.

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 12) shows the diagnostic criteria for diabetic ketoacidosis (DKA)⁹ – **be aware that DKA can occur with a normal glucose concentration, in particular with SGLT-2 inhibitor use.**¹²

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 HbA1c 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 HbA1c is not appropriate for the age and comorbidities, 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 6.0 - 12.0mmol/L for most people.

If the glucose is $>30.0\text{mmol/L}$, and ketones are negative then the plasma osmolality should be calculated ($2 \times \text{serum sodium} + \text{serum glucose} + \text{serum urea}$ (all in mmol/L). If this is $>320\text{mOsmol/kg}$, 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 6.0 - 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 $>3.0\text{mmol/L}$ 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 6.0 - 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 10.0mmol/L with an acceptable range of 6.0 - 12.0mmol/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 6.0-12.0mmol/L. Capillary glucose concentrations should be measured hourly whilst a VRIII is in use.¹³ 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 22).

A decision tool on the management of hyperglycaemia admissions is shown In Appendix 4 (page 23).

Table 2. Risk factors for developing hyperglycaemia

Adapted from The Management of Diabetic Ketoacidosis in Adults⁹

- 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 State

- 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 guideline¹⁰

- You need the **'D'**
 - A glucose concentration of >11.0mmol/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.¹³ Managing the diabetic foot, coupled with the cost of associated lower limb amputations, costs the NHS up to £1 billion annually.^{13,14}

There are more than 9,000 amputations a year in England caused by the disease. At least £1 in every £140 of NHS spending goes towards foot care for people with diabetes. Diabetes leads to more than 176 leg, toe or foot amputations every week in England, according to new analysis by the charity Diabetes UK 2020. 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 NDFA has found that the proportion of referrals seen by a specialist foot care team within 13 days has increased from 43% in 2014-15 to 46% in 2020-21. They have also seen a linked reduction in the proportion of ulcers that are severe at first expert assessment (FEA) (from 48% to 43%) and the subsequent decrease in the proportion of ulcers still active (not healed) at 12 weeks (from 49% to 40%). This suggests that the NDFA focus on prompt referral to the specialist team has been effective.

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 14). 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

There is still much work to do. Variations in 12-week outcomes persist there are gaps in service provision, particularly in multi-disciplinary foot care service (MDFS) integration with renal services and it is notable that almost 1 in 5 people (18%) presenting with a severe ulcer are dead (15%) or have undergone major amputation (3%) within 1 year <https://digital.nhs.uk/data-and-information/publications/statistical/national-diabetes-footcare-audit/2014-2021>

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 24)

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.¹ In 2014, nearly half of all deaths in England occurred in hospitals. The numbers of people dying where they usually reside (home , residential or care home or home or religious establishment has increased from 35% in 2004 to 49% in 2021.¹⁹ The majority of individuals when given a preference 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 Trend Diabetes 2021 recommendations:

- Recommended glucose targets are 6.0-15.0mmol/L
- The use on continous glucose monitoring may be useful as this method of testing is less invasive
- HbA1c measurement is not generally recommended unless it is used to estimate long-term hypoglycaemia; fasting 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. Humulin I, Insulatard
 - If hypoglycaemia is a significant risk, long-acting analogue insulin such as Degludec and Insulin Glargene 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 for an example of and End of Life treatment algorithm (page 25)

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

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 VRIII and monitor capillary blood glucose hourly
- If the person is unwell OR their 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 VRIII until the individual has recovered, and the usual insulin/dose is known and prescribed and given
- Continue long acting/intermediate acting insulin in addition to the VRIII

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 premeal 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 glucose level is more than 12.0mmol/L and the individual is unable to take diet and or fluids commence a VRIII

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 6.0-12.0mmol/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 glucose readings of 6.0-15.0mmol/L with no glycaemic symptoms

