

20

The Aims of Diabetes Care

Richard I.G. Holt¹ & Barry J. Goldstein²

¹Institute of Developmental Sciences, University of Southampton, Southampton, UK

²Clinical Research, Metabolism, Merck Research Laboratories, Rahway, NJ, USA

Keypoints

- People with diabetes should be seen as individuals with a condition that has medical, personal and social consequences, instead of being passive recipients of health care.
- The optimal management of diabetes occurs when the multidisciplinary diabetes care team actively involves the person with diabetes as an equal partner in their care.
- Life-threatening diabetes emergencies, such as diabetic ketoacidosis, should be effectively managed, and attention paid to prevention.
- Acute symptoms of hyperglycemia need to be addressed by careful lifestyle and pharmacologic management.
- Much of diabetes management is focused on reducing the risk of long-term complications through screening and supporting achievement of improved glycemic control and cardiovascular risk factor management.
- The time of diagnosis is a key milestone in the management of diabetes, when education, support and treatment are needed.
- Regular lifelong contact between the person with diabetes and their health care team is essential in order to support them to cope with the demands of a complex condition which changes throughout life.
- Diabetic complications should be managed effectively, if and when they present, to reduce morbidity.

Introduction

Diabetes is a lifelong condition that is, for the majority, currently incurable. It is associated with premature mortality and morbidity from an increased prevalence of cardiovascular disease and microvascular complications affecting the kidney, nerve and eye [1,2]. High-quality randomized trials have shown that improving glycemic control is associated with a reduction in microvascular complications [3–5] while a multifaceted approach to cardiovascular risk factors will reduce cardiovascular morbidity and mortality [6].

The person living with diabetes will spend the vast majority of their time managing their diabetes and only an estimated 1% of their time in contact with health care professionals. Therefore, the person with diabetes needs to be supported to take upon themselves much of the responsibility for the management of their diabetes. Given the central role of the person with diabetes and the relatively little contact with health care professionals, it is important that the purposes of the consultation or other contacts with the diabetes health care team are well defined and their

aims are made clear so that the patient derives the maximum benefit from the time spent with their diabetes health care team, whether this is in a hospital or primary care setting. As well as the clinic visit, diabetes care may also be through phone or email contact or through educational sessions outside a traditional clinic setting.

This chapter provides an overview of the aims and philosophy of diabetes care. Separate aspects of care are covered in greater detail in subsequent chapters. The aims of diabetes care and management are fourfold. Life-threatening diabetes emergencies, such as diabetic ketoacidosis or severe hypoglycemia, should be managed effectively including preventative measures. The acute manifestations of hyperglycemia, such as polyuria and polydipsia, need to be addressed. In practice, these occupy only a minority of the work undertaken by diabetes health care professionals. Much of the focus of care is therefore directed towards minimizing the long-term complications through screening and working together with the person with diabetes to support improved glycemic control and cardiovascular risk factor management. This provides a challenge for the diabetes team because people often have no symptoms at the time of care and yet are asked to make lifestyle changes and take medications that may place a considerable burden on that individual. It is also important that clinicians bear in mind the fourth aim of care which is to avoid iatrogenic side effects, such as hypoglycemia. Involvement of the person with diabetes in this care planning is paramount to success.

St. Vincent's Declaration

During the 1980s, there was a transformation in the widely held perceptions of the roles of people with diabetes and philosophy of care. Instead of being viewed as passive recipients of health care, there was an increasing recognition that people with diabetes were individuals with a condition that has medical, personal and social consequences. During this time, there was an increasing awareness and acceptance of the concept that each person with diabetes should accept part of the responsibility for their treatment and act as equal partners with health care professionals. In response to this paradigm shift, representatives of government health departments and diabetes organizations from all European countries met with diabetes experts under the auspices of the Regional Offices of the World Health Organization (WHO) and the International Diabetes Federation (IDF) in the hillside town of St. Vincent, Italy, October 10–12, 1989. They unanimously agreed upon a series of recommendations for diabetes care and urged that action should be taken in all countries throughout Europe to implement them [7]. Since this time, this philosophy of partnership between people with diabetes and health care professionals has been adopted within individual nation's strategies to improve the quality of diabetes care.

The diabetes care team

The diabetes care team involves a multidisciplinary group of health care professionals who are available to support the person with diabetes (Figure 20.1). A key component of diabetes care is to ensure that the individual with diabetes is at the center of the provision of care. This means that the person with diabetes should work together with the health care professionals as an equal member of the diabetes care team. This relationship should provide the information, advice, and education to support the

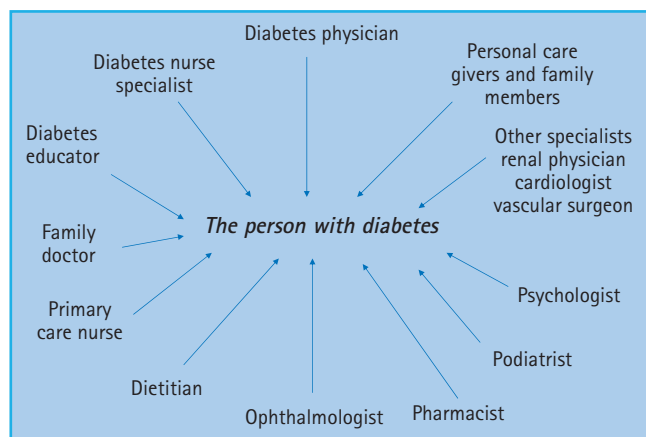


Figure 20.1 The multidisciplinary group of health care professionals who are available to support the person with diabetes.

