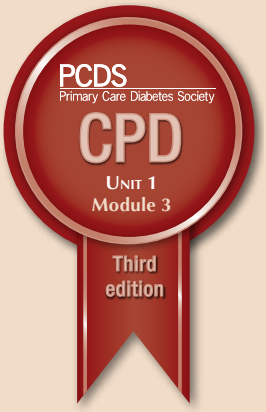

Unit 1 Core aspects of care

Managing diabetes emergencies

Online learning

Visit diabetesonthenet.com/cpd to gain a certificate of continuing professional development for participating in this module.

See page 147

Citation: James J (2015) Managing diabetes emergencies. *Diabetes & Primary Care* **17:** 140–7

Learning objectives

After reading this article, the participant should be able to:

1. Outline the prevalence of diabetes in the hospital setting.
2. List the common reasons for emergency admission to hospital related to diabetes.
3. Describe key aspects of the more common diabetes-related emergencies.

Key words

- Children
- Diabetic ketoacidosis
- Emergencies
- Hyperosmolar hyperglycaemic state

Author

June James is a a Diabetes Nurse Consultant for the University Hospitals of Leicester.

June James

On the day of the 2013 National Diabetes Inpatient Audit, more than 14 000 people in hospital beds in England and Wales had diabetes. Just over 8% of these people had been admitted specifically for management of their diabetes. This highlights the clinical importance of managing diabetes emergencies. The article presented here focuses on the more common clinical emergencies associated with diabetes, including diabetic ketoacidosis, hyperosmolar hyperglycaemic state, hypoglycaemia, the diabetic foot and the presentation of children newly diagnosed with diabetes.

At any one time, up to 15% of people in English and Welsh hospital beds have diabetes, and on the day of the 2013 National Diabetes Inpatient Audit, just under 14 200 people in this setting had the condition (Health and Social Care Information Centre [HSCIC], 2014a; 2014b). Nearly 85% of these had been admitted as an emergency, although the majority were not admitted for something directly related to diabetes: 66.3% were admitted for a medical problem and only 8.1% were admitted specifically for management of their diabetes. Where diabetes was the main reason for admission, 47% had been admitted because of active foot disease (HSCIC, 2014b).

Diabetes inpatient care is expensive for the NHS. Between £2.3 billion and £2.5 billion is spent on this annually, and at least £600 million of this is excess spending when compared with those of the same age group admitted to hospital without diabetes (Kerr, 2011). The 2013 National Diabetes Inpatient Audit found that inpatients with diabetes admitted as an emergency case stayed an extra 2 days compared with those who had a planned admission (HSCIC, 2014b). Other research has found that the median overall length of stay for inpatients with diabetes is 3 days longer than those without (8 days versus 5 days), and this disparity does not appear to have changed over time (Davies et al, 2001; Sampson et al, 2007).

Two reports from the 2012–13 National Diabetes Audit have also recently been published. The first, which was based on data from 2 058 321 people with diabetes in England and Wales, reviewed care processes and treatment targets (HSCIC, 2014a), predominantly focusing on the level of care and surveillance carried out in primary care and on achievement of HbA_{1c} targets. It found that treatment targets for glucose and blood pressure control were less likely to be achieved in younger people and in those with type 1 diabetes. Younger people (those under 55 years of age) with either type 1 or 2 diabetes were less likely than older age groups to have completed all their annual checks or achieved their treatment targets. This, combined with very low numbers of people being offered structured education at diagnosis to enable self-management (3.9% for type 1 diabetes and

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

16.7% for type 2 diabetes), raises concerns that poor outcomes and future complications may be particularly likely in this group of individuals.

The second report (HSCIC, 2015) reviewed data on 2 460 261 individuals and focused on complications and mortality. It investigated the prevalence of:

- Cardiovascular complications, many of which would require hospital admission, such as angina, myocardial infarction, heart failure and stroke.
- Serious kidney disease, as measured by the uptake of renal replacement therapy.
- Foot disease, including minor amputation and major amputation.
- Diabetic ketoacidosis (DKA).
- But not retinopathy, which is reported separately by NHS Diabetes Eye Screening.

Heart failure is now the second most common complication of diabetes among these (see *Table 1*) and contributes the most to additional mortality (HSCIC, 2015).

Based on data from the audit, it was estimated that, compared with the background rate, diabetes was responsible for 22 060 additional deaths in England and 1926 additional deaths in Wales during 2013 (HSCIC, 2015).

