Adolescence is characterised by major changes in energy intake, growth and hormonal maturation, as well as by profound changes in cognitive function, lifestyle, mood and coping. In non-diabetic adolescents, fasting insulin levels rise in both sexes through puberty until Tanner stage 3 or 4, with the higher levels in girls reflecting their earlier growth spurt and marginally earlier pubertal maturation. These changes in both basal and stimulated insulin levels reflect and compensate for decreased insulin sensitivity during puberty, which is partly due to the significant increase in growth hormone (GH) secretion. They have important practical implications for the management of adolescents with diabetes who commonly have greater exogenous insulin requirements. A twice, three or four times a day insulin regimen incorporating long-acting insulin overnight may still provide inadequate insulin through the latter part of the night when GH and glucocorticoid levels are rising. Conventional insulin regimens will not correct abnormalities of intermediate and fatty acid metabolism through the night.

Standard insulin regimens through puberty will not correct all the metabolic abnormalities or maintain optimal glycaemic control. In practical terms, these considerations are overshadowed by some of the lifestyle and behaviour of adolescents which mitigate against good glycaemic control in adolescents with Type 1 diabetes.

Adolescents develop through stages of dependence and interdependence before becoming independent. They develop psychologically and emotionally at different rates, and may regress at times. It is a time of testing out and experimentation. It can be a confusing and frightening time for adolescents and their parents, particularly if there is the added stress of diabetes.

### Risk taking behaviours

Seeking excitement and involvement in risk taking behaviours is the norm during adolescence. This extends from music and dance to sexual behaviour and the use of drugs. Table 1 shows the extent and range of drug taking in 11–17 year olds in Scotland in 1996. The impact of drug use on diabetes is relatively unknown; most of the evidence is anecdotal, apart from information on alcohol and tobacco. Drug use is accepted as normal behaviour within the dance/youth culture. The main cohort of drug users is becoming older, so this may provide an opportunity for more effective educational intervention in early adolescence. Table 2 shows the extent and associated dangerous practices of drug taking at dance events in Edinburgh.

Much of the behaviour associated with ecstasy andamphetamine use can lead to 'hypo's'. These drugs act as appetite suppressants and also lead to huge expenditure of energy. Engaging in the use of drugs can lead to insulin omission and diabetic ketoacidosis (DKA). Multiple drug use is common, and users may not know what they have taken. Health professionals may not agree with their patients taking drugs, but ignoring the possibility is unhelpful. Drug taking should always be taken into consideration when trying to identify reasons for admission with DKA or a severe hypo. Referral to community projects that work with drug users should be considered.

Unprotected sex is not associated only with drug taking. Despite the huge amount of education on the prevention of HIV and AIDS, the number of teenage pregnancies remains high: 8.7 per 1,000 13–15 year olds and 7.1 per 1,000 16–19 year olds became pregnant in Scotland in 1998. New cases of sexually transmitted diseases have been increasing over the last 15 years. Our young female diabetic patients need to be aware of the risks of unplanned pregnancy, and health professionals should seek opportunities to discuss both preconception care and contraception with their adolescent girls.

As indicated by the Scottish Schools Drug Survey, alcohol and tobacco use is also high in adolescents. Although experimentation is the norm, many adolescents go on to become habitual
smokers and alcohol users. Cigarette smoking greatly increases the risks of microvascular complications for people with diabetes. Alcohol use, in particular binge drinking (which is common in adolescents), potentiates hypoglycaemia. Adolescents must be aware of these risks, and of how to avoid the dangers and pitfalls. Health professionals should refrain from being judgmental and encourage their patients to discuss these issues openly, at which time appropriate advice can be given.

Social, psychological and environmental aspects of diabetes

Adolescents with diabetes must not be seen out of context. Their social, psychological and environmental circumstances have a huge impact on their well-being and ability to manage. Those on lower incomes inevitably feel the financial burden of a chronic condition in the family. Metabolic control is known to be better in those adolescents who have supportive families. To be supportive, families must be resourceful and understanding. The adolescent with diabetes may feel isolated and not know anyone else with the condition. Diabetic holiday camps and the Youth Diabetes projects can help overcome this problem. Health professionals should encourage families to join the British Diabetic Association.

Adolescents are aware of the stigma attached to chronic illness and are reluctant to inject or draw attention to their diabetes outside their home. It can be difficult for them to test blood for sugar and inject insulin at school without going to a nurse’s room, which may involve time out of class, time away from peers, and draws attention to themselves and their condition. The imbalance between what is expected of them and what is possible for them to achieve within their own acceptable limits often causes more stress and difficulties. Internal conflict and conflict within the family can leave the adolescent in a no-win situation. Health professionals’ expectations of adolescents with diabetes must be realistic, and take into consideration the social, psychological and environmental influences on the individual.

Careers

Careers are also affected, in that people with Type 1 diabetes cannot join the armed forces, the police or the fire service, while working at heights and depths is also restricted. There is anecdotal evidence that those who disclose their diabetes on job applications are offered fewer interviews than their non-diabetic peers. Health care professionals must support their patients with applications, and take the time to discuss diabetes with prospective employers if requested.

