Management outcomes of patients with type 2 diabetes: targeting the 10-year absolute risk of coronary heart disease

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ABSTRACT

Objective: To assess the management of patients with type 2 diabetes mellitus in the primary care setting, with respect to risk factors associated with coronary heart disease.

Design: Retrospective cross-sectional audit.

Setting: Specialised diabetes assessment clinic in a tertiary referral teaching hospital.

Participants: 328 patients with type 2 diabetes mellitus (mean age, 58.3 years [95% CI, 57.5–59.1]) and no existing coronary heart disease (CHD) referred to the clinic by general practitioners during 2004–2005.

Main outcome measures: Comparison of glycated haemoglobin (HbA_{1c}), systolic blood pressure and total cholesterol levels and smoking frequency with current RACGP (Royal Australian College of General Practitioners) targets (< 7.0%; < 130/80 mmHg; < 4 mmol/L; and smoking cessation, respectively). Estimation of patients' 10-year absolute risk of CHD events using the United Kingdom Prospective Diabetes Study risk engine, and its relation to primary prevention of CHD.

Results: 42%, 61% and 43% of patients were receiving medication to treat hyperglycaemia, hypertension and hypercholesterolaemia, respectively; 46%, 29% and 15% of patients, respectively, had achieved the recommended RACGP target values for HbA_{1c}, blood pressure, and total cholesterol; and 22% of patients were current smokers. The mean 10-year absolute risk of CHD was 16.8% (95% CI, 15.7%–17.9%), and 48% of patients were classified as "high risk" (absolute risk, > 15%). Based on the 10-year absolute risk, there was no difference between high- and low-risk groups with respect to prescription of aspirin, statins or angiotensin-converting enzyme inhibitors. If all the recommended RACGP goals were achieved, the mean 10-year absolute risk would decrease to 12.6% (95% CI, 11.8%–13.4%).

Conclusions: Recommended treatment targets are not being uniformly achieved. Medication for primary CHD prevention is not being preferentially directed at those patients at highest risk, based on the estimated 10-year absolute risk of CHD events. Our findings suggest new initiatives are required in the way target goals and primary CHD prevention measures are set for patients with type 2 diabetes mellitus.

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The macro- and microvascular complications of type 2 diabetes significantly increase patient morbidity and mortality.[1] However, there is also evidence from randomised controlled trials that treating hyperglycaemia, dyslipidaemia and hypertension will decrease the severity and/or delay the onset of diabetes-related complications, particularly coronary heart disease (CHD).[2-5] Accordingly, the Royal Australian College of General Practitioners (RACGP) has proposed target threshold values for glycated haemoglobin (HbA_{1c}), blood pressure and total cholesterol of < 7.0%, < 130/80 mmHg, and < 4 mmol/L, respectively.[6] Smoking cessation, low-dose aspirin (50–150 mg/day), statins, and angiotensin-converting enzyme (ACE) inhibitors are also an integral part of this management strategy. Given that, for patients with diabetes, preventing CHD remains the primary goal of risk modification, estimating the 10-year absolute risk of CHD events provides a unique summary of key risk factors for an individual patient.[7] Additionally, an absolute risk > 15% has been chosen to define patients within the high-risk category for CHD events, and therefore most likely to benefit from aspirin and statin treatment.[8-10] Estimating the 10-year absolute risk also provides a single focus with which to review the current efficacy or assess the likely impact of different risk-factor modification strategies in the primary care setting.

We assessed the management of patients with type 2 diabetes mellitus in the primary care setting, with respect to risk factors associated with CHD.

METHODS

Our study cohort comprised 328 patients with type 2 diabetes (52 patients with existing CHD were excluded) seen at the hospital's Diabetes Assessment Clinic during the period March 2004 – February 2005. Patients were referred by their general practitioners for a comprehensive diabetes assessment and to receive diabetes education.

At the clinic, details of all current medications were recorded, blood pressure was measured, and a venous blood sample drawn for fasting lipids and HbA_{1c} measurement. The 10-year absolute risk of CHD was calculated using the United Kingdom Prospective Diabetes Study (UKPDS) risk engine equation,[7] which incorporates nine variables: age at diagnosis, duration of diabetes, sex, ethnicity, smoking status, systolic blood pressure, HbA_{1c} level, and total cholesterol and high-density lipoprotein cholesterol levels. The UKPDS equation is not valid for patients with existing CHD. A summary of the assessment, highlighting non-attainment of RACGP target thresholds,[6] as well as suggestions for treatment change, was mailed to the GPs.