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

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**

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	$0.3 \times 100 = \mathbf{30 \text{ units}}$
Basal bolus insulin regimen (MDI)* Give half of TDD as basal insulin and divide the remainder by three for bolus doses with each meal	Basal dose: $30 \div 2 = \mathbf{15 \text{ units}}$ Bolus dose: $15 \div 3 = \mathbf{5 \text{ units with each meal}}$
Twice-daily pre-mixed insulin regimen* 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, 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 regimen (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 regimen* 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

Leicestershire Diabetes Guidelines

NHS
University Hospitals of Leicester
NHS Trust

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

Person attends ED

Person 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

People who should always be referred to DSN:

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

Scenarios when referral to DSN team should be considered:

- Hypo-unawareness
- Prolonged hypoglycaemia
- Individual/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 individual they will receive telephone follow up within 2 working days
3. Give person 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

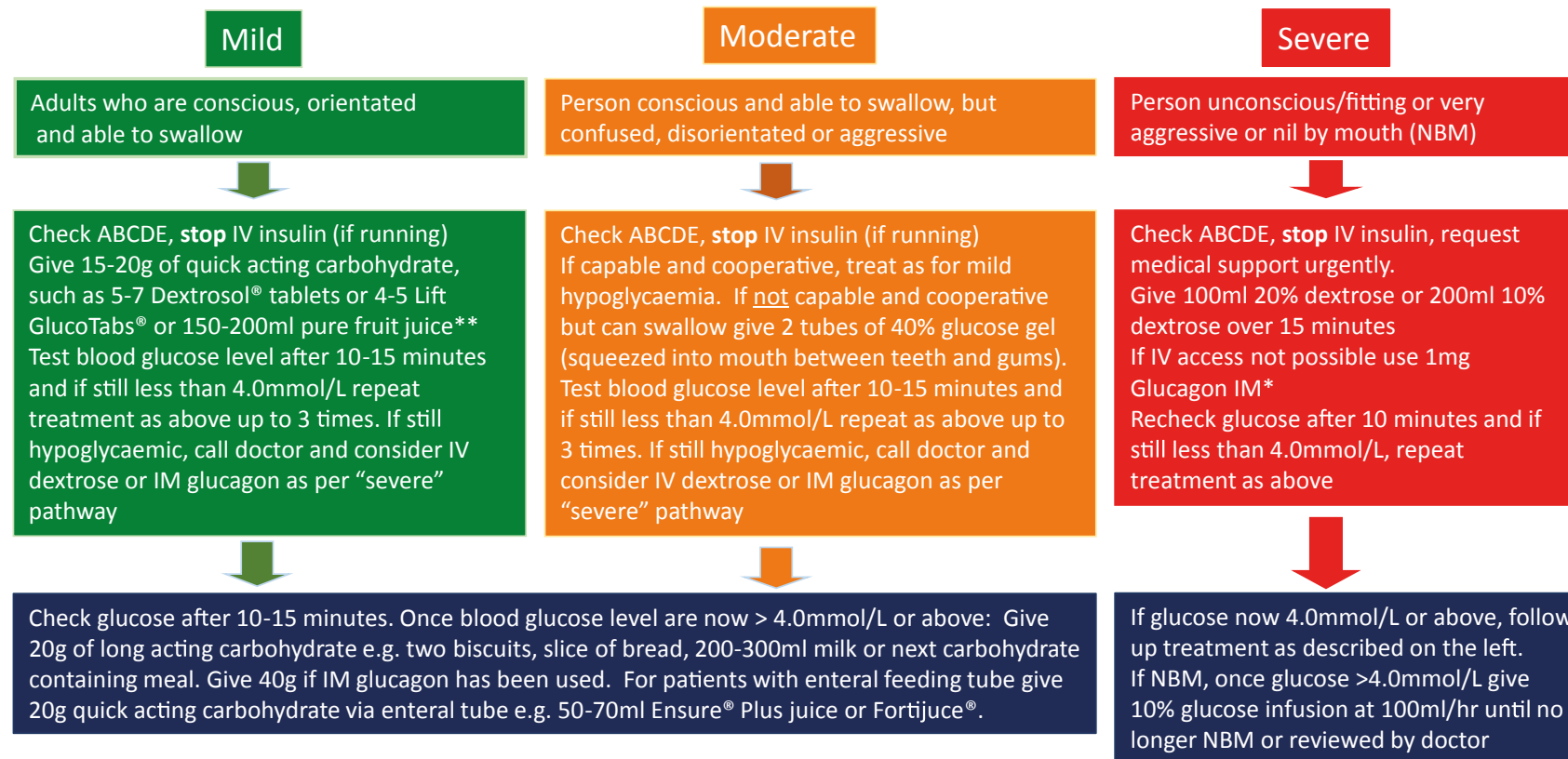
The Treatment of Hypoglycaemia – this is separated in 3 sections depending of the severity of symptoms