Box 20.1 St. Vincent's Declaration [7]

- Elaborate, initiate and evaluate comprehensive programs for detection and control of diabetes and of its complications with self-care and community support as major components
- Raise awareness in the population and among health care professionals of the present opportunities and the future needs for prevention of the complications of diabetes and of diabetes itself
- Organize training and teaching in diabetes management and care for people of all ages with diabetes, for their families, friends and working associates and for the health care team
- Ensure that care for children with diabetes is provided by individuals and teams specialized both in the management of diabetes and of children, and that families with a child with diabetes obtain the necessary social, economic and emotional support
- Reinforce existing centres of excellence in diabetes care, education and research
- Create new centers where the need and potential exist
- Promote independence, equity and self-sufficiency for all people with diabetes, children, adolescents, those in the working years of life and the elderly
- Remove hindrances to the fullest possible integration of people with diabetes into society
- Implement effective measures for the prevention of costly complications:
 - Reduce new blindness caused by diabetes by one-third or more
 - Reduce numbers of people entering end-stage renal failure by at least one-third
 - Reduce by half the rate of limb amputations
 - Cut morbidity and mortality from coronary heart disease by vigorous programs of risk factor reduction
 - Achieve pregnancy outcomes in women with diabetes that approximate that of women without diabetes
- Establish monitoring and control systems using state-of-the-art information technology for quality assurance of diabetes health care provision and for laboratory and technical procedures in diabetes diagnosis, treatment and self-management
- Promote European and international collaboration in programs of diabetes research and development through national, regional and World Health Organization (WHO) agencies and in active partnership with the person with diabetes and diabetes organizations
- Take urgent action in the spirit of the WHO program, "Health for All," to establish joint machinery between WHO and International Diabetes Federation European Region to initiate, accelerate and facilitate the implementation of these recommendations

empowerment of the individual with diabetes to enable them to take control of their condition and ensures that care offered is made appropriate for the individual and their circumstances.

The large number of health professionals involved in the diabetes care team means that the roles and responsibilities of all must be clearly presented and agreed. It is often helpful for the person with diabetes if the key members of the diabetes care team are identified, as they will have more contact with some health care staff than others.

Most routine diabetes care takes place in a primary care setting but some people with diabetes with additional or complex needs will require management and support in a specialist setting for some or all of their care [8]. The diabetes physician usually takes the overall responsibility for the diabetes medical care but other specialists may be involved, for example an ophthalmologist may be needed to examine the eyes carefully and treat diabetic retinopathy if present. Diabetes care is multidisciplinary, involving doctors, nurses and many allied health care professionals whose responsibility is to support the person living with diabetes in the management of their condition. A close collaboration between primary and secondary health care professionals and among specialists is needed to ensure that all involved are aware of the issues that are relevant to the individual with diabetes and that care is integrated and coordinated across the wide range of disciplines involved. Placing the person with diabetes at the center of care is likely to facilitate collaboration.

Given the chronic nature of diabetes, continuity of care is essential. Ideally, this should be provided by the same doctors and nurses at each visit, but where this is not possible, the health care team should have access to previous records so that they are fully aware of the medical history and background of the person with diabetes. In some low and middle income countries, where medical records are focused on the acute care of infectious diseases, this is particularly challenging [9].

With the involvement of the person with diabetes in the diabetes team come a number of responsibilities for that individual. The task of implementing the day-to-day management plan lies with the person with diabetes and sometimes it can be difficult for health care professionals to accept this. It must be understood that managing diabetes is challenging, but the diabetes care team should be there to support the person through their experiences with their condition. Adolescence can be particularly challenging as this period of the person's life coincides with a time of change when experimentation and adaptation by the adolescent are to be expected (see Chapter 52).

Improving the outcome of the consultation

The time that a person with diabetes spends with a health care professional is limited and should be used as effectively as possible. It is important that both the person with diabetes and the health care professional prepare for the clinic visit. In the UK, the Department of Health has provided literature entitled *Questions*

Box 20.2 Top tips for people with diabetes to achieve a successful consultation [10]

Before your appointment

- Write down your two or three most important questions
- List or bring all your medicines and pills – including vitamins and supplements
- Write down details of your symptoms, including when they started and what makes them better or worse
- Ask your hospital or surgery for an interpreter or communication support if needed
- Ask a friend or family member to come with you, if you like

During your appointment

- Don't be afraid to ask if you don't understand. For example, "Can you say that again? I still don't understand"
- If you don't understand any words, ask for them to be written down and explained
- Write things down, or ask a family member or friend to take notes

Before you leave your appointment check that:

- You've covered everything on your list
- You understand, for example "Can I just check I understood what you said?"
- You know what should happen next – and when. Write it down
- Ask who to contact if you have any more problems or questions
- Ask about support groups and where to go for reliable information
- Ask for copies of letters written about you – you are entitled to see these

After your appointment, don't forget to:

- Write down what you discussed and what happens next. Keep your notes
- Book any tests that you can and put the dates in your diary
- Ask what will happen if you are not sent your appointment details
- "Can I have the results of any tests?" (If you don't get the results when you expect – ask for them.) Ask what the results mean

to Ask, which provides guidance about the questions a person with diabetes should ask during a consultation to maximize the benefit from the visit to their health care team [10].

The consultation or education program should lead the person with diabetes to gain a clear understanding of their condition. This can only be achieved effectively when professionals and people with diabetes are enabled to work together. The interaction should not be seen as an opportunity for the health care profession to "give care" to the patient, but an opportunity for equal involvement in decision-making and care.

People with diabetes should be encouraged to ask questions to check knowledge and further explanation and literature may be needed. It is good practice to provide the person with diabetes with copies of any letters written about them [11,12]. Questions about their treatment should be encouraged and they should be

aware of what will happen next, including any requirement for further investigation. Regular review of management plans through joint dialogue, listening, discussion and decision-making between the person with diabetes and health care professional, sometimes known as care planning, is the key to enhancing relationships and partnership working [13]. Contact details should be made available so the individual with diabetes knows where to seek help if further questions arise.