These audit reports, along with the Commissioning Outcomes Framework and the *Diabetes in adults quality standard* (NICE, 2011; 2012), provide the foundation for clinical commissioning groups (CCGs), and challenge healthcare providers and clinicians, to review clinical processes and access to patient-centred and peer-reviewed structured education, in order to reduce variations in care and hospital admissions.

Diabetes emergencies are more often than not preventable. This article focuses on the more common clinical emergencies, including DKA, hyperosmolar hyperglycaemic state (HHS), hypoglycaemia, the diabetic foot and the presentation of newly diagnosed children with diabetes.

DKA and HHS

DKA occurs mainly in people with type 1 diabetes but can occasionally present in those known to have type 2 diabetes. HHS is a condition that affects only people with type 2 diabetes. Both conditions are life threatening. They are caused by a complete or relative lack of insulin and require emergency hospital admission. In a study that analysed data

Table 1. One-year prevalence* of complications for England and Wales from a 2011–2012 audit (Health and Social Care Information Centre, 2015). Adapted with permission of the Healthcare Quality Improvement Partnership, of which these data remain sole and exclusive property.

	People with type 1 diabetes		People with type 2 diabetes		All diabetes†	
Complication	Number of people experiencing complication	Crude prevalence* (not adjusted for age and sex structure of population)	Number of people experiencing complication	Crude prevalence* (not adjusted for age and sex structure of population)	Number of people experiencing complication	Crude prevalence* (not adjusted for age and sex structure of population)
Angina	3414	1.60%	74 669	3.38%	79 171	3.22%
Myocardial infarction	1110	0.52%	16 696	0.76%	18 110	0.74%
Heart failure	2448	1.15%	53 072	2.4%	56 571	2.3%
Stroke	1004	0.47%	20 307	0.92%	21 712	0.88%
Major amputation (above the ankle)	263	0.12%	1536	0.07%	1834	0.07%
Minor amputation (below the ankle)	616	0.29%	3019	0.14%	3699	0.15%
Renal replacement therapy	1765	0.83%	8843	0.4%	10 832	0.44%
Diabetic ketoacidosis‡	7608	3.57%				

*One-year prevalence is the number of people who appeared in the 2011–2012 audit with one or more complication event during the year 1 April 2012 to 31 March 2013 as a proportion of the relevant group in the 2011–2012 audit. †All diabetes includes maturity-onset diabetes of the young, other specified diabetes and not specified diabetes. ‡Diabetic ketoacidosis figures are included for those with type 1 diabetes only.

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

"Precipitating factors for diabetic ketoacidosis (DKA) include infection, intercurrent illness, surgery, and omission of insulin. People with DKA tend to be younger and there is a link to socioeconomic, psychosocial and educational factors contributing to poor compliance to insulin therapies."

from the US, significant declines in the rates of death due to hyperglycaemic crisis (DKA or HHS) were found between 1985 and 2002 (Wang et al, 2006). But while mortality rates associated DKA in the US have dropped below 5%, for those with HHS the mortality rate is over 10% (Kitabchi et al, 2006). Furthermore, the prognosis in both conditions is substantially worsened at the extremes of age and in the presence of coma and hypotension (Hansen and Møller, 2010).

Data from the National Diabetes Audit revealed that 14 240 individuals identified in the 2009–10 audit were admitted for DKA at least once during a 3-year follow up time-span (HSCIC, 2015). Clinical services and commissioners are tasked with investigating new approaches to reducing admissions to hospital. Part of the challenge is that readmission rates for DKA are high, with an average of 31% of people readmitted with DKA within a year of their initial admission (Joint British Diabetes Societies Inpatient Care Group, 2013b).

DKA

Diagnosis of DKA can be difficult and individuals may be defined as having DKA but simply be hyperglycaemic. Precipitating factors for DKA include infection, intercurrent illness, surgery and omission of insulin. People with DKA tend to be younger, and there is evidence that socioeconomic, psychosocial and educational factors contribute to poor compliance to insulin therapies (Randall et al, 2011). Diagnosis is dependent on three components: uncontrolled hyperglycaemia, ketonaemia and acidaemia (Joint British Diabetes Societies Inpatient Care Group, 2013a). Successful treatment has traditionally focused on frequent monitoring, correction of hypovolaemia and hyperglycaemia, correction of electrolyte losses, and investigation for the precipitating cause. However, recent national guidelines recommend that, rather than focusing on hyperglycaemia, a reduction in ketones is a more effective measure of success (Joint British Diabetes Societies Inpatient Care Group, 2013b).