Algorithm for the Management of Hypoglycaemia in Adults with Diabetes 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 $<4.0\text{mmol/L}$ (if not $<4.0\text{mmol/L}$ but symptomatic give a small carbohydrate snack for symptom relief)

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

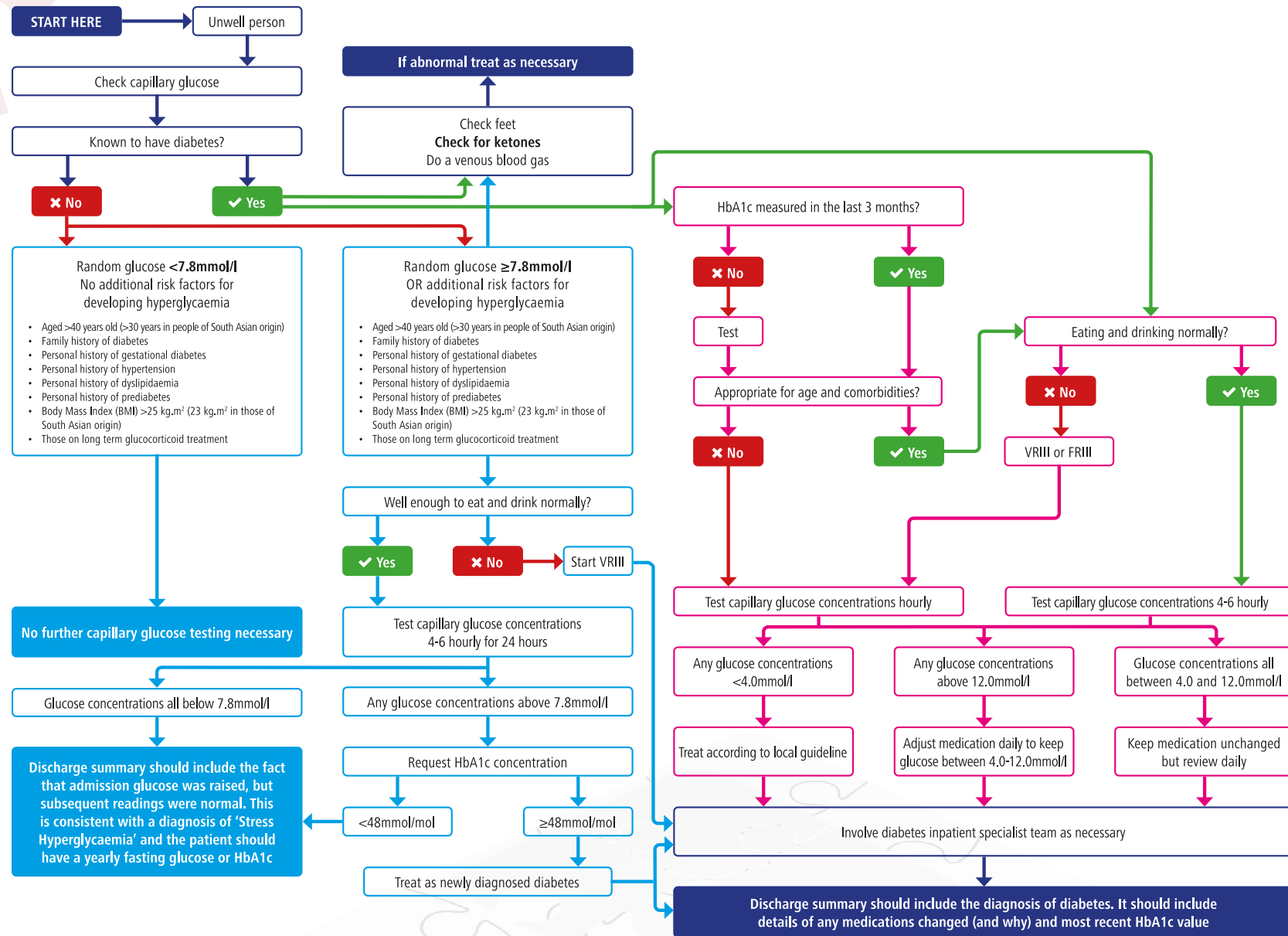


DO NOT omit subsequent insulin doses. Continue regular capillary blood glucose monitoring for 24-48 hours. Review insulin and/or oral hypoglycaemic doses. If previously on IV insulin, would generally consider restarting insulin once blood glucose >4.0 but may require review of regimen. Give hypoglycaemia education and refer to inpatient diabetes team.

*Glucagon may take up to 15 minutes to work and may be ineffective in treating hypoglycaemia in undernourished patients, in severe liver disease, sulfonylurea induced hypoglycaemia and in repeated hypoglycaemia.

Appendix 3

Diabetes assessment in people with known and unknown previous diagnosis of diabetes



Appendix 4

Diabetes Decision Support tool: Management of hyperglycaemia

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

ADULT

DIABETES DECISION SUPPORT TOOL

NHS
University Hospitals of Leicester
NHS Trust

PRN INSULIN DOSE GUIDANCE FOR PEOPLE WITH DIABETES WHO ARE CLINICALLY WELL AND CBG >18mmol/L

