

## UNIT NO. 1

## ASSESSING POORLY CONTROLLED DIABETES

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## ABSTRACT

The poorly controlled diabetic faces both acute and chronic diabetic complications. Just as for those with acutely uncontrolled diabetes, the chronically poorly controlled diabetic manifests with symptoms of hyperglycaemia, including weight loss, osmotic diuresis with resultant glycosuria (ie. polyuria, nocturia), polydipsia and lethargy. Setting aside the slight differences in various guidelines and therapeutic targets, and excluding abnormal hemoglobinopathies and thalassemias, HbA1c frankly exceeding 8% implies poorly controlled diabetes, be it type 1 or type 2 diabetes, while HbA1c > 10% indicates very poor control, often with symptoms impacting negatively on quality of life. It is helpful to develop a systematic approach that allows the family physician to tailor accordingly to the poorly controlled diabetic in order to facilitate rapid clinical assessment, so that the causes and factors responsible for the poor control can be elucidated and physical complications detected, following which a plan can be drawn up to actively deal with the affected patient to help overcome the obstacles to optimal diabetic control and reduce further morbidities of diabetic complications.

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## INTRODUCTION

Despite major advances in our knowledge and treatment of diabetes over the past couple of decades, it remains challenging that a significantly large number of diabetic patients worldwide are still poorly controlled and are therefore, at high risk of complications. Poor control is defined as a failure to reach the recommended glycaemic and related metabolic treatment targets. This section deals primarily with the strategy and approach of assessment of the poorly controlled diabetic. In order to make it as practical and readily applicable to the family physician as possible, this difficult topic is deliberately structured into a 'point form' format that would allow the principles to be more easily grasped, assimilated and remembered by the busy family physician dealing with such groups of diabetic patients.

## DEFINITION OF POOR GLYCAEMIC CONTROL

It should be appreciated that there are no universally agreed definitions for poor glycaemic control, because there is no single glycaemic threshold for diabetic complications, and the diabetic-related endpoints span through a range of HbA1c

concentrations<sup>1</sup>. Yet, taking an arbitrary cutoff that is sufficiently practical to benefit the greatest number of diabetic patients remains justifiable from the evidence provided by various large-scale prospective studies (eg. United Kingdom Prospective Diabetes Study-UKPDS and Diabetes Control and Complications Trial-DCCT) that led to formulation of guidelines dictating the standards of care required in the management of diabetes<sup>2,3</sup>. In this respect, glycosylated hemoglobin A1c (HbA1c), being a marker of long-term glycometabolic control, is a good indication of diabetic control. In the UKPDS, the risk of microvascular events was 11.4 events per 1000 patient-years in the conventional treatment arm (mean HbA1c = 7.9%), whereas it was 8.6 events per 1000 patient-years in the intensively treated group (mean HbA1c = 7%). Therefore, the American Diabetes Association (ADA) suggested HbA1c < 7% as the target for satisfactory control, while HbA1c > 8% requires active interventions<sup>4</sup>. Setting aside the slight differences in various guidelines and therapeutic targets, and excluding abnormal hemoglobinopathies and thalassemias, HbA1c frankly exceeding 8% implies poorly controlled diabetes, be it type 1 or type 2 diabetes, while HbA1c > 10% indicates very poor control, often with symptoms impacting negatively on quality of life<sup>5</sup>.

## CLINICAL FEATURES OF THE POORLY CONTROLLED DIABETIC

The poorly controlled diabetic faces both acute and chronic diabetic complications. Just as for those with acutely uncontrolled diabetes, the chronically poorly controlled diabetic manifests with symptoms of hyperglycaemia, including weight loss, osmotic diuresis with resultant glycosuria (ie. polyuria, nocturia), polydipsia and lethargy.

The diabetic microvascular and macrovascular complications familiar to all physicians including retinopathy, peripheral neuropathy, autonomic neuropathy, nephropathy, dyslipidemia, peripheral arterial disease, diabetic foot complications, ischaemic heart disease, carotid arterial insufficiency and strokes should be screened.