The majority of DKA cases occur in people with a known history of diabetes and should be largely preventable through early detection and with the education of patients and healthcare professionals. The *Diabetes in adults quality standard* (NICE, 2011) emphasises the important role that structured education plays in enabling people to manage their own diabetes and recommends that people admitted for DKA receive educational and psychological support prior to discharge. In practice, access to psychological support is limited in the UK, and so healthcare professionals need to ensure that patients know how to prevent reoccurrence and readmission following an event. During periods of intercurrent illness, prevention of DKA is a major part of reducing admissions to hospital. Recently, TREND-UK formed an expert working group with representatives from major healthcare professional organisations in the UK, with the purpose of formulating guidance and ensuring consistency in advice given on managing intercurrent illness. (This document, entitled *Managing diabetes during intercurrent illness in the community*, is available at http://www.trend-uk.org/resources.php [accessed 18.05.15].) With suspected DKA, a "rule of thumb" is that children, pregnant women or any patients who are unable to keep fluids down should always be admitted to hospital as an emergency.

HHS

HHS is often the result of poorly treated type 2 diabetes or delayed diagnosis of type 2 diabetes. Affected individuals are usually frail, severely dehydrated and clinically very unwell, with an altered level of consciousness. Infection or cardiovascular events are the most common predisposing factors. Strict differentiation between HHS and DKA is often difficult as some patients with HHS may present with ketonuria. The onset of symptoms with HHS is very slow whereas symptoms of DKA occur rapidly (*Table 2*), and the presenting blood glucose readings are often the key sign as values with HHS can be 30–40 mmol/L or more. This, combined with hypovolaemia and a calculated serum osmolality of >320 mOsm/kg, is diagnostic (Hansen and Møller, 2010).

Treatment of HHS is focussed on blood glucose reduction and otherwise usually follows the main treatment objectives shown for DKA: rehydration, correction of hyperosmolality, electrolyte imbalance and hyperglycaemia. These patients are usually more sensitive to insulin (Joint British Diabetes Societies Inpatient Care Group, 2012).

Sick day education, given through structured education programmes at the diagnosis of diabetes

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

and reinforced at annual review, may play a part in reducing occurrences of HHS or DKA.

Hypoglycaemia

Hypoglycaemia is the most common diabetes-related reason for ambulance call-out and is associated with increased morbidity and mortality (Brackenridge et al, 2006). There are approximately 70 000–100 000 emergency call-outs for hypoglycaemia per year (NHS Diabetes, 2012). These events are expensive: it is estimated that ambulance call-outs cost the NHS £13.6 million per year (Farmer et al, 2012). Each admission to hospital due to hypoglycaemia costs the NHS about £1000 (Amiel et al, 2008). People with diabetes may have a fear of hypoglycaemia, which can impact on adherence to medication and agreed glycaemic targets (Wild et al, 2007).

CCGs are tasked with reducing: the number of people with diabetes who require medical attention as a result of a hypoglycaemic episode; and the rate of recurrence of an episode of hypoglycaemia requiring medical attention over 12 months (NICE, 2011). If commissioners are to meet this requirement, patient and healthcare professional education will be important, as will innovative commissioning processes.

National guidance regarding hypoglycaemia is readily available for hospital and community staff and includes algorithms and care pathways (Joint British Diabetes Societies Inpatient Care Group, 2013a; TREND-UK, 2011). Online training on hypoglycaemia for staff and patients also exists (Virtual College, 2012). Innovative ways of reducing admissions are being implemented across the UK; the case example in *Box 1* describes a pilot study undertaken in Leicestershire with the aim of reducing repeat episodes of hypoglycaemia and enabling people living with diabetes to prevent and manage hypoglycaemia.

The diabetic foot

Around one in 20 people with diabetes will develop a foot ulcer in a given year, and diabetes is the most common cause of lower-limb amputations. Annually, approximately 6000 people with diabetes have leg, foot or toe amputations, of which, it is estimated, 80% are potentially preventable (Diabetes UK, 2015). Despite this, 28% of people with type 1 diabetes and 13% of people with type 2 diabetes are not receiving an annual foot check (Diabetes UK, 2015). Up to 80% of people will die within 5 years of having an amputation as a result of diabetes (Diabetes UK, 2015).