Following diagnosis

The period following the diagnosis of diabetes is crucial for the long-term management of diabetes. A huge amount of information and skills need to be assimilated by the person with diabetes at a time when they may be in denial or angry with the diagnosis [14]. Considerable skill is therefore needed to support them at this time. The diabetes team should perform a medical examination (usually the physician) and develop a program of care with the person with diabetes. It is important that this is individualized so that it suits the particular person with diabetes and should include treatment-oriented goals.

Issues relating to diagnosis

The diagnosis of diabetes is based on the finding of one or more glucose values above internationally agreed values (see Chapter 2) [15]. Usually, a diagnosis has been made prior to referral to the diabetes clinic but this is not always the case. In the absence of symptoms, individuals should have two values above the diagnostic criteria. Where there is diagnostic doubt, the 75-g oral glucose tolerance test is the investigation of choice but there is ongoing discussion about the use of glycated hemoglobin as a diagnostic test [16].

While the diagnosis of diabetes has frequently been made prior to referral, advice may be required to determine the type of diabetes as the distinction is not always as clear as may be expected. When a young preschool child develops weight loss, polyuria, polydipsia and ketoacidosis over a short period of time, the diagnosis is obviously type 1 diabetes mellitus (T1DM). In contrast, if an asymptomatic elderly overweight individual is found to be hyperglycemic, the diagnosis is type 2 diabetes (T2DM) (see Chapter 19). These presentations lie at two ends of a spectrum, and the diagnosis of the type of diabetes may be less clear when the onset occurs in the thirties in an overweight adult who is found to have islet cell antibodies. Diabetes health care professionals should also be alert to the possibility of monogenic causes of diabetes (see Chapter 15).

Although a precise diagnosis may not be needed from the outset, an early decision should be made about the necessity for insulin therapy (see Chapter 19). While there are clinical features that suggest the type of diabetes, time is often a useful diagnostic tool to determine whether the person with diabetes requires insulin.

Diabetes education

A key component of the empowerment of the person with diabetes is the provision of diabetes education (see Chapter 21) [17]. This information should be provided in a patient-centered manner as it is retained more effectively when delivered in this way. Education may be provided individually or in a group setting.

It is essential that the person with diabetes understands their diabetes and develops the skills and competencies required to take control of their condition as well as possible if they are going to be an effective partner in the diabetes care team.

People with newly diagnosed diabetes should have the chance to speak with a diabetes specialist nurse (or practice nurse) who can explain what diabetes is [18]. This will provide an opportunity to discuss the treatment and goals as well as providing a practical demonstration of any equipment required to manage the diabetes such as blood glucose meters or insulin devices. The importance of ketones testing for those with T1DM should be explained. When self-monitoring of blood glucose has been advocated, it is essential that the person with diabetes knows how to interpret the results and what action is required in response to the treatment.

A qualified dietitian should provide advice about how to manage the relationships between food, activity and treatment (see Chapter 22). Where necessary, they should explain about the links between diabetes and diet and the benefits of a healthy diet, exercise and good diabetes control. As an essential member of an effective clinical care team, a diabetes specialist nurse or practice nurse often has a role in providing dietary advice together with relevant literature [18].

The social effects of diabetes should be discussed, as they may relate to employment, insurance or driving (see Chapter 24). Some countries require individuals with diabetes to inform the appropriate licensing authorities. Advice about diabetes and foot care should also be given (see Chapter 44).

Although education is essential following diagnosis, it is important to appreciate that this is a lifelong process that should take into account recent advances in medical science and changes in circumstances of the person with diabetes [17].

The best measure of successful education may not be simply that someone knows more, but rather that they behave differently. The simple provision of knowledge by itself is often insufficient to influence behavioral change. This can be a particular challenge for the person with T2DM who may have been asymptomatic prior to diagnosis. High demands are placed on the person with diabetes regardless of the type of diabetes, especially when the benefits are not immediate, may only accrue with time and even then may not be appreciated. The individual with diabetes needs to gain an understanding that improved glycemic control can help in preventing the complications of diabetes, such as a myocardial infarction or proliferative retinopathy, even though they may have never experienced these conditions.

The diagnosis of diabetes may provoke a grief reaction and support is needed from the diabetes team to help person with diabetes through this. Engagement is needed to help the person

with diabetes come to terms with their diabetes and take control rather than being left with the feeling that their diabetes or their health care team is taking control of them. For some it may take a very long time to accept their diabetes and the demands this places on their life. Therefore, emotional and psychological support and techniques need to be available in the long term.

People with newly diagnosed diabetes often want to speak with others who have diabetes who have had similar experiences while developing diabetes. Many countries have diabetes-related charities that can provide this support and it is therefore important that the information given includes local centers or patient support groups.

The clinic visit

The diabetes team needs to work together with the person with diabetes to review the program of care including the management goals and targets at each visit [19]. It is important that the person with diabetes shares in any decisions about treatment or care as this improves the chance of jointly agreed goals being adopted following the consultation. A family member, friend or carer should be encouraged to attend the clinic to help them stay abreast of developments in diabetes care and help the person with diabetes make informed judgments about diabetes care.

An important goal of diabetes management is to prevent the microvascular and macrovascular complications of diabetes without inducing iatrogenic side effects. This involves active management of hyperglycemia together with a multifaceted approach targeting other cardiovascular risk factors.

Glycemic management

Enquiries and discussions should be made about hyperglycemic symptoms, problems with medications, including issues relating to injections, hypoglycemia and self-monitoring of blood glucose.

Hyperglycemic symptoms

Symptoms relating to hyperglycemia usually occur when the blood glucose rises above the renal threshold leading to an osmotic diuresis. Polyuria, particularly at night, polydipsia and tiredness may ensue. General malaise may also occur and is not always ascribed to the hyperglycemia.