- **Standard CBG target** for people with diabetes 4-12mmol/L
- **Conservative CBG target** (for frail, elderly, end of life individuals) 6-15mmol/L
- **Guidance for PRN insulin doses** given in table (below right)
For people with conservative target range consider reducing PRN insulin dose

Note: As a guide, 1 unit of Novorapid will reduce CBG by 3mmol/L

Caution: Some people with type 1 diabetes, particularly if slim/newly diagnosed, are very sensitive to insulin. Review PRN insulin dose in context of their usual insulin dose, use PRN insulin doses with caution

CBG (mmol/L)	PRN insulin dose (units)
18.1-25	4
>25.1	6

THINK

Does this person need a PRN insulin dose? Consider on an individual basis.

If NO: • Doctor to document

If YES: • Doctor to prescribe PRN dose of Novorapid 2-6 units subcut max frequency 4 hrly on the 'as required' section of the 'green chart' (Adult Insulin Prescribing and Glucose Monitoring Chart)

- Review PRN dose daily as PRN insulin doses can increase risk of hypoglycaemia

*Note to nursing staff

Annotate on the 'green chart' the **ACTUAL** number of units administered and repeat CBG at 2 and 4 hr after PRN insulin dose.

If NO PRN doses required in 48 hr period:
• **STOP** PRN Novorapid Insulin

If <2 PRN doses given in 48 hr period:

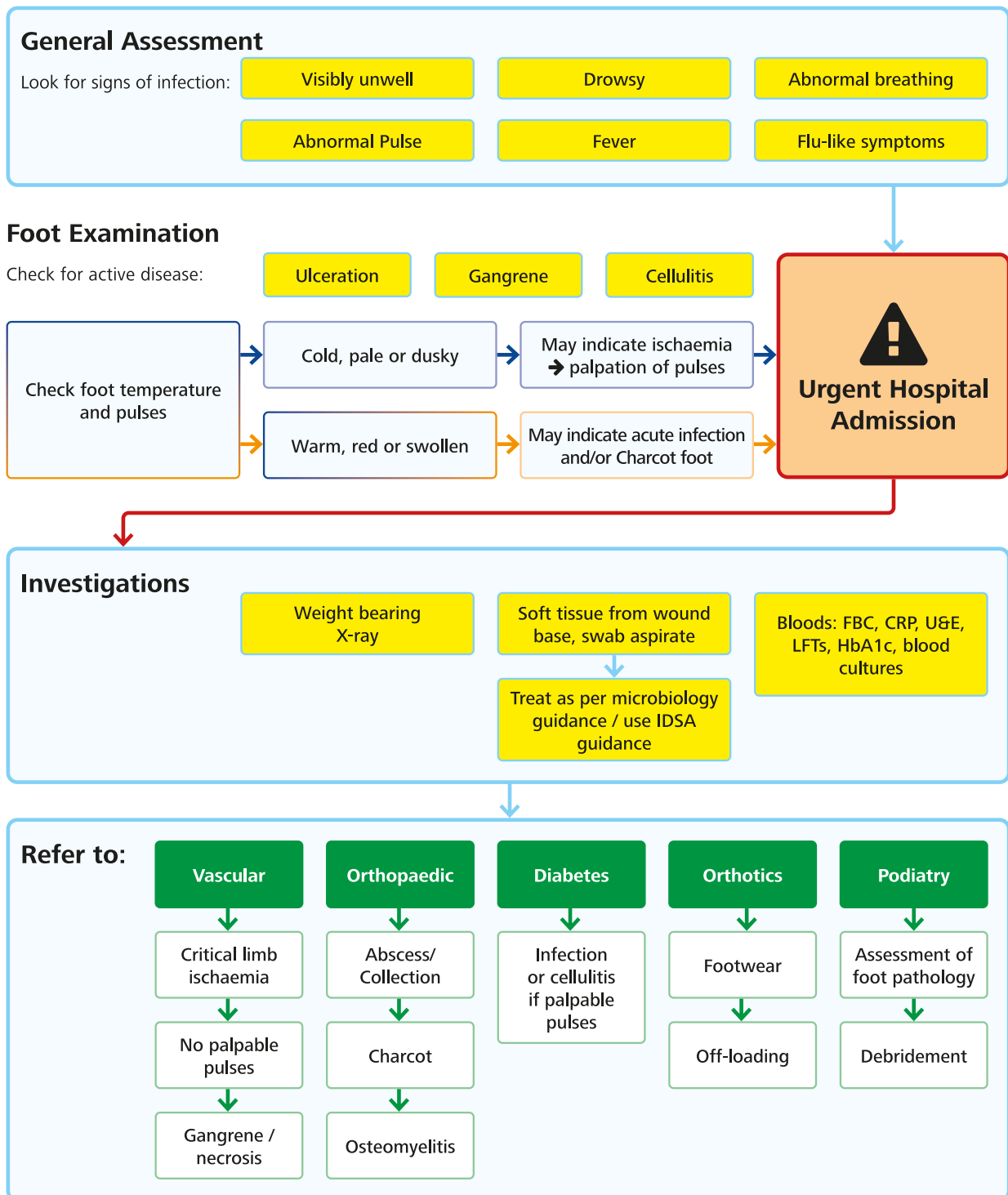
- **CONTINUE** PRN insulin and
- Review daily
- Refer to diabetes team via ICE if any concerns.

If PRN doses given daily in 48 hr period:

- **Doctor to review insulin +/- other diabetes medication**
- Increase doses of insulin (see insulin titration decision support tool)
- Refer to diabetes team via ICE