As mentioned in the introduction, the 2013 National Diabetes Inpatient Audit found that among inpatients admitted for the management of their diabetes or an associated complication, 47% had been admitted for active diabetic foot

Table 2. Differential diagnosis – diabetic ketoacidosis and hyperosmolar hyperglycaemic state (Joint British Diabetes Societies Inpatient Care Group, 2012).

Diabetic ketoacidosis	Hyperosmolar hyperglycaemic state
● Rapid-onset hyperglycaemia	● Slow-onset and progressive hyperglycaemia with blood glucose reading over 35 mmol/L
● Ketonuria	● Severe dehydration
● Rapid weight loss	● Confusion
● Polyuria	*Typically affects frail individuals with type 2 diabetes*
● Polydipsia	*Significant marked comorbidities usually present*
● Kussmaul respiration	
● Abdominal pain	
● Lethargy	

Box 1. A pilot study in Leicestershire.

The identification, in Leicestershire, of an increasing number of paramedic call-outs related to hypoglycaemia resulting in admission to hospital triggered the formation of a partnership project between the East Midland Ambulance Service and University Hospitals of Leicester NHS Trust. As part of this, a local audit was undertaken in which 106 paramedic call-outs were reviewed during a 16-week period (between 1 March and 25 June 2013), providing data on 93 patients.

The mean age of the cohort was 65 years (range, 17–90 years). Forty-one patients (44.1%) were female, and 59 of the call-outs (55.7%) were for people with type 1 diabetes. The mean HbA_{1c} was 61 mmol/mol (approximately 50% had an HbA_{1c} <58 mmol/mol [7.5%]; around 10% had an HbA_{1c} <42 mmol/mol [<6.0%]). The average blood glucose level on attendance was 2.3 mmol/L (the value was un-recordable in 11 cases). Eighty-one (87.1%) of the 93 patients in the cohort were taking insulin only for their diabetes; 5% were taking a sulphonylurea.

The local pathway ensured that all patients were contacted by a specialist nurse within 2 working days to discuss and assess diabetes management and give advice on prevention and treatment of hypoglycaemia. Six of the 93 people referred (6.5%) were called out by the paramedics more than once. Three patients were admitted to hospital following another hypoglycaemic episode.

This initiative is now being implemented in other areas in England.

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

disease (HSCIC, 2014b). In terms of financial costs, it has been estimated that £1 in every £150 spent by the NHS in England is related to diabetic foot ulcers (McInnes, 2012).

Major predisposing factors to foot ulceration include the following (Boulton, 2013):

- A history of ulceration.
- Neuropathy or nerve damage.
- End-stage renal disease.
- Vascular disease.

National initiatives such as the *Putting Feet First* campaign and the development of the National Minimum Skills Framework (NHS Diabetes and Diabetes UK, 2011) have helped to inform clinicians and commissioners of the foundation for high-quality foot care in diabetes.

Prevention of foot disease and referral

For the incidence of diabetic foot disease to reduce, there needs to be effective foot screening in place, along with foot protection teams, care pathways and information for healthcare professionals and people with diabetes that is provided routinely and repeatedly. The development of a simple tool to identify if people with diabetes have reduced sensation and are at risk of foot ulceration – the "Touch the toes" test – is availably online for all to access (Diabetes UK, 2012b). The "traffic light" referral system developed by Diabetes UK is easy to use and gives clear guidance on when to refer (*Figure 1*). Intravenous antibiotics can be given at home. Fast-track referral pathways to specialist diabetes foot services should be in place in each locality.

Table 3. Presentation of newly diagnosed diabetes in children and young people (International Diabetes Federation and International Society for Pediatric and Adolescent Diabetes, 2011).

Presenting symptoms	Clinical signs giving indication of diabetic ketoacidosis
• Polyuria including bed wetting in a previously "dry" child • Polydipsia • Blurring of vision • Weight loss in association with glycosuria and ketonuria • Abdominal pain • Recurrent infections or genital thrush	• Confusion • Dehydration • Kussmaul breathing • Smell of ketones on the breath (not everyone can detect this) • Lethargy or drowsiness • Nausea and vomiting

Children newly diagnosed with diabetes

There are around 35 000 people under the age of 19 with diabetes in England. Of these, 96% have type 1 diabetes, 2% have type 2 and 2% are recorded as having maturity-onset diabetes of the young. The peak age of diagnosis is 10–14 years (Diabetes UK, 2014).