Medications

The diabetes care team is responsible for ensuring that the person with diabetes has access to the medication and equipment necessary for diabetes control. In many countries this is available free or at a reduced rate; many people with diabetes may be unaware of this and timely advice may alleviate some of the anxieties about the cost of diabetes.

Oral hypoglycemic drugs

Each of the oral hypoglycemic drugs has its strengths and profile of side effects (see Chapter 29) and these should be discussed.

Strategies should be devised to maximize the tolerability of diabetes medications. For example, the timing of metformin in relationship to meals, or the use of long-acting preparations, may reduce the risk of gastrointestinal upset. Where treatments are not being tolerated, these may need to be changed in order to facilitate improved concordance with the regimen. Another example is the need to discuss the risks of hypoglycemia with sulfonylureas.

Insulin

Insulin therapy is complex: it must be given by self-injection or pump and there is considerable variation in the doses, regimens and devices available. It is important that during the clinic visit the individual has an opportunity to discuss injection technique and any difficulties with injection sites, which should be examined at least annually. Information about the appropriate storage of insulin and safe disposal of sharps (needles) is needed.

The most common side effects of insulin are hypoglycemia and weight gain (see Chapter 27). In addition to these, there are a number of other issues that should be addressed including injection site problems, such as lipohypertrophy, and device problems.

Assessment of glucose control

Supporting the person with diabetes to achieve excellent glycemic control is an essential component of diabetes care. The methods of assessing glucose control essentially involve short-term measures such as self-monitoring of blood glucose and long-term measures such as glycated hemoglobin (see Chapter 25). Not all those with diabetes will undertake self-monitoring of blood glucose, but when they do it is incumbent on the health care professional to discuss the findings with the person with diabetes and how these will affect future management. The glycated hemoglobin provides a further measure of the adequacy of glycemic control and sometimes there may be a discrepancy between this measure and self-monitored blood glucose. It is important to explore the reasons that underlie the differences, which may range from biologic issues such as genetically determined rates of glycation, through to inappropriately timed glucose readings to fabricated results. A pristine sheet (with no blood stains from fingersticks) and with the use of a single pen color may be a clue to the latter. The use of computers and the ability to download results may help to observe patterns of hyperglycemia, although it is important to make sure that the meter has not been shared.

It is clearly important that people with diabetes are encouraged to tell the truth. Sometimes clinicians can appear judgmental which may result in people with diabetes falsifying their results because they are scared. They can feel as if some clinicians are headteachers and they do not want to be reprimanded. It is understandable why someone would not put themselves through that if they did not have to. It is better to break down these barriers and to build a relationship whereby the person with diabetes feels that it does not benefit them to lie, and that the health care professional is there to support, not to judge.

Table 20.1 Glycemic and cardiovascular risk factor targets [20–22,38].

	Glycated hemoglobin	Blood pressure (mmHg)	Lipid profile
ADA	<53 mmol/mol (<7.0%)	<140/90	LDL < 100 mg/dL HDL > 40 mg/dL for men >5.0 mg/dL for women Triglycerides < 150 mg/dL
EASD	<53 mmol/mol (<7.0%)	<130/80	LDL < 1.8 mmol/L (<70 mg/dL) HDL > 1.0 mmol/L (>40 mg/dL) for men >1.2 mmol/L (>46 mg/dL) for women Triglycerides < 1.7 mmol/L (<150 mg/dL)
IDF	<48 mmol/mol (<6.5%)	<130/80	LDL < 2.5 mmol/L (<95 mg/dL) Triglycerides < 2.3 mmol/L (<200 mg/dL) HDL > 1.0 mmol/L (>39 mg/dL)
NICE	<48 mmol/mol (<6.5%)	<130/80	Total cholesterol 4.0 mmol/L LDL cholesterol 2.0 mmol/L

ADA, American Diabetes Association; EASD, European Association for the Study of Diabetes; HDL, high density lipoprotein cholesterol; IDF, International Diabetes Federation; LDL, low density lipoprotein cholesterol; NICE, National Institute for Health and Clinical Excellence.

The Diabetes Control and Complications Trial and the UK Prospective Diabetes Study (UKPDS) have clearly established that lower levels of glycemia are associated with a reduced risk of long-term microvascular complications in T1DM and T2DM, respectively [3–5]. For this reason, learned societies such as the American Diabetes Association (ADA) and European Association for the Study of Diabetes (EASD), and government bodies such as the National Institute for Health and Clinical Excellence have set tight glycemic targets to minimize the risk of complications for person with diabetes (Table 20.1) [20–22]. Despite these targets, many people with diabetes are unable to achieve this level of control. It is important for the health care professional to explore the reasons with the person with diabetes why the control is not ideal. Advice about adjustment of treatment or further education may be needed.

A common limiting factor in the ability to achieve good control is hypoglycemia which is one of the most uncomfortable, inconvenient and feared side effects of diabetes medication (see Chapter 33). The frequency and severity of hypoglycemic episodes should be discussed. An exploration of the underlying causes and advice about prevention are required for the future.

When a person with diabetes is treated with insulin, it is important to ensure that they carry a readily accessible source of glucose such as glucose tablets. Concentrated glucose solution and glucagon should also be made available for use in more severe hypoglycemia. As these treatments may only be used infrequently, it is worth checking whether they are in date. Furthermore, as they need to be administered by another individual, it is important to

ensure that the friends and relatives of the person with diabetes know how to administer them before they are needed.

In some instances, the only way of avoiding disabling hypoglycemia is to accept a lesser degree of glycemic control. This recalibration of glycemic goals should be decided with the person with diabetes and an individual target appropriate for the circumstances should be agreed. As well as the risk of hypoglycemia, other factors should be considered when discussing the target including the overall clinical situation and risk of complications affecting the individual.

