# What the primary healthcare worker needs to know about the management of type 2 diabetes

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Globally, type 2 diabetes remains the most common type of diabetes, and its prevalence is rising, unabatedly driven by physical inactivity and the emerging epidemic of obesity.[1] The risk of developing type 2 diabetes is especially increased in rural girls, of whom up to 25% are already overweight or obese in late adolescence.[2]

Ideally, diabetes care is organised around the person with diabetes, incorporating a multi- and interdisciplinary diabetes healthcare team, focused on self-care management.[3] This ideal remains largely elusive in the South African public healthcare sector, although significant progress has made in the private healthcare sector.[4] Diabetes patient care flow sheets, care objectives and patient information leaflets are freely available.[5] Initial evaluation of a patient with type 2 diabetes, whether newly diagnosed or established, presents a unique opportunity to individualise a comprehensive care plan.[6]

The lowering of haemoglobin $A_{1c}$ levels ($HbA_{1c}$) to 7%, or lower reduces the development of microvascular complications in the long term. If initiated early, intensive glycaemic control also translates to a reduction in macrovascular disease, the so-called legacy effect of tight control.[7] Less stringent control is acceptable in patients with a history of severe hypoglycaemia and co-morbid disease, and reduced life expectancy.

Regular exercise is strongly advised for all patients, in the absence of contraindications.[6] Exercise prevents the onset of type 2 diabetes in high-risk individuals, and also improves glucose control, reduces cardiovascular risk, improves well-being, and promotes weight loss. The American Diabetes Association (ADA) recommendation with regard to exercise is very specific. It advocates at least 150 minutes/week of moderate-intensity aerobic physical activity, spread out over three days, with no more than two consecutive days lapsing without exercise.[6] Medical nutrition therapy (MNT) forms an integral part of the lifestyle changes aimed at moderate and sustained weight loss, and improves diabetes control. Ideally, it should be combined with regular exercise.[6] Nutrition counselling should preferably be delivered by a registered dietitian, and is equally effective when given to a small group, or on a one-to-one basis.[6]

In contrast to past policy, the ADA now recommends that metformin therapy should be initiated, along with lifestyle interventions and MNT, unless metformin is contraindicated in newly diagnosed patients with type 2 diabetes.[6] A second agent from a different class, such as a sulphonylurea, should be added if $HbA_{1c}$ targets are not met within three to six months. It is of interest that each class of non-insulin agent that is added to the initial therapy decreases $HbA_{1c}$ by 0.9-1.1% on average.[6] Both the ADA and the Canadian Diabetes Association now recommend that in newly diagnosed patients with type 2 diabetes, and with marked hyperglycaemia or elevated $HbA_{1c}$ (> 9%), insulin therapy should be considered from the outset, with or without additional agents.[6,8] Alternative therapies that may be considered in special circumstances include acarbose and the newer classes of agents, such as the incretins and dipeptidyl peptidase-4 (DPP-4) inhibitors.[6] The US Food and Drug Administration recently issued a warning on the continued use of rosiglitazone, due to concerns about an increase in cardiovascular mortality.[9] The remaining thiazolidenedione, pioglitazone, has recently been associated with an increased risk of bladder cancer.[10]

Hypoglycaemia may result from the use of insulin and insulin secretagogues, such as sulphonylureas, and is the main limiting factor for glycaemia management in patients with type 2 diabetes.[6] Severe hypoglycaemia in older adults increases the risk of dementia.[11] Patients should be fully informed about the precipitating factors for hypoglycaemia, and how to recognise symptoms. Relatives

should be instructed on how to manage severe hypoglycaemia, including the use of glucagon.[6]

Cardiovascular risk factors in patients with type 2 diabetes should be aggressively managed. Low-dose aspirin may be beneficial in diabetics for the primary prevention of vascular disease and in subjects who have a 10-year risk of cardiovascular disease (CVD) events exceeding 10%, and who are not at increased risk of bleeding.[12] Aspirin should not be recommended for primary prevention of CVD to adults with diabetes who are at low CVD risk (< 5%).[12]

The ADA also recommends low-dose aspirin as a secondary prevention strategy in diabetics with a history of CVD.[6] Low-density lipoprotein (LDL) cholesterol levels should be lowered to < 2.6 mmol/l initially in most patients with diabetes, together with optimal glycaemic control, MNT, and lifestyle intervention.[6] Statin therapy should be considered in patients who do not respond to non-pharmacological measures, in patients older than 40 years with additional risk factors, and in those with clinical CVD, regardless of the LDL cholesterol level. In such patients, the LDL cholesterol goal should be < 1.8 mmol/l.[6] Severe hypertriglyceridaemia [triglyceride levels > 10 mmol/l] may cause acute pancreatitis, and should be managed immediately with MNT, fibrates, niacin, or fish oil.[6]