DKA is a common problem in children with diabetes. The frequency of DKA at diagnosis of type 1 diabetes varies widely by geographical region. For instance, among the 11 European centres in the EURODIAB study that recorded DKA status, the frequency varied from 26% to 67% (Lévy-Marchal et al, 2001). In the UK, approximately one quarter of children with newly diagnosed type 1 diabetes present with DKA (Diabetes UK, 2012a). The *National Diabetes Audit Paediatric Report 2009–2010* estimated that 15.5% of children and young people had one episode of DKA over a period of 5 years, while 10.4% of children had two or more episodes (HSCIC, 2011). Furthermore, there are approximately 10 deaths from DKA a year in the UK in children with diabetes (Ali et al, 2011).

It is vital that clinicians are aware of the signs and symptoms of type 1 diabetes in children (*Table 3*). Symptoms in those under 2 years of age are more difficult to identify but will include lethargy, polydipsia and polyuria.

A marked elevation of blood glucose level confirms the diagnosis. If ketones are present in blood or urine, treatment is urgent, and the child should be referred the same day to avoid the development of ketoacidosis. Insulin therapy should be instituted in most cases as soon as the diagnosis of diabetes is made, to prevent development of DKA (International Diabetes Federation and International Society for Pediatric and Adolescent Diabetes, 2011).

There should be a specialist team with expertise in diabetes and paediatrics, including the child and family, a paediatrician, a diabetes specialist nurse educator, a dietitian, and a paediatric social worker, psychologist, or psychiatrist. Ongoing care should encompass: structured education; links with nurseries, schools and colleges, and community teams; assessment of growth and development; psychological support; and consideration of