The natural history of the development of complications is long and in some situations may be longer than the life expectancy of the person with diabetes. It would be a poor trade to insist on switching a frail complication-free 90-year-old person to insulin if they subsequently fell and broke their hip and died as a result of insulin-induced hypoglycemia. Less melodramatic but still important is the consideration about dietary and lifestyle change in people with low risk of disabling complications: is it really necessary to deny an elderly person with diabetes a piece of birthday cake if this is one of the few pleasures in their life? A more sensible approach would be to advise a limit to portion size, rather than insist on severe dietary limitations.

Although there is a clinical emphasis on glycemic targets, the results of the Action to Control Cardiovascular risk in Diabetes (ACCORD) trial [23], the Action in Diabetes and Vascular disease: Preteraz and diamicron MR controlled evaluation (ADVANCE) trial [24] and Veterans Affairs Diabetes Trial (VADT) have led to a note of caution [25]. These trials have shown that tight glycemic control in people with a longer duration of diabetes did not prolong life. In the case of the ACCORD trial, increased cardiovascular mortality was seen in those receiving intensive glycemic control [23]. The underlying reasons for these findings are discussed in Part 8, but again their findings highlight the need for individualized targets.

Assessment of cardiovascular risk

The most common cause of death in people with diabetes is cardiovascular disease (CVD) and much effort has been expended to develop strategies that will reduce its morbidity and mortality [26].

Cardiovascular risk should be assessed at least once a year for people with diabetes. This should include a history of cardiovascular risk factors, such as family history, smoking, an examination to include weight, waist circumference and blood pressure as well as investigations such as a lipid profile. The results of this assessment can be used to calculate cardiovascular risk using the various risk engines available. Some, such as the UKPDS risk engines for coronary heart disease and stroke, were designed specifically for use in people with diabetes [27,28].

Because the risk of myocardial infarction is as high in people with diabetes as in non-diabetic people with pre-existing CVD, the diabetes itself is widely considered to be a major risk factor for CVD [29]. This has influenced prescribing guidelines which now recommend that specific pharmacologic interventions are

required to reduce the incidence of CVD in people with diabetes regardless of risk assessment. Large randomized controlled trials have shown the effectiveness of these interventions and are discussed in greater detail in Chapter 40 [30].

Although physicians may appreciate the close connection between diabetes and CVD, many people with diabetes have never been told about this increased risk, and the importance of blood pressure and lipid control in diabetes. Thus, many individuals are not taking appropriate drugs for cardiovascular prevention or if they are then the doses may be inadequate to bring the individuals to the recommended targets (Table 20.1). When working with someone with diabetes, it is important that strategies to reduce CVD and the need for preventative drugs are discussed. In addition, the increased vascular damage promoted by smoking in the setting of diabetes may not be appreciated.

The main classes of drugs used are lipid-lowering drugs, predominantly statins, antihypertensives, particularly drugs acting on the renin-angiotensin system and aspirin. Antihypertensives are also important in the prevention of microvascular complications.

While each individual intervention for various risk factors is important in the prevention of macrovascular disease, the Steno II study has demonstrated that a coordinated approach to the management of cardiovascular risk can be successful [6]. In this study, the clinic setting and protocol-driven approach to overall cardiovascular risk led to improved mortality compared with routine care.

Microvascular complications

Around 80% of individuals will have developed microvascular complications by the time they have had diabetes for 20 years [31]. Many complications will remain asymptomatic until they have catastrophic consequences. The management of microvascular complications involves measures to prevent, detect and treat. General measures such as optimal glycemic and blood pressure control lead to a reduction in the incidence and progression of microvascular complications but specific preventative measures are also needed and are discussed below [3–5,32].

Eyes

Diabetic retinopathy is the most common cause of blindness in people of working age (see Chapter 36). It is almost invariably asymptomatic until there is a catastrophic sight-threatening hemorrhage. For this reason it is important to screen regularly for retinopathy to allow treatment before hemorrhage and visual loss occur. Traditionally, this has been performed by examination of the visual acuity and fundoscopy within the diabetes clinic at least on an annual basis. Alternatively, in many countries, dilated ophthalmologic examinations are regularly performed by a specialist.

The gold standard for screening now is digital retinal photography, which may be undertaken in several different settings. When this is performed outside the traditional diabetes clinic, communication between the screener and diabetes team is essential if other aspects of diabetes care are to take account of the

development of retinopathy. Where retinopathy is detected within the clinic, it is the responsibility of the clinic to ensure that the patient is referred for specialist ophthalmologic attention in a timely fashion.

Neuropathy

Distal symmetrical polyneuropathy is the most common form of neuropathy seen in diabetes and is addressed in the following section on the diabetic foot. Autonomic neuropathy may affect the person with diabetes in a number of ways (e.g. gustatory sweating, postural hypotension or bloating) (see Chapter 38). Health care professionals should be alert to this possibility if symptoms suggestive of these conditions are raised.

Diabetic foot

Diabetes is the most common cause of non-traumatic lower limb amputation in the developed world (see Chapter 44). Around 10–15% of all people with diabetes develop a foot ulcer as a result of the combination of peripheral neuropathy and vascular insufficiency to the foot.

Prevention of ulceration is an important goal and requires education of the person with diabetes so that they are aware of this possibility. It is important to inform people that they should not delay obtaining professional help if problems ensue.

An assessment of the risk of foot ulceration is needed at least annually, and more frequently when neuropathy or vascular disease is present. The assessment should include a history of previous ulceration and trauma as well as an examination of the skin, vascular supply and sensation. Opportunistic foot screening should also be performed if an individual with diabetes is admitted to hospital.