In addition to the above list, other associated signs and symptoms attributed to diabetes, several of which are particularly more prevalent in poorly controlled diabetes that family physicians should be aware of, include:

- ✧ dermatologic conditions (eg. hyperpigmentation from dermopathy, diabetic scleredema, necrobiosis lipoidica diabetorum, granuloma annulare, diabetic bullae, acanthosis nigricans)<sup>6</sup>
- ✧ frequent infections (eg. carbuncles, recurrent urinary tract infections, candidiasis and serious infections such as septicemia, emphysematous cholecystitis, emphysematous pyelonephritis, tuberculosis and rhinocerebral mucormycosis)<sup>7</sup>

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- ✧ neurological syndromes (eg. mononeuritis multiplex such as oculomotor nerve palsy, painful diabetic amyotrophy, hemichorea-hemiballism)<sup>8,9</sup>
- ✧ unusual musculoskeletal-rheumatological problems such as diabetic cheiroarthropathy (or diabetic stiff-hand syndrome) and Charcot's joints<sup>10</sup>
- ✧ oral/dental/periodontal disorders (eg. gingivitis)<sup>11</sup>

This is so that appropriate referrals should be made to the relevant specialists in conjunction with endocrinologists' inputs in such difficult and complicated cases to reduce morbidity and mortality, as well as to target the underlying poor glycaemic control.

### PRACTICAL APPROACH TO ASSESSMENT

Diabetic consultations, as it stands, often take 30 to 60 minutes for a thorough assessment of a new patient, while follow-up reviews may take 15 to 30 minutes. Thus, it is helpful to develop a systematic approach that allows the family physician to tailor accordingly to the poorly controlled diabetic in order to facilitate rapid clinical assessment, thus the causes and factors responsible for the poor control can be elucidated and physical complications detected; following which, a plan can be drawn up to actively deal with the affected patient to help overcome the obstacles to optimal diabetic control and reduce further morbidities of diabetic complications.

The areas to be covered during the assessment of the poorly controlled diabetic are:

#### 1) Confirmation:

- ✧ HbA1c > 8% (either once or repeatedly)

#### 2) Focused history:

- ✧ evaluation of symptoms
- ✧ duration and history of diabetes (the longer the duration, the greater the chances of beta cell exhaustion and progressive decline in glycaemic control in those type 2 diabetics on sulfonylureas/meglitinides)
- ✧ dietary history
- ✧ exercise history (especially the lack of it)
- ✧ systemic review (think of sepsis, Cushing's syndrome, thyrotoxicosis, acromegaly, pheochromocytoma, or even malignancy on chemotherapy)
- ✧ any physical disabilities and handicaps (eg. blindness) that could impede on physical functioning and proper usage of medications
- ✧ consider psychological elements such as depression, dementia, psychosis, or mental retardation that can interfere with understanding of diabetes and need for cooperating with medical professionals and complying with medications and lifestyle interventions
- ✧ consider frequent hypoglycaemic episodes which can be a result of attempts to bring down glucoses, and contributions to high glucoses from over-corrections

- ✧ review glucometer finger-stick glucose records
- ✧ review contact frequency, especially for any history of frequent clinic follow-up defaults, and explore reasons for 'no show'
- ✧ ask about recent hospitalisations for DKA/HHNK or for sepsis/CVA/AMI/amputations for gangrene of lower extremity
- ✧ ophthalmologist's evaluation – when, progressive retinopathy?
- ✧ for males – enquire about erectile dysfunction; females (in reproductive age) – enquire about any ongoing pregnancy that could deteriorate diabetic control; if not pregnant yet – counsel against becoming pregnant until optimal glycaemic control has been established
- ✧ find out degree of family support which might play a role in poor control
- ✧ find out whether patient has ever been properly counseled by diabetes nurse clinicians and dietitians
- ✧ educational level and occupation
- ✧ unusual occupations and shift-works with resultant abnormal mealtimes, improper meals taken at the workplace and difficulties with proper timing of medications
- ✧ medications – compliance and dose adjustments (by doctors and even by patients themselves!)
- ✧ other drugs not prescribed by you (eg. corticosteroids, niacin, thiazides, protease inhibitors) – consider the potential situation that certain medications, prescribed by other doctors or even off-the-counter (including traditional herbal medications – TCMs), might not be volunteered to the physician in charge in patients harbouring certain evasiveness unless deliberately enquired
- ✧ smoking, alcohol

#### 3) Focused physical examination:

- ✧ check body weight (and track previous serial records to assess for progressive obesity or weight loss stemming from catabolic state due to overt insulin deficiency), height, waist circumference, BMI
- ✧ general appearance: metabolic syndrome phenotype, cushingoid appearance (enquire about TCM use, increase in doses of steroids for control of other conditions such as bronchial asthma or autoimmune disorders, viz. SLE, rheumatoid arthritis, myasthenia gravis, or organ transplant)
- ✧ blood pressure control plus assessment for any orthostatic hypotension
- ✧ assessing for complications of poor glycaemic control (eg. peripheral neuropathy, retinopathy, diabetic foot ulcers and macroangiopathy such as carotid bruits, heart failure or evidence of cerebrovascular disease)
- ✧ assessing for any other physical features consistent with poor diabetic control (eg. worsening dermatopathy, candidiasis, ongoing sepsis)