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

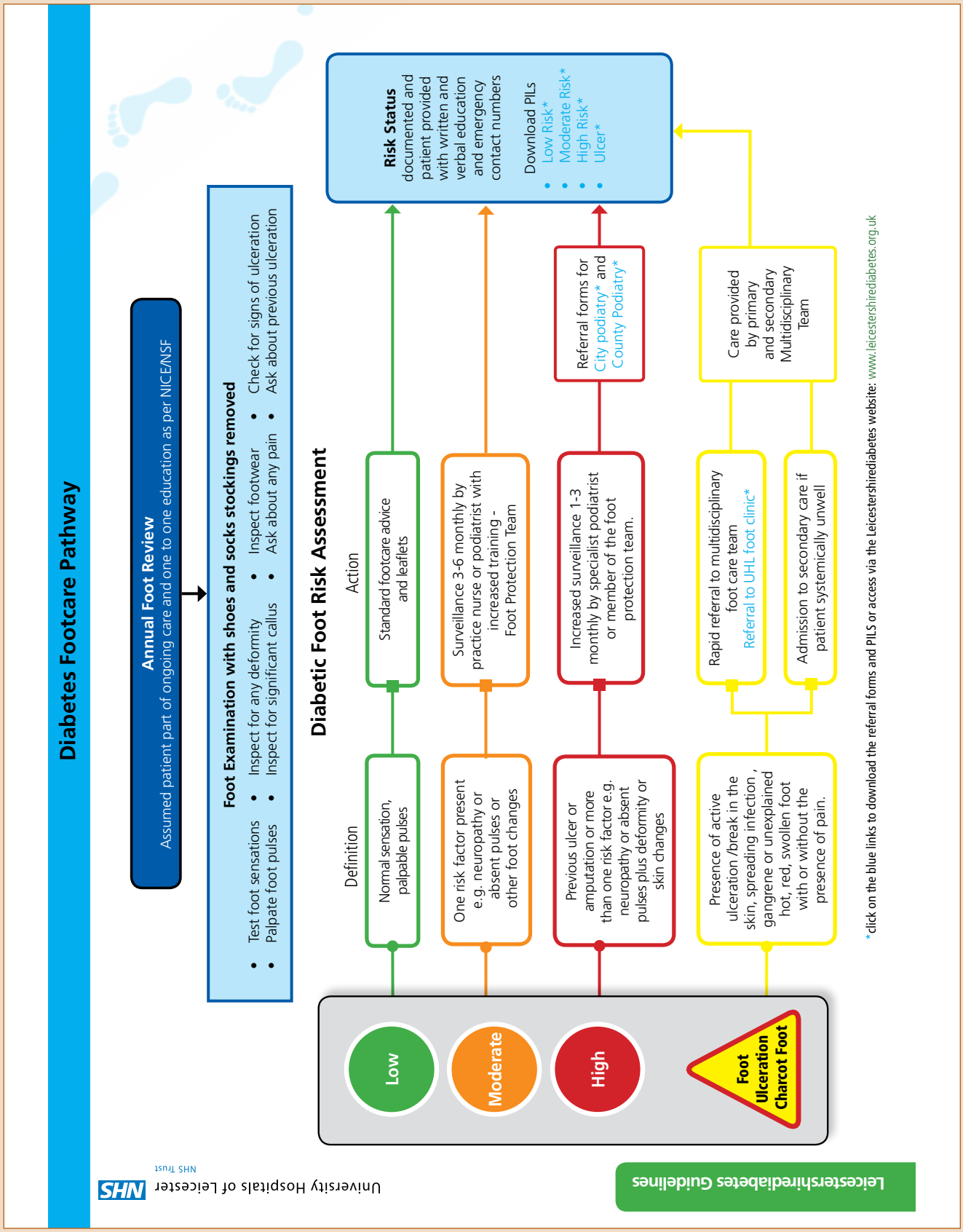

Figure 1. Example of a diabetes foot-care pathway. Adapted for local use from the Diabetes UK and NHS Diabetes "Putting Feet First" foot-care pathway 2011 (NHS Diabetes and Diabetes UK, 2011). Reproduced with kind permission of Diabetes UK.

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

"Clinical management plans should be in place for all urgent and emergency care, ensuring appropriate referral and assessment by the 'right' healthcare professional, for the 'right' individual at the 'right' time."

traditional markers for glycaemic control, treatment options and prevention of complications.

Conclusion

Diabetes-specific emergencies requiring hospital admission are not common, but they do, in general, require prompt diagnosis and treatment. It is important that healthcare professionals have the correct knowledge, skills and competencies to recognise the different emergency situations, and understand treatment and referral pathways, in order to support people living with diabetes.

Information for healthcare professionals and individuals living with diabetes is freely available and easily accessible and should be offered to patients at diagnosis and at annual review. Structured education programmes can reinforce the message and enable attendees to recognise when they may need urgent assessment and assistance. Clinical management plans should be in place for all urgent and emergency care, ensuring appropriate referral and assessment by the "right" healthcare professional, for the "right" individual at the "right" time. ■

Case examples

A series of case examples can be found in the previous version of this module:

http://bit.ly/1KjpgKb

Ali K, Harnden A, Edge JA (2011) Type 1 diabetes in children. *BMJ* **342**: d294

Amiel SA, Dixon T, Mann R et al (2008) Hypoglycaemia in type 2 diabetes. *Diabet Med* **25**: 245–54

Boulton AJ (2013) The pathway to foot ulceration in diabetes. *Med Clin N Am* **97**: 775–90

Brackenridge A, Wallbank H, Lawrenson RA, Russell-Jones D (2006) Emergency management of diabetes and hypoglycaemia. *Emerg Med J* **23**: 183–5

Davies M, Dixon S, Currie C et al (2001) Evaluation of a hospital diabetes specialist nursing service: a randomized controlled trial. *Diabet Med* **18**: 301–7

Diabetes UK (2012a) *Early diagnosis of children with Type 1 diabetes*. Diabetes UK, London. Available at: http://bit.ly/1HulNaY (accessed 18.05.15)

Diabetes UK (2012b) *Touch the toes test*. Diabetes UK, London. Available at: http://bit.ly/1pq2HUE (accessed 18.05.15)

Diabetes UK (2014) *Diabetes: Facts and stats*. Diabetes UK, London. Available at: http://bit.ly/1v0MhGr (accessed 18.05.15)

Diabetes UK (2015) *State of the nation: Challenges for 2015 and beyond*. Diabetes UK, London. Available at: http://bit.ly/17L5YNz (accessed 18.05.15)

Farmer A, Brockbank K, Keech M et al (2012) Incidence and costs of severe hypoglycaemia requiring attendance by the emergency medical services in South Central England. *Diabet Med* **29**: 1447–50