In patients with numbness, close attention to discovering unsuspected foot lesions, including examination of the sole of the foot using a small mirror, must be performed by the patient on a regular basis. This can lead to a rapid intervention and prevent an early infection from progressing, potentially averting such devastating consequences as osteomyelitis and gangrene.

Prompt referral to the podiatrist and foot clinic should be arranged by the diabetes clinic if needed.

Kidneys

Diabetic nephropathy is characterized by a progressive increase in urinary albumin excretion which is accompanied by increasing blood pressure and decline in glomerular filtration rate, ultimately culminating in end-stage renal disease (ESRD). It is also associated with a marked increase in the rate of CVD.

Microalbuminuria, the earliest stage of nephropathy, affects around 50% of people with diabetes after 30 years while frank proteinuria affects one-quarter of people with T1DM after 25 years. Diabetic nephropathy is a common reason for the initiation of renal replacement therapy. Although it appears that with modern treatments of diabetes, the percentage of people with diabetes developing ESRD appears to be falling, the absolute numbers requiring renal replacement therapy is

increasing in line with the increased prevalence of diabetes worldwide.

Diabetic nephropathy is asymptomatic and so screening is required annually. This is usually achieved by measurement of urinary albumin excretion. The most common method is a single urinary albumin:creatinine ratio (ACR) measurement which should be repeated 2–3 times if abnormal. An estimation of glomerular filtration rate should be obtained annually.

The primary prevention of nephropathy relies on excellent glycemic control as well as tight blood pressure control. Once nephropathy is present, blood pressure management is the mainstay as there is little evidence that glycemic control at this stage slows the rate of progression. The antihypertensive drugs of choice are angiotensin-converting enzyme (ACE) inhibitors of the renin-angiotensin system (ACE inhibitors or angiotensin-2 receptor antagonists) as they have specific effects on renal blood flow [33,34].

There has been some debate about the value of undertaking urinary ACR measurements in people with T2DM, the argument being that tight blood pressure control (often including an ACE inhibitor or angiotensin-2 receptor antagonist) together with good glycemic control should form part of the general management of cardiovascular risk reduction.

It is important that the person with diabetes understands the need for screening and then treatment if nephropathy develops. Timely referral to the nephrology team is needed to ensure that the management of renal disease is managed promptly in patients with abnormal renal function.

Diabetes emergencies

Diabetic ketoacidosis and hyperosmolar hyperglycemic syndrome

Diabetic ketoacidosis and hyperosmolar hyperglycemic syndrome are potentially life-threatening emergencies (see Chapter 34). It is important that the person with diabetes is educated about the risk of these and discusses strategies to prevent them. If a person with diabetes has been admitted with diabetic ketoacidosis or hyperosmolar hyperglycemic syndrome, the opportunity should be taken to explore the reasons why this episode occurred and to identify what might be changed to prevent this from happening in future. The most common causes of hyperglycemic emergencies in those with pre-existing diabetes are infections and insulin omission and errors. It is particularly important that people with diabetes understand the “sick day” rules: insulin should never be discontinued and indeed doses may need to be increased, even when appetite is diminished.

Hypoglycemia

Hypoglycemia is a much more common diabetic emergency, affecting around 10% of people with T1DM and 2.4% of insulin-treated people with T2DM (see Chapter 33). Hypoglycemia can have a major adverse effect on quality of life and is the most important limiting factor in the achievement of good glycemic control.

Box 20.3 Causes of hypoglycemia

Excessive insulin administration:

- Person with diabetes, doctor or pharmacist error
- Deliberate overdose during a suicide or parasuicide attempt

Excessive sulfonylurea administration

Unpredictable insulin absorption:

- Insulin is absorbed more rapidly from the abdomen
- Lipohypertrophy

Altered clearance of insulin:

- Decreased insulin clearance in renal failure

Decreased insulin requirement:

- Missed, small or delayed meals
- Alcohol: inhibits hepatic glucose output
- Vomiting: may occur with gastroparesis, a long-term complication of diabetes
- Exercise
 - Promotes glucose uptake into muscle
 - Increases rate of insulin absorption

Recurrent hypoglycemia and unawareness

It is important that the person with diabetes is educated about the symptoms of hypoglycemia and the actions to be taken to prevent and treat this. Friends and family members should be invited to learn about hypoglycemia and its management in order to intervene where necessary, for example providing glucagon treatment if the person with diabetes is unconscious. If hypoglycemia becomes disabling or recurrent it is important to explore underlying causes.

Lifestyle issues

Diabetes has a number of social, as well as medical, consequences and one aspect of diabetes care is to discuss how diabetes is affecting issues such as driving, education and employment (see Chapter 24). The health care professional may need to act as an advocate for the person where discrimination is occurring. Some aspects of lifestyle also affect diabetes care, such as diet, exercise, smoking and alcohol. These issues should be discussed carefully and sensitively in order to help the person with diabetes understand how their lifestyle affects their diabetes and general health. Support should be given to help and encourage a person with diabetes to make changes to their lifestyle.

Psychologic issues

The diagnosis of diabetes can provoke a number of psychologic reactions, such as anger and sadness in the individual which may be akin to a bereavement reaction (see Chapter 49). More serious mental health problems such as depression are common in people with diabetes and these can impede the person's ability to achieve good glycemic control (see Chapter 55) [35].

It is important for those working in diabetes care to explore with the person with diabetes whether they are experiencing psychological problems as there may be reticence in raising this in the consultation. While all members of the diabetes team should be able to recognize and address basic psychological issues, the psychologist is an important team member to address more complex needs, such as eating disorders. Despite the importance of psychological issues, this need is frequently unmet because of a lack of trained health care professionals.

