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Diabetes Mellitus

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INTRODUCTION

Diabetes mellitus is a chronic disorder, characterised by raised glucose levels in blood (hyperglycaemia) and urine (glycosuria). The cause may be inherited and/or acquired deficiency of insulin production by the pancreas, or insulin resistance, where the insulin produced is ineffective. Increased blood glucose concentrations can cause structural damage, particularly to blood vessels and nerves. Microvascular complications of diabetes (diabetic retinopathy, nephropathy and neuropathy) bring problems of blindness, kidney failure, foot ulcers, gangrene and erectile impotence. However, heart disease accounts for around 50% of deaths of people with diabetes. Management involves striving to maintain blood glucose at near-normal levels through behaviour change and medication, prevention or early detection and treatment of microvascular complications and reduction of cardiovascular risk, including hypertension, lipids and weight.

There are three main forms of diabetes. Type 1 diabetes usually develops in childhood or early adulthood. The pancreas stops producing insulin, so insulin by injection or infusion pump is essential for survival. Inhaled insulin is under evaluation. Type 2 diabetes typically begins in late adulthood, though maturity onset diabetes of the young (MODY) is increasing in children. Often, though not always, associated with high body mass index, insulin production and/or the body's response to insulin declines. Management initially involves diet and exercise, perhaps with tablets to increase insulin production or uptake. In time, insulin may be required. The third form, gestational diabetes, is not considered in detail here. Diabetes prevalence is increasing rapidly worldwide, with notable

ethnic differences. For example, South Asians are particularly prone to Type 2 diabetes.

The landmark Diabetes Control and Complications Trial (DCCT) (1993) compared usual care of Type 1 diabetes with intensified management to tighten control. It provided clear evidence that chronic hyperglycaemia increases risk of microvascular complications. However, tight control increased episodes of severe hypoglycaemia (very low blood glucose levels). The influential United Kingdom Prospective Diabetes Study (UKPDS) (1998) demonstrated similar relationships between hyperglycaemia and microvascular complications in Type 2 diabetes. Additionally, intensified blood pressure management reduced macrovascular complications.

Because stabilising blood glucose is a primary clinical goal of diabetes management, accurate measures are needed. At home, finger-prick samples and reagent strips can be used, with or without meters. The most commonly-used laboratory measure, haemoglobin A1c (HbA1c), measures average blood glucose over the previous 2-3 months. The normal range for HbA1c varies between assays but increasingly, laboratories provide 'DCCT–aligned' results. In the DCCT, normal HbA1c was below 6.05%, but in diabetes, HbA1c should probably not fall below 6; UK clinical guidelines for diabetes recommend keeping HbA1c between 6.5 and 7.5%, depending on cardiovascular risk (NICE, 2003). Although HbA1c is useful when making treatment decisions, the average may conceal episodes of hypoglycaemia. Hypoglycaemic symptoms are idiosyncratic and may include hunger, sweating, irritability, disorientation, concentration lapses or hallucinations. Mild symptoms can be resolved with quickly-absorbed carbohydrate (e.g. fruit juice or glucose tablet). More severe but conscious cases need help to administer oral carbohydrate. Hypoglycaemic coma may require a glucagon injection, to release glucose from the liver. At the other extreme, hyperglycaemia associated with lack of insulin in Type 1 diabetes can cause diabetic ketoacidosis and, if untreated, life-threatening coma.

THE ROLE OF PSYCHOLOGY

Diabetes management mostly occurs outside the medical setting and the daily life of someone with diabetes can involve many restrictions, as well as recommended activities including medication-taking and blood glucose monitoring. The knowledge, beliefs and behaviour of people with diabetes and their health-care professionals may all affect diabetes control. Psychological perspectives can therefore be valuable in enhancing self-care. Several important interventions have been devised and evaluated by multi-disciplinary teams that include psychologists (Norris et al 2001; Ismail et al, 2004). Moreover, measurement of patient-reported psychological outcomes is becoming the norm in clinical trials of pharmacological interventions, including new insulin analogues. We will outline a few of the many ways in which psychologists familiar with diabetes and its management have already made valuable contributions towards enhancing care of people with diabetes (for more, see Anderson and Rubin, 2002; Anderson and Wolpert 2004; Bradley et al, 1998; Glasgow et al, 1999; Riazi and Bradley, 2000). Our brief overview of the role of psychology begins with measurement.