Hansen TK, Møller N (2010) Acute metabolic complications of diabetes: Diabetic ketoacidosis and hyperosmolar hyperglycemia. In: Holt RI et al (eds). *Textbook of Diabetes* (4th edition). Wiley Blackwell, Oxford: 546–52

Health and Social Care Information Centre (2011) *National Diabetes Audit Paediatric Report 2009–2010*. HSCIC, Leeds. Available at: http://bit.ly/1HnAOsn (accessed 18.05.15)

Health and Social Care Information Centre (2014a) *National Diabetes Audit 2012–2013. Report 1: Care Processes and Treatment Targets*. HSCIC, Leeds. Available at: http://bit.ly/1mTWjub (accessed 18.05.15)

Health and Social Care Information Centre (2014b) *National Diabetes Inpatient Audit 2013*. HSCIC, Leeds. Available at: http://bit.ly/1lVGNf2 (accessed 18.05.15)

Health and Social Care Information Centre (2015) *National Diabetes Audit 2012–2013. Report 2: Complications and Mortality*. HSCIC, Leeds. Available at: http://bit.ly/1GjABrq (accessed 18.05.15)

International Diabetes Federation, International Society for Pediatric and Adolescent Diabetes (2011) *Global IDF/ISPAD Guideline for Diabetes in Childhood and Adolescence*. IDF, Brussels, Belgium

Joint British Diabetes Societies Inpatient Care Group (2012) *The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes*. NHS Diabetes, Leicester

Joint British Diabetes Societies Inpatient Care Group (2013a) *The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus*. NHS Diabetes, Leicester. Available at: http://bit.ly/1IHBEDt (accessed 18.05.15)

Joint British Diabetes Societies Inpatient Care Group (2013b) *The Management of Diabetic Ketoacidosis in Adults*. NHS Diabetes, Leicester. Available at: http://bit.ly/tiCbjn (accessed 18.05.15)

Kerr M (2011) *Inpatient care for people with diabetes: The economic case for change*. NHS Diabetes, Leicester

Kitabchi AE, Umpierrez GE, Murphy MB, Kreisberg RA (2006) Hyperglycemic crises in adult patients with diabetes: a consensus statement from the American Diabetes Association. *Diabetes Care* **29**: 2739–48

Lévy-Marchal C, Patterson CC, Green A et al (2001) Geographical variation of presentation at diagnosis of type I diabetes in children: the EURODIAB study. *Diabetologia* **44**(Suppl 3): B75–80

McInnes AD (2012) Diabetic foot disease in the United Kingdom: about time to put feet first. *J Foot Ankle Res* **5**: 26

NHS Diabetes, Diabetes UK (2011) *Putting Feet First: National minimum skills framework*. Diabetes UK, London. Available at: http://bit.ly/1LdYmRI (accessed 18.05.15)

NHS Diabetes (2012) *Emergency care referral pathway survey – for hypoglycaemia*. NHS Diabetes, Leicester

NICE (2011) Diabetes in adults quality standard (QS6). NICE, London. Available at: http://www.nice.org.uk/guidance/qs6 (accessed 18.05.15)

NICE (2012) *First Commissioning Outcomes Framework indicators revealed*. NICE, London. Available at: http://bit.ly/1QXohA9 (accessed 18.05.15)

Randall L, Begovic J, Hudson M et al (2011) Recurrent diabetic ketoacidosis in inner city minority patients: behavioral, socioeconomic, and psychological factors. *Diabetes Care* **34**: 1891–6

Sampson MJ, Dozio N, Ferguson B, Dhatariya K (2007) Total excess bed occupancy by age, specialty and insulin use for nearly one million diabetes patients discharged from all English acute hospitals. *Diabetes Res Clin Pract* **77**: 92–8

TREND-UK (2011) Recognition, treatment and prevention of hypoglycaemia in the community. SB Communications Group, London. Available at: http://www.trend-uk.org/documents/Trend_report_to_print.pdf (accessed 18.05.15)

Virtual College (2012) *Safe management of hypoglycaemia*. Available at: http://bit.ly/1B83fG2 (accessed 18.05.15)

Wang J, Williams DE, Narayan K et al (2006) Declining death rates from hyperglycemia crisis among adults with diabetes, US, 1985–2002. *Diabetes Care* **9**: 2018–22

Wild D, von Maltzahn R, Brohan E et al (2007) A critical review of the literature on fear of hypoglycemia in diabetes: Implications for diabetes management and patient education. *Patient Educ Couns* **68**: 10–5

Supported by an educational grant from Janssen, part of the Johnson & Johnson Family of Diabetes Companies. These modules were conceived and are delivered by the Primary Care Diabetes Society in association with *Diabetes & Primary Care*. The sponsor had no input into the module and is not responsible for its content.