Sexual health

Sexual dysfunction

Sexual dysfunction is more common in both men and women with diabetes than the general population. This can affect the person's quality of life considerably. Many people are reluctant to discuss this aspect of their lives because of embarrassment and so it is the responsibility of the health care professional to enquire about this. There are now effective treatments for erectile dysfunction and failure to ask about this can deny the person with diabetes the opportunity to receive treatment.

Pregnancy planning

Starting a family is an important milestone for many and the presence of diabetes can make this decision more difficult for the woman or man with diabetes (see Chapter 53). People are often worried about the effects that diabetes will have on their pregnancy and vice versa. The implications for the long-term risk of diabetes in the offspring are also of concern.

Planning for a pregnancy by a woman with diabetes can dramatically improve the outcome, reducing the risk of miscarriage, congenital malformations and macrosomia, with its attendant risks of shoulder dystocia, and neonatal hypoglycemia [36]. Some oral medications should not be used in pregnancy and the treatment regimen may need to be altered as part of the planning process.

Despite this, women frequently enter pregnancy without adequate preparation or pre-conception care. It is therefore incumbent on the health care professional to discuss pregnancy with all women of childbearing age, including adolescents, to ascertain their plans regarding pregnancy. The answers are often not black and white; women may state that they are not actively planning to become pregnant despite being sexually active and not using effective contraception. Contraceptive advice is needed and where a pregnancy is being planned, women should be referred to a dedicated pre-conception clinic as these have been shown to improve the outcomes of diabetic pregnancies.

With an increasing number of women with T2DM of childbearing age, it is important that pre-conception is not solely focused towards those with T1DM. This is particularly relevant as some women with T2DM are not seen in specialist centers.

Prompt referral to a joint diabetes antenatal clinic is necessary once a woman becomes pregnant.

Inpatient diabetes care

It is estimated that around 10–15% of people in hospital have diabetes (see Chapter 32). In many instances, the diabetes is coincidental to the admission and the person with diabetes remains capable of managing their own diabetes, often with greater skill than the health care professionals around them. Good diabetes control remains an important goal as this improves the rate of recovery and may lead to an earlier discharge.

Admission to hospital is a worrying time but much of the fear can be alleviated if a full explanation of the treatment in hospital is given along with an opportunity to discuss any particular concerns. Being given the opportunity to discuss the management of diabetes is reassuring. Where possible, the person with diabetes should be allowed to continue to self-manage their diabetes. The individual should be encouraged to bring in their own insulin supplies where admissions are planned. There should be access to their regular diabetes health care team where possible as the admission may provide an occasion to check techniques and results. Ready access to carbohydrate and appropriate coordination of mealtimes, snacks and medication should obviate the need for more dramatic treatment of hypoglycemia.

There will be times when the person with diabetes is unable to manage their diabetes themselves. In these instances, the responsibility will fall entirely on the health care team, for example during surgery when the person with diabetes is unconscious and requires intravenous insulin and dextrose.

Following discharge, clear communication with the primary care team and diabetes clinic is essential so that any changes in management or medication are made known to those involved in the individual's care.

Involving people with diabetes in the planning of health care and service development

Involving people with diabetes and their carers in the planning and decision-making of local health services allows these to be built around the needs of those who use the service, rather than the needs of the system [37]. An open dialogue is needed and service users should feel that their views are listened to. This will improve the accountability and legitimacy for any decisions made and is likely to improve clinical and care outcomes. People with diabetes should be encouraged to express their views and concerns about their services as better feedback about service provision which should help to improve and shape future provision of care.

Conclusions

The aim of diabetes care is to improve the lives of those with diabetes. This can only be achieved through a partnership between

the person with diabetes and a multifunctional health care team that should be in place to support the person with diabetes.

Acknowledgments

The authors acknowledge Bridget Turner of Diabetes UK and June James, Consultant Nurse, University Hospitals of Leicester Trust, UK, for their helpful comments on this chapter.