Statistical analyses were performed using SPSS, version 14.0 (SPSS Inc, Chicago, Ill, USA).

RESULTS

The final cohort comprised 52% women and had a mean age of 58.3 years (95% CI, 57.5–59.1); body mass index (BMI) of 31.1 kg/m^2 (95% CI, 30.4–31.9) (52% were obese); and duration of diabetes of 5.5 years (95% CI, 5.0–6.1). The respective group means for HbA_{1c}, systolic blood pressure, and total cholesterol level were 7.4% (95% CI, 7.3%–7.4%), 139 mmHg (95% CI, 137–142), and 5.0 mmol/L (95% CI, 4.9–5.1). Among the cohort patients, 42%, 61% and 43%, respectively, were receiving medication to control glycaemia, blood pressure and cholesterolaemia. Ten per cent of all patients were using insulin. The proportions of patients achieving RACGP target values[6] for HbA_{1c}, blood pressure and total cholesterol were 46%, 29% and 15%, respectively, while 78% were non-smokers. Only 2% of patients attained all these four targets, while 6% attained none. Patients following a diet and/or lifestyle schedule were 3.9 times

Characteristics of patients with type 2 diabetes in three different surveys (the AusDiab Study[17] is considered to have the most representative patient group). Data are proportion of patients (95% CI)

Characteristics	AusDiab ($n = 439$)	Our study ($n = 328$)	Bryant et al[21] ($n = 509$)
Diet-only therapy	31.9% (27.7%–36.4%)	42.0% (36.7%–47.3%)	12.0% (9.4%–15.1%)
HbA_{1C} level < 7%	57.0% (52.3%–61.5%)	45.9% (40.6%–51.3%)	30.1% (26.2%–34.2%)
Taking blood pressure-lowering drugs	43.0% (38.5%–47.7%)	60.8% (55.4%–65.9%)	70.9% (66.8%–74.7%)
Systolic blood pressure < 130/80 mmHg	18.9% (15.5%–22.8%)	28.9% (24.2%–34.0%)	26.9% (23.2%–30.9%)
Taking lipid-lowering drugs	36.0% (31.6%–40.6%)	43.0% (37.7%–48.4%)	53.0% (48.7%–57.3%)

HbA_{1C} = glycated haemoglobin. ◆

more likely to have an HbA_{1c} level < 7.0% than those taking hypoglycaemic medication (95% CI, 2.5–6.3; $P < 0.001$). In contrast, patients treated with cholesterol-lowering drugs were 5.2 times more likely than untreated patients to have a total cholesterol level < 4 mmol/L (95% CI, 2.6–10.4; $P < 0.001$). There was no significant difference between those taking or not taking antihypertensive medication with respect to achieving a blood pressure level < 130/80 mmHg (odds ratio [OR], 1.3; 95% CI, 0.8–2.2; $P > 0.1$).

The mean 10-year absolute risk of CHD was 16.8% (95% CI, 15.7%–17.9%), and 48% of patients had a 10-year absolute risk of > 15%. The rates of aspirin, statin and ACE inhibitor use by the low- and high-risk patients (defined by a 10-year absolute risk 15% threshold) were 36% v 39% (OR, 1.1; 95% CI, 0.7–1.8; $P = 0.7$); 47% v 39% (OR, 0.7; 95% CI, 0.5–1.1; $P = 0.15$); and 44% v 53% (OR, 1.4; 95% CI, 0.9–2.2; $P = 0.13$), respectively. If each of the four risk factors were lowered within the patient group to achieve the respective targets, then the mean 10-year absolute risk of CHD would decrease to 12.6% (95% CI, 11.8%–13.4%); that is, 42 CHD events would be prevented per 1000 patients, or there would be a 4.2% absolute risk reduction in CHD events (25% relative risk reduction). Alternatively, focusing on individual risk factor reduction, achieving RACGP targets for total cholesterol, HbA_{1c}, blood pressure and smoking would theoretically decrease the likelihood of 10-year CHD events per 1000 patients by 22.5, 9.2, 4.0 and 9.8, respectively. The increased effect for total cholesterol reduction reflects the low number of patients with a total cholesterol level < 4.0 mmol/L.