Online CPD activity

Visit www.diabetesonthenet.com/cpd to record your answers and gain a certificate of participation

Participants should read the preceding article before answering the multiple choice questions below. There is ONE correct answer to each question. After submitting your answers online, you will be immediately notified of your score. A pass mark of 70% is required to obtain a certificate of successful participation; however, it is possible to take the test a maximum of three times. A short explanation of the correct answer is provided. Before accessing your certificate, you will be given the opportunity to evaluate the activity and reflect on the module, stating how you will use what you have learnt in practice. The CPD centre keeps a record of your CPD activities and provides the option to add items to an action plan, which will help you to collate evidence for your annual appraisal.

1. What approximate proportion of hospital beds in England and Wales are occupied at any one time by a person with diabetes? Select ONE option only.

   A. 5%
   B. 15%
   C. 25%
   D. 35%
   E. 50%

2. According to the 2012–13 National Diabetes Audit, what approximate proportion of people with type 2 diabetes are offered structured education to enable self-management at diagnosis? Select ONE option only.

   A. 5%
   B. 15%
   C. 50%
   D. 75%
   E. 90%

3. According to the 2012–13 National Diabetes Audit, which one of the following complications of diabetes contributes MOST to additional mortality? Select ONE option only.

   A. Cerebrovascular accident
   B. Chronic kidney disease stage 5
   C. DKA
   D. Heart failure
   E. Limb amputation

4. Which one of the following diabetes complications affects ONLY people with type 2 diabetes and not those with type 1? Select ONE option only.

   A. DKA
   B. HHS
   C. Hypoglycaemia
   D. Microalbuminuria
   E. Proteinuria

5. In which of the following situations is it MOST appropriate to manage the person with diabetes at home? Select ONE option only.

   A. A 7-year-old with polyuria, polydipsia and glycosuria ++++
   B. A 16-year-old with recent weight loss, a random blood glucose of 17 mmol/L and ketonuria +++
   C. A 24-year-old pregnant woman with type 1 diabetes and significant hyperemesis gravidarum
   D. A 42-year-old man with type 2 diabetes treated with metformin, gliclazide and sitagliptin. He is unable to keep fluids down owing to an acute vomiting illness
   E. A 62-year-old morbidly obese man with a fasting glucose of 23 mmol/L and negative urine ketones

6. A 75-year-old woman has become increasingly unwell over the past 10 days. She is dehydrated, is drowsy and has a blood glcuose of 36 mmol/L.

   Which of the following additional findings is MOST consistent with a diagnosis of HHS? Select ONE option only.

   A. Heart rate >110 bpm
   B. Serum creatinine 150 µmol/L
   C. Serum sodium 129 mmol/L
   D. Serum osmolality 370 mOsm/kg
   E. Systolic blood pressure <120 mmHg

7. According to 2012 NHS Diabetes data, approximately how many emergency ambulance call-outs for hypoglycaemia occur in the UK per year? Select ONE option only.

   A. 10 000
   B. 50 000
   C. 100 000
   D. 500 000
   E. 1 000 000

8. What is the approximate 5-year mortality rate for people who had had an amputation that is related to diabetes? Select ONE option only.

   A. 30%
   B. 40%
   C. 55%
   D. 75%
   E. 80%

9. A 10-year-old, previously healthy boy is admitted to hospital acutely unwell with DKA.

   In retrospect, the recognition of which one of the following new symptoms would have increased the likelihood of an early diagnosis? Select ONE option only.

   A. Anorexia
   B. Nocturnal enuresis
   C. Reactive arthritis
   D. Recurrent epistaxis
   E. Weight gain

10. A 56-year-old woman has type 2 diabetes and takes regular metformin, aspirin and atorvastatin. Her glycaemic control has been good and she has had no other medical problems. At her annual diabetes check, there is evidence of bilateral sensory lower-limb neuropathy but no other abnormal examination findings.

    According to the Leicester diabetes footcare pathway, what is the MINIMUM recommended interval of foot surveillance by a healthcare professional? Select ONE option only.

    A. One month
    B. Three months
    C. Four months
    D. Six months
    E. Twelve months