References

- 1 DECODE Study Group. Glucose tolerance and mortality: comparison of WHO and American Diabetes Association diagnostic criteria. The DECODE study group. European Diabetes Epidemiology Group. Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Europe. *Lancet* 1999; **354**:617–621.
- 2 DECODE Study Group. Glucose tolerance and cardiovascular mortality: comparison of fasting and 2-hour diagnostic criteria. *Arch Intern Med* 2001; **161**:397–405.
- 3 Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993; **329**:977–986.
- 4 Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10-year follow-up of intensive glucose control in type 2 diabetes. *N Engl J Med* 2008; **359**:1577–1589.
- 5 UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 1998; **352**:837–853.
- 6 Gaede P, Lund-Andersen H, Parving HH, Pedersen O. Effect of a multifactorial intervention on mortality in type 2 diabetes. *N Engl J Med* 2008; **358**:580–591.
- 7 WHO/IDF St. Vincent Declaration Working Group. Diabetes mellitus in Europe: a problem at all ages in all countries – a model for prevention and self care. *Acta Diabetol* 1990; **27**:181–183.
- 8 Ensuring access to high quality care for people with diabetes. Available from: http://www.diabetes.org.uk/About_us/Our_Views/Position_statements/Ensuring_access_to_high_quality_care_for_people_with_diabetes. Accessed on 21 August, 2009.
- 9 Yudkin JS, Holt RI, Silva-Matos C, Beran D. Twinning for better diabetes care: a model for improving healthcare for non-communicable diseases in resource-poor countries. *Postgrad Med J* 2009; **85**:1–2.
- 10 Department of Health. *Questions to Ask*. London: Department of Health, 2007.
- 11 Lloyd BW. A randomised controlled trial of dictating the clinic letter in front of the patient. *Br Med J* 1997; **314**:347–348.
- 12 Treacy K, Elborn JS, Rendall J, Bradley JM. Copying letters to patients with cystic fibrosis (CF): letter content and patient perceptions of benefit. *J Cyst Fibros* 2008; **7**:511–514.
- 13 Department of Health. *Care Planning in Diabetes: Report from the Joint Department of Health and Diabetes UK Care Planning Working Group*. London: Department of Health, 2006.
- 14 Garay-Sevilla ME, Malacara JM, Gutierrez-Roa A, Gonzalez E. Denial of disease in type 2 diabetes mellitus: its influence on metabolic control and associated factors. *Diabet Med* 1999; **16**:238–244.
- 15 World Health Organization. *Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications: Report of a WHO Consultation*. WHO/NCD/NCS/99.2. Geneva: World Health Organization, 1999.
- 16 International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. *Diabetes Care* 2009; **32**:1327–1334.
- 17 Funnell MM, Brown TL, Childs BP, Haas LB, Hoseney GM, Jensen B, et al. National standards for diabetes self-management education. *Diabetes Care* 2009; **32**(Suppl 1):87–94.
- 18 Diabetes UK. What to expect when you have just been diagnosed. Available from: http://www.diabetes.org.uk/Guide-to-diabetes/What_care_to_expect/From_your_healthcare_team/What_to_expect_when_you_have_just_been_diagnosed. Accessed on 21 August, 2009.
- 19 Diabetes UK. What to expect on a regular basis. Available from: http://www.diabetes.org.uk/Guide-to-diabetes/What_care_to_expect/From_your_healthcare_team/What_to_expect_on_a_regular_basis. Accessed on 21 August, 2009.
- 20 Nathan DM, Buse JB, Davidson MB, Ferrannini E, Holman RR, Sherwin R et al. Medical management of hyperglycaemia in type 2 diabetes mellitus: a consensus algorithm for the initiation and adjustment of therapy. Consensus statement from the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetologia* 2009; **52**:17–30.
- 21 National Institute for Clinical Excellence (NICE). *Diabetes Type 2 (update): NICE guidance*. NICE, 2008.
- 22 National Institute for Clinical Excellence (NICE). *Type 1 Diabetes in Adults: NICE guidance*. NICE, 2008.
- 23 Gerstein HC, Miller ME, Byington RP, Goff DC Jr, Bigger JT, Buse JB, et al. Effects of intensive glucose lowering in type 2 diabetes. *N Engl J Med* 2008; **358**:2545–2559.
- 24 Patel A, MacMahon S, Chalmers J, Neal B, Billot L, Woodward M, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. *N Engl J Med* 2008; **358**:2560–2572.
- 25 Duckworth W, Abraira C, Moritz T, Reda D, Emanuele N, Reaven PD, et al. Glucose control and vascular complications in veterans with type 2 diabetes. *N Engl J Med* 2009; **360**:129–139.
- 26 Roper NA, Bilous RW, Kelly WF, Unwin NC, Connolly VM. Cause-specific mortality in a population with diabetes: South Tees Diabetes Mortality Study. *Diabetes Care* 2002; **25**:43–48.
- 27 Kothari V, Stevens RJ, Adler AI, Stratton IM, Manley SE, Neil HA, et al. UKPDS 60: risk of stroke in type 2 diabetes estimated by the UK Prospective Diabetes Study risk engine. *Stroke* 2002; **33**:1776–1781.
- 28 Stevens RJ, Kothari V, Adler AI, Stratton IM. The UKPDS risk engine: a model for the risk of coronary heart disease in type II diabetes (UKPDS 56). *Clin Sci (Lond)* 2001; **101**:671–679.
- 29 Haffner SM, Lehto S, Ronnema T, Pyorala K, Laakso M. Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. *N Engl J Med* 1998; **339**:229–234.
- 30 Collins R, Armitage J, Parish S, Sleight P, Peto R. MRC/BHF Heart Protection Study of cholesterol-lowering with simvastatin in 5963 people with diabetes: a randomised placebo-controlled trial. *Lancet* 2003; **361**:2005–2016.
- 31 Klein R, Knudtson MD, Lee KE, Gangnon R, Klein BE. The Wisconsin Epidemiologic Study of Diabetic Retinopathy: XXII the twenty-five-year progression of retinopathy in persons with type 1 diabetes. *Ophthalmology* 2008; **115**:1859–1868.

- 32 UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *Br Med J* 1998; **317**:703–713.
- 33 EUCLID Study Group. Randomised placebo-controlled trial of lisinopril in normotensive patients with insulin-dependent diabetes and normoalbuminuria or microalbuminuria. *Lancet* 1997; **349**:1787–1792.
- 34 Parving HH, Lehnert H, Brochner-Mortensen J, Gomis R, Andersen S, Arner P. The effect of irbesartan on the development of diabetic nephropathy in patients with type 2 diabetes. *N Engl J Med* 2001; **345**:870–878.
- 35 Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. *Diabetes Care* 2001; **24**:1069–1078.
- 36 National Collaborating Centre for Women's and Children's Health. *Diabetes in Pregnancy: Management of Diabetes and its Complications from Pre-conception to the Postnatal Period*. London: National Institute for Health and Clinical Excellence, 2008.
- 37 Diabetes UK. Involving people with diabetes in health care planning and service development. Available from: http://www.diabetes.org.uk/About_us/Our_Views/Position_statements/Involving_people_-_with_diabetes_in_health_care_planning_and_service_development. Accessed on 21 August, 2009.
- 38 Ryden L, Standl E, Bartnik M, Van den Berghe G, Betteridge J, de Boer MJ, *et al*. Guidelines on diabetes, pre-diabetes, and cardiovascular diseases: executive summary: The Task Force on Diabetes and Cardiovascular Diseases of the European Society of Cardiology (ESC) and of the European Association for the Study of Diabetes (EASD). *Eur Heart J* 2007; **28**:88–136.