MEASUREMENT OF PSYCHOLOGICAL OUTCOMES AND PROCESSES

When only metabolic outcomes are measured, clinicians and pharmaceutical developers may value new treatments only if metabolic control improves. They may underestimate treatment benefits. This happened when an innovative diabetes education and training programme developed by Muhlhauser, Berger and colleagues in Germany was shown to improve glycaemic control. Psychological outcomes were not measured initially, but were later shown to improve markedly alongside glycaemic control when the programme was evaluated in the UK (DAFNE Study Group, 2002). We need to aim for the best achievable profile of biomedical and psychological outcomes.

Questionnaires measuring psychological outcomes, developed with and for people with diabetes (e.g. Bradley 1994; Bradley and Speight 2002; Polonsky 2000, Pouwer et al 2000) consider issues important and relevant to people with diabetes. In contrast, commonly used generic measures typically focus on health and illness, rather than the impact of diabetes, with the demands and restrictions of long-term self-care (Bradley 2001). Measures of perceived health cannot be expected to detect diabetes-related quality of life impairments in someone without symptoms, who feels well.

Where problems are identified in one or more biomedical or psychological outcome, measures of psychological *processes* such as diabetes-related knowledge, self-care skills and behaviour, locus of control and coping strategies can indicate what action might be appropriate. Thus, someone with poor glycaemic control, despite good diabetes-related knowledge, is unlikely to benefit from further information-giving. Patient-completed questionnaires can illuminate reasons for glycaemic control problems, preferences for different treatment regimens and for therapies such as relaxation training (Bradley 1994, chapters 12 and 13).

FACILITATING DIABETES CONSULTATIONS

Psychologists can be most effective when sharing with health-care professionals consultation skills such as negotiated target-setting, open questioning and listening to patients' perspectives and priorities. Although some cultures may still believe 'doctor knows best', the prevailing 21st century Western philosophy involves 'empowering' patients to manage their own diabetes (Glasgow and Anderson, 1999; Department of Health, 2003). Training health professionals in 'empowerment' and 'patient-centred consulting' can have significant patient benefits. In Sweden, Rosenqvist's team has developed patient-centred methods of working with patients and training interventions that encourage professionals to change how they work. For example, Holmström et al (2004) have

demonstrated that professionals can shift from a *prescriptive*, information-giving model to a *reflective,* supportive model or *combined* model of consulting.

There has been limited success with brief interventions promoting patient participation in diabetes consultations. Kidd and colleagues (2004), aimed to encourage patient question-asking through brief interventions such as written encouragement to ask questions. Although intervention-group patients reported greater self-efficacy in asking questions, they asked no more questions than did controls. Although more satisfied, their glycaemic control was no different. It seems that some brief interventions may change beliefs without improving clinical outcomes, so there is still potential to develop feasible yet effective interventions. Unfortunately, well-being and quality of life have not always been included as outcomes in such studies.

By combining a short training intervention for primary care doctors and nurses with a booklet encouraging patients newly-diagnosed with Type 2 diabetes to prepare questions, Kinmonth and colleagues (1998) significantly improved well-being, treatment satisfaction and satisfaction with the doctor's consulting a year later, compared with controls. Although HbA1c did not differ, body mass index was higher in intervention patients. This illustrates the need to attend to the patient's concerns without losing sight of the medical agenda. Partnerships between psychologists and clinicians will be important in further developing feasible programmes to improve both psychological and biomedical outcomes.

OPTIMISING BLOOD GLUCOSE MONITORING

Most insulin-treated and some tablet-treated patients monitor their own blood glucose. If glycaemic control improves, and microvascular complications and hospital treatments are reduced, these benefits may far outweigh the costs of meters and reagent strips and the pain and inconvenience of self-testing. However, self-monitoring is not always performed optimally. Amongst children

and adolescents, parental involvement predicts adherence to home monitoring and diabetes-related family conflict is related to poorer glycaemic control. Good practice needs to be established soon after diagnosis, through building positive family interaction and involvement in diabetes management (Anderson et al 2002).