Diabetes is the leading cause of end-stage renal disease in Europe and the USA.[13] Approximately 40% of patients with diabetes will develop chronic kidney disease (CKD).[13] Classic diabetic nephropathy progresses from subclinical disease to the earliest clinically detectable stage, and is characterised by persistent proteinuria.[14] Before each screening and urine dipstick testing, transient causes of albuminuria [such as recent strenuous exercise, menstruation, fever, urinary tract infections, pregnancy, uncontrolled heart failure or acute severe elevation in blood pressure (BP) or blood glucose], low estimated glomerular filtration rate (such as dehydration and hypovolaemia) and acute renal failure on clinical grounds should be excluded.[14]

All patients with type 2 diabetes should be screened for microalbuminuria at the time of diagnosis, since type 2 diabetes may be present for some time before diagnosis.[15] Adults with diabetes and persistent albuminuria [albumin/creatinine ratio (ACR) > 2 mg/mmol in males, > 2.8 mg/mmol in females] should be given an angiotensin-converting enzyme (ACE) inhibitor to delay progression of CKD,[16] even in the absence of hypertension.[14] Typically ACE inhibitors such as enalapril 10-20 mg daily, perindopril 2 mg daily, ramipril 2.5-10 mg daily and lisinopril 5-20 mg daily were used in clinical trials to prevent, or delay, a progressive decline in glomerular filtration rate.[17]

Patients should be monitored with follow-up testing of their serum creatinine and potassium levels, within one to two weeks of initiation of an ACE inhibitor or angiotensin-receptor blocker (ARB) or titration of the dose in the event of significant worsening of the renal function, or the development of hyperkalaemia.[14] Serum creatinine may increase by up to 30% above baseline, after initiation of an ACE inhibitor or an ARB.[18] In such an event, the ACE inhibitor or ARB should be discontinued. Referral to a nephrologist or a physician who is experienced in the management of renal disease should be considered when there is chronic progressive loss of renal function in spite of the suggested measures. This also applies when any of the following criteria are present: estimated glomerular filtration rate is < 30 ml/minute, ACR is persistently above 60 mg/mmol; BP targets cannot be reached, patients cannot tolerate ACE inhibitors or ARBs due to hyperkalaemia, and a > 30% increase in serum creatinine within three months of starting these agents.[14]

Up to 40% of patients with diabetes have diabetic retinopathy, while 8% have sight-threatening retinopathy.[19] All patients with type 2 diabetes should be screened for diabetic retinopathy at diagnosis.[20] Since few primary healthcare workers in South Africa are adequately trained to screen for diabetic retinopathy, most patients at primary healthcare level will have to be referred to a skilled professional for screening. Diabetic retinopathy may be prevented, or delayed, by tight glycaemic control, and by treating elevated BP and lipids to target.[20]

Hypertension is present in about one third of patients with type 2 diabetes at diagnosis.[21] Hypertension in diabetes is aggressive and progresses rapidly to renal failure, unless it is treated aggressively.[21] The treatment goals for hypertension in persons with diabetes and hypertension should be a systolic BP (SBP) < 130 mmHg and diastolic BP (DBP) < 80 mmHg.[6,21] Lifestyle intervention, including MNT, should be the first step towards the lowering of BP in patients with a BP ≥ 130/80 mmHg, normal urinary albumin excretion, and without chronic kidney disease.[22] Should BP targets not be reached with these measures, pharmacological therapy should be introduced. Monotherapy, with any one of the following medications, should be considered: an ACE inhibitor (or an ARB, if the ACE is not tolerated), a dihydropyridine (DHP) calcium-channel blocker or a thiazide-type diuretic.[22] If monotherapy fails, these agents could be used in combination. For patients with BP ≥ 130/80 mmHg and microalbuminuria,

an ACE inhibitor (or an ARB if the ACE inhibitor is not tolerated) is the first choice.[22] If the BP target is not reached, a DHP calcium-channel blocker or a thiazide diuretic should be added.[22] Two or more agents at maximal dose are usually required to achieve BP targets.[22] If ACE inhibitors, ARBs or diuretics are used, kidney function and serum potassium levels should be monitored.[6]

In a large cohort of patients with type 2 diabetes, 59% had some form of neuropathy, while polyneuropathy was present in 45% of these.[23] Foot ulceration and amputation are costly complications of diabetic neuropathy.[24]Annual screening for neuropathy can be performed reliably and rapidly by either the 5.07/10 g Semmes-Weinstein monofilament method, or vibration sense testing with a 128 Hz tuning fork utilising the on-off method.[25] Intensive glycaemic control in the United Kingdom Prospective Diabetes Study (UKPDS) reduced the development of microvascular complications, including neuropathy.[26]

The plethora of pharmacological agents recommended for the treatment of painful polyneuropathy[24] gives an indication of the difficulty of treating this often crippling condition successfully. Counselling patients at high risk of foot ulceration can prevent this from happening, while performing regular examinations of the feet, by both the patient and a healthcare professional, is a proven strategy in ultimately preventing amputation.[27]

## Conclusion

Type 2 diabetes is a chronic, and often debilitating, condition, calling for a multidisciplinary approach and ongoing medical care. Patient education and self-care is central to the prevention of acute complications, and that of chronic macro- and microvascular complications.

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