Appendix 5

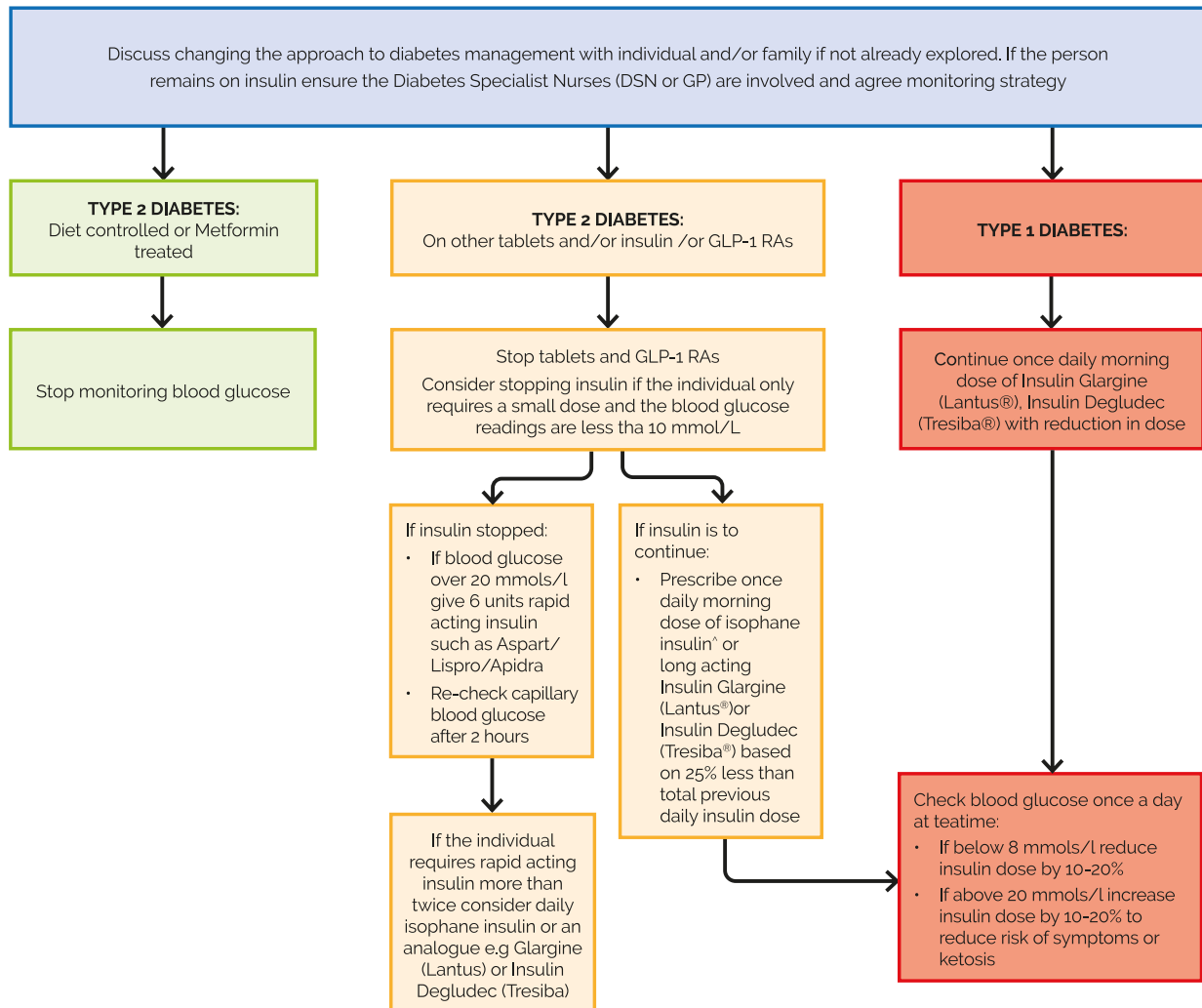
Diabetic foot Assessment



Appendix 6

The management of diabetes during the last days of life

Permission to print kindly granted by Trend Diabetes²⁰



IMPORTANT INFORMATION:

- ❶ Aim for capillary blood glucose readings of 6-15 mmol/L
- ❶ Keep tests to a minimum. It may be necessary to perform some tests to ensure unpleasant symptoms do not occur due to low or high blood glucose
- ❶ It is difficult to identify symptoms due to "hypo" or hyperglycaemia in a dying person
- ❶ If symptoms are observed it could be due to abnormal blood glucose levels
- ❶ Test urine or blood for glucose if the person is symptomatic
- ❶ Observe for symptoms in previously insulin treated individual where insulin has been discontinued.
- ❶ Flash glucose monitoring may be useful in these individuals to avoid finger prick testing

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