Glucose monitoring is cost-effective only when patients understand their readings and respond appropriately at the time, rather than seeking the doctor's verdict on a book of results, months later. Many patients with Type 2 diabetes who self-monitor do not even know their blood glucose targets. Problems may be overlooked when patients monitor at set times of day. If they learn to recognise how they *feel* when their blood glucose levels are outside the normal range and how their own body responds to medication, exercise, food, illness and stress, they can then test their blood at times likely to detect problems. Cox and colleagues developed a blood glucose awareness training (BGAT) programme and manual, subsequently refined as BGAT-2. Blood glucose monitoring is used, alongside symptom ratings, mood and environmental cues, to identify each patient's predictors of high and low blood glucose. An 'error grid' highlights error judgments that matter clinically, such as failure to detect extreme blood glucose levels. Efforts are then concentrated on reducing clinically important errors and learning when to take appropriate action, such as deciding not to drive. Impressive results have been demonstrated in several studies of people with Type 1 diabetes. The training improved not only estimation accuracy but also glycaemic control and occurrence of car accidents. BGAT-2 has been found to have multiple long-term benefits, over and above detection of hypoglycaemia and hyperglycaemia, including reduced fear of hypoglycaemia and improved diabetes knowledge a year later (Cox et al 2001).

PSYCHOLOGICAL TREATMENTS OF SEXUAL DYSFUCTION

Nowadays, erectile dysfunction (ED) is often treated as an organic, vasculogenic disease, with increasing focus on pharmacological treatments. Opinions vary on the importance of psychogenic causes (e.g. relationship issues, inadequate stimulation and performance anxiety) and the need to consider psychological as well as biomedical issues in treatment. Despite the 'blockbuster' status of sildenafil citrate oral medication for men with ED (Salonia et al, 2003), men with diabetes appear to respond less well long-term to a range of ED treatments than do those without (Penson et al, 2003). Diabetes is associated with sexual dysfunction for women too. Amongst men, ED is related to demographic and clinical factors (age, body mass index, diabetes duration and complications), but for women, psychological and social factors (depression and poor partner relationships) predict sexual dysfunction (Enzlin et al, 2003). To achieve more enduring treatment benefits, Heiman (2002) recommended combining pharmacological and psychological therapies for both men and women. Psychologists thus have an essential role in redressing the current imbalance in treatment perspectives.

WEIGHT MANAGEMENT PROGRAMMES

In the 1980s and 90s, Wing and colleagues conducted studies evaluating various weight management programmes for people with Type 2 diabetes, where excess weight can obstruct diabetes control (see Wing's chapter in Anderson and Rubin 2002). Programmes included combinations of nutrition education, behaviour modification, very low calorie diets and exercise, and resulted in some dramatic weight losses, with results improving as the programmes were developed and refined. The main problem is weight loss maintenance, suggesting a need for continuing support and encouragement. Clark (2004) reviewed obesity management in diabetes, highlighting the failure of any behavioural, dietetic or pharmacological treatment to achieve long-term weight loss. She questions the

wisdom of encouraging eating restraint, with its many negative consequences, including self-blame, and suggests that encouraging weight *maintenance* rather than weight loss may be better for some individuals. A Cochrane review (Moore et al 2004) considered 18 trials in which the main intervention was dietary advice and concluded that it was the adoption of *regular exercise* that appeared to improve glycaemic control.

CONCLUSION

Psychological perspectives are already evident in many innovative approaches to diabetes care in hospital and community settings, in policy documents such as the National Service Framework for Diabetes (Department of Health, 2003) and in clinical trial reports, demonstrating how psychologists can work with health-care professionals to improve the lives of people with diabetes.

References

Anderson BJ and Rubin RR (Eds). *Practical psychology for diabetes clinicians, second edition.* USA: American Diabetes Association, 2002.

Anderson BJ and Wolpert HA. A developmental perspective on the challenges of diabetes education and care during the young adult period. *Pat Ed Couns* 2004; 53: 347-352.

Anderson BJ, Vangsness L, Connell A, Butler D, Goebel, Fabbri A and Laffel LMB. Family conflict, adherence and glycaemic control in youth with short duration Type 1 diabetes *Diab Med* 2002; **19**: 635-52.

Bradley C. (Ed) *Handbook of Psychology and Diabetes: a guide to psychological measurement in diabetes research and practice* Chur Switzerland: Harwood Academic, 1994.

Bradley C, Pierce MB, Hendrieckx C, Riazi A and Barendse S. Diabetes Mellitus. In M Johnston and DW Johnston (Eds) *Health Psychology,* Vol. 8 in AS Bellack and M Hersen (Eds) *Comprehensive Clinical Psychology,* Oxford: Elsevier Science, 1998. pp277-304.

Bradley C. Importance of differentiating health status from quality of life *The Lancet* 2001; **357**, 7-8.