- for those on insulin therapy, look out for tell-tale signs of lipohypertrophy over injection sites
- assessing for associated problems that can be aggravated by poor glycaemic control – dehydration, eruptive xanthomata, nephrotic syndrome

#### 4) Focused investigations:

- serial HbA1c measurements
- urinary microalbumin (ie. albumin:creatinine ratio); if grossly elevated, do 24h urinary total protein estimation with creatinine clearance
- plasma electrolytes with urea and creatinine
- fasting plasma lipids and plasma glucose (consider glucolipotoxicity that impairs beta cell function and response to insulin secretagogues)
- if sepsis suspected, consider appropriate septic workup, and if indicated, admit for management of sepsis plus stabilisation of diabetes
- if indicated, do imaging studies to assess for carotid artery stenosis, renal artery stenosis
- if clinically indicated, screen thyroid function tests (free T4/TSH), 24h urinary free cortisol

#### 5) Referrals to consider:

- digital retinal photography; if abnormal, refer for ophthalmologic examination
- diabetes nurse clinician to assist in evaluating factors responsible for poor diabetes control
- dietitian review to analyse for important dietary factors that might not be obvious during the clinic consultation; food diary review (esp. to determine a patient's typical schedule with regards to time and dose of medication/insulin injections, meals, snacks, and exercise)
- psychological review if indicated
- podiatrist as indicated
- consider referral to cardiologist to evaluate for coronary artery disease (eg. treadmill stress ECG, dobutamine stress echocardiography, sestamibi scan, coronary angiography) in those deemed at high risk and high probability of having developed ischaemic heart disease
- if indicated, refer to neurologist for autonomic nerve function testing and management of intractable, painful peripheral neuropathy

- renal physician review in cases where clinically significant and deteriorating diabetic nephropathy had occurred

#### 6) Scheduling clinic visits:

- unlike those with optimal and ideal glycaemic control who could be reviewed between 3-6 monthly, the poorly controlled diabetic should be preferably seen more frequently
- frequent visits should continue until most, if not all, metabolic targets have been met.

#### REFERENCES

1. Stratton IM, Adler AI, Neil AW, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *Br Med J* 2000; 321:405-12.
2. 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* 1994; 329:977-86.
3. 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; 352:837-53.
4. American Diabetes Association: Standards of medical care for patients with diabetes mellitus. *Diabetes Care* 2002; 25:S33-49.
5. Meltzer S, Leiter L, Daneman D, et al. 1998 clinical practice guidelines for the management of diabetes in Canada. *Canadian Medical Association. CMAJ* 1998; 159 (8 Suppl):S9-12.
6. Aye M, Masson EA. Dermatological care of the diabetic foot. *Am J Clin Dermatol* 2002; 3:463-74.
7. Wheat LJ. Infection and diabetes mellitus. *Diabetes Care* 1980; 3:187-97.
8. Chu K, Kang DW, Kim DE, Park SH, Roh JK. Diffusion-weighted and gradient echo magnetic resonance findings of hemichorea-hemiballismus associated with diabetic hyperglycaemia: a hyperviscosity syndrome? *Arch Neurol* 2002; 59:448-52.
9. Vinik A, Ullal J, Parson HK, Casellini CM. Diabetic neuropathies: clinical manifestations and current treatment options. *Nat Clin Pract Endocrinol Metab* 2006; 2:269-81.
10. Cagliero E. Rheumatic manifestations of diabetes mellitus. *Curr Rheumatol Rep* 2003; 5:189-94.
11. Tan WC, Tay FB, Lim LP. Diabetes as a risk factor for periodontal disease: current status and future considerations. *Ann Acad Med* 2006; 35:571-81.

#### LEARNING POINTS

- The patient with poorly controlled diabetes (regardless of type of diabetes) is at high risk and should be identified with HbA1c exceeding 8%.
- These patients require diligent assessments that elucidate the factors perpetuating the poor control, and screened for critical diabetic complications in order to be treated to the recommended metabolic targets.
- Thorough assessment should focus on pertinent historical aspects, physical examination, and appropriate laboratory and ancillary investigations that address both the antecedent factors and the chronic medical consequences of poor diabetic control as highlighted.