Some sports are also restricted, particularly if they might put the patient at risk of hypoglycaemia. However, many people with Type 1 diabetes are high achievers in the sports field, and participate at national and international level.

Coping strategies adopted by adolescents with diabetes

Coping strategies adopted by adolescents with diabetes range from obsessional control to denial of their diabetes. The latter will quickly come to the attention of health professionals, whilst those who are obsessional may never be recognised but may be seen as ‘good diabetics’. Brittle diabetes is now accepted to be insulin omission. Work carried out in Dundee clearly associates insulin omission with episodes of DKA and poor glycaemic control. Many adolescents admit to omitting their insulin, but some find it difficult to discuss why. Health professionals should be aware of the signs of insulin omission, such as DKA, weight loss and infrequent insulin prescription requests. Insulin omission is also adopted as a weight control strategy. Eating disorders

<table>
<thead>
<tr>
<th>Drug</th>
<th>Users (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astralight</td>
<td>0.5</td>
</tr>
<tr>
<td>Heroin</td>
<td>0.5</td>
</tr>
<tr>
<td>Cocaine</td>
<td>1.8</td>
</tr>
<tr>
<td>Ecstasy</td>
<td>3.0</td>
</tr>
<tr>
<td>Tranquillizers</td>
<td>5.6</td>
</tr>
<tr>
<td>LSD</td>
<td>6.0</td>
</tr>
<tr>
<td>Magic mushrooms</td>
<td>6.3</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>8.0</td>
</tr>
<tr>
<td>Solvents</td>
<td>16.0</td>
</tr>
<tr>
<td>Painkillers</td>
<td>23.0</td>
</tr>
<tr>
<td>Cannabis</td>
<td>25.0</td>
</tr>
<tr>
<td>Tobacco</td>
<td>48.0</td>
</tr>
<tr>
<td>Alcohol</td>
<td>74.0</td>
</tr>
</tbody>
</table>

Table 2. Behavioural trends associated with drug use by people attending Edinburgh dance events (male to female ratio 4:3).
are more common in adolescents with diabetes\textsuperscript{11}.

Psychological care should be an integral part of the support offered to adolescents with diabetes\textsuperscript{12}, particularly in view of the fact that psychological problems are more common where chronic illness exists.

Aims of a diabetes service for adolescents

Implicit in the support already discussed is the clinic service where the patients should be reviewed on a regular basis. Annual screening should be carried out to pick up any early first manifestations of complications. Appropriate screening tests are shown in Table 3 and complications of diabetes in Table 4. The Diabetes Control and Complications Trial\textsuperscript{13} has clearly shown that complications of diabetes can be minimised by keeping blood sugar levels as near to normal as possible. It is therefore important that our adolescents understand the reasons why they need to have tight control and the reason for annual review.

A service for adolescents with diabetes should be jointly staffed by paediatric and adult diabetes teams. Clinics should be run at a time convenient for the patients, out of school hours and completely separate from other diabetes clinics. The level of contact should be negotiated between the patient and practitioner. However, some adolescents do not attend clinic and refuse support in the community. It is important to identify these patients and to maintain some form of contact, no matter how minimal. The overall aims of the service are shown in Table 5.

Conclusion

Adolescence is a difficult time for all young people and their families, but for those with diabetes the stressors are multiple. There are specific worries about complications of diabetes and future health, the ability to carry a successful pregnancy, and gaining employment. With support, the majority of adolescents come through this difficult time, having maintained the best control achievable for themselves, so minimising the risks of complications in later life.

In Lothian, the post of specialist nurse for diabetic adolescents was created in recognition of the specific needs of this group\textsuperscript{14}. This service could not be provided within the constraints of existing staffing levels, so the local diabetes focus group advocated the setting up of this post which has now become an established part of the diabetes service in Lothian. This has led to higher clinic attendance, more contact in the community, improved relationships with and understanding of this group, and better liaison with others involved in the care of individuals.

References

Malignant disease and the adolescent

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Malignancy affects an estimated one in 800 people in the age group 13–18 years. The majority of these patients are curable, but the cost in terms of physical, intellectual and psychological morbidity can be high for an individual undergoing the developmental transformations of adolescence.

Figure 1 illustrates the most common diagnoses affecting teenagers and young adults in the UK. Compared with adult malignancy, relatively few patients develop tumours of epithelial origin, but compared with paediatric malignancy, they are more common, as are primary bone tumours and lymphomas.

Adolescence is a period of substantial and significant growth and of re-formation physically and intellectually, as the dependent child moves in stages towards independence. The diagnosis and treatment of a life-threatening illness are likely to disturb and possibly arrest this progress, leaving an individual poorly adjusted to adult life. Hence, the goal of all oncologists must be to cure the patient with minimal morbidity.

Acute problems

General

The effects of a diagnosis of malignancy and of its treatment are profound and may colour the patient’s subsequent ability to overcome the illness. Many sequelae of therapy relate to ‘the system’: prolonged treatment in hospital, family, social and educational disturbance, and the reaction of the adolescent to the acute events experienced whilst undergoing treatment. They must be minimised, which may

Fig. 1. Malignant diseases in adolescent patients. GCT = germ cell tumour; NBL = neuroblastoma; NHL = non-Hodgkin’s lymphoma.