Bradley C and Speight J. Patient perceptions of diabetes and diabetes therapy: assessing quality of life. *Diab Metab Res Rev* 2002; **18**: S64-9.

Clarke M. Is weight loss a realistic goal of treatment in type 2 diabetes? *Pat Educ Couns* 2004; **53**: 277-283.

Cox DJ, Gonder-Frederick L, Polonsky W, Schlundt D, Kovatchev B and Clarke W. Blood glucose awareness training (BGAT-2): long-term benefits. *Diab Care* 2001; **24** (4):637-42.

DAFNE study group. Training in flexible, intensive insulin management to enable dietary freedom in people with type 1 diabetes: the dose adjustment for normal eating (DAFNE) randomised controlled trial. *Br Med J* . 2002; **325**:746-749.

Department of Health *National Service Framework for Diabetes.* London: Department of Health, 2003.

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**: 977-86.

Enzlin P, Mathiue C, Van Den Bruel A, Vanderschueren D and Demyttenaere K. Prevalence and predictors of sexual dysfunction in patients with type 1 diabetes. *Diab Care* 2003; **26**: 409-414.

Glasgow RE and Anderson RM. In diabetes care, moving from compliance to adherence is not enough: something else entirely different is needed. *Diab Care* 1999; **22**:2090-2092

Glasgow RE, Fisher EB, Anderson BJ, LaGreca A, Marrero D, Johnson SB, Rubin RR and Cox DJ. Behavioural science in diabetes; contributions and opportunities. *Diab Care* 1999; **22**: 832-843.

Heiman JR. Sexual dysfunction: overview of prevalence, etiological factors, and treatments . *J. Sex Res* 2002; **39**:73-78.

Holmström I, Larsson J, Lindberg E and Rosenqvist U. Improving the diabetes-patient's encounter by reflective tutoring for staff. *Pat Educ Couns* 2004; **53**: 325-32.

Ismail K, Winkley K, Rabe-Hesketh S. Systematic review and meta-analysis of randomised controlled trials of psychological interventions to improve glycaemic control in patients with type 2 diabetes. *The Lancet* 2004; 363(9421):1569-70.

Kidd J, Marteau TM, Robinson S, Ukoumunne OC and Tydeman C. Promoting patients participation in consultations; a randomised controlled trial to evaluate the effectiveness of three patient-focused interventions *Pat Educ Couns* 2004; 52:107-12.

Kinmonth A-L Woodcock A Griffin S, Spiegal N, Campbell MJ. Randomised controlled trial of patient centred care of diabetes in general practice: impact on current well-being and future disease risk. *Br Med J* 1998; **317:** 202-1208.

Moore H, Summerbell C, Hooper L, Cruickshank K, Vyas A, Johnstone P, Ashton V, and Kopelman P. Dietary advice for treatment of type 2 diabetes mellitus in adults. *Cochrane Database Syst Rev.* 2004; (3): CD004097.

NICE (National Institute for Clinical Excellence). Management of Type 2 diabetes: Management of blood glucose. National Institute for Clinical Excellence. London, September 2003.

Norris SL, Engelau MM and Venkat Narayan KM. Effectiveness of self-management training in type 2 diabetes: a systematic review of randomised controlled trials. *Diab Care* 2001; 24: 561-87.

Penson DF, Latini DM, Lubeck DP, Wallace KL, Henning JM and Lue TF. Do impotent men with diabetes have more severe erectile dysfunction and worse quality of life than the general population of impotent patients? Results from the Exploratory Comprehensive evaluation of Erectile Dysfunction (ExCEED) database. *Diab Care* 2003; **26**:1093-1099.

Polonsky WH. Understanding and assessing diabetes-specific quality of life. *Diabetes Spectrum* 2000; **13:** 17-22..

Pouwer F, Snoek FJ, van der Ploeg HM, Adèr HJ and Heine RJ (2000) The Well-being Questionnaire: evidence for a three-factor structure with 12 items (W-BQ12). *Psychological Medicine*, **30**, 455-462.

Riazi A and Bradley C. Diabetes, Type 1. In G Fink (Ed) *Encyclopedia of Stress* San Diego: Academic Press, 2000. pp688-693.

Salonia A, Rigatti P and Montorsi F. Sildenafil in erectile dysfunction: a critical review. *Curr Med Res Opin* 2003; **19**:241-262.

UK Prospective Diabetes Study 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) *The Lancet* 1998; **352**: 837-53.