DISCUSSION

Our study highlights that a majority of patients with type 2 diabetes managed in the primary care setting and referred to a diabetes clinic are not achieving RACGP recommended target thresholds for HbA_{1c}, blood pressure, and total cholesterol and may potentially benefit, in terms of a decreased 10-year risk of CHD, from clinically realisable interventions. For example, the UKPDS intensive arm achieved a 0.9% decrease in HbA_{1c} and a 10 mmHg reduction in systolic blood pressure level,[2,5] while the Heart Protection Study achieved a 1 mmol/L lowering in total cholesterol level using simvastatin.[11] However, it is known that glycaemic control progressively deteriorates with diabetes duration,[12,13] requiring increasingly aggressive antihyperglycaemic treatment. Accordingly, and consistent with other studies, we find that patients who are adhering to a diabetes diet have the lowest HbA_{1c} values, and insulin-treated patients the highest.[14-17] Intensive antihyperglycaemic treatment, though, has practical limitations, which relate to hypoglycaemia and, to a lesser extent, weight gain. For that reason, extensive debate persists about the appropriateness of strict HbA_{1c} target thresholds for individual patients.[18,19] In contrast, meeting total cholesterol target levels directly relates to the intensive use of cholesterol-lowering drugs, with the only limitations being adverse side effects and the economic cost when patients do not meet Pharmaceutical Benefits Scheme eligibility criteria.

We acknowledge that our findings are biased by both the geographical location and the referral characteristics of the GPs. However, recently published comparable Australian surveys[14,17,20-22] for patients with type 2 diabetes also contain similar biases, and do not exclude patients with pre-existing CHD. Only the AusDiab Study (1999–2000),[17] which identified 439 of 11 247 participants as having previously diagnosed type 2 diabetes, is a population-based survey. While the NEFRON study[22] contained the largest cohort ($n = 3893$) of patients with type 2 diabetes, and involved some 500 GPs throughout Australia, its exclusive focus was dyslipidaemia, and no data are reported concerning either type of treatment or the degree of hyperglycaemia. The Box compares variables between the AusDiab Study,[17] our study, and the study by Bryant et al[21] ($n = 509$) (which contained the most important variables for direct comparison with the AusDiab and our studies). If we accept that the AusDiab Study[17] has the most representative random diabetes cohort, then the characteristics of our study are more comparable, particularly for diet-only treatment and HbA_{1c} < 7.0%, than those reported by Bryant et al.[21] Two previous publications, by Ackermann and Mitchell[20] and Thomas and Nestel[22] also reported CHD risk estimates using the same UKPDS risk equation. Ackermann and Mitchell, however, only reported the 5-year absolute risk estimates, so any direct comparison is not possible.[20] Thomas and Nestel showed that about 56% of patients not receiving lipid-lowering treatment have a 10-year absolute risk of CHD > 15%, quite similar to our finding of 52% of patients.[22]

In the main, and unaddressed by previous studies, our estimates of the 10-year risk of CHD reveal that primary CHD prevention for patients with type 2 diabetes in the primary care setting, dependent on the use of aspirin, statins and ACE inhibitors, is essentially unstructured. In particular, patients at the highest predicted risk of CHD are not preferentially targeted for aspirin, statin or ACE inhibitor treatment. For statins, there is even a tendency to target patients in the lowest CHD risk category. This represents a significant predicament, as the maximum likelihood of reducing CHD events is to treat high-risk patients with lipid-lowering drugs.

The results of our study and previous studies[12-17,20-22] reiterate that target goals, like those recommended by the RACGP[6] for patients with type 2 diabetes, are not being

achieved. This unsatisfactory management outcome is inevitably framed in terms of patient compliance and adherence. Recent discourses,[23,24] however, have highlighted that the nature of the compliance–adherence issue is complex and does not simply reflect on the patient, but also on the diabetic specialist and the GP and their connectivity. Accordingly, for patients with type 2 diabetes, meeting target goals will require new initiatives focusing on patients and their doctors, as well as the clinical and community environment.

COMPETING INTERESTS

Patrick Phillips has received research and travel grants for clinical meetings, clinical trials and consultancy from various companies, including AstraZeneca, GlaxoSmithKline, Janssen–Cilag, Merck Sharpe & Dohme, Novo Nordisk, Parke Davis, Roche, Sanofi–Aventis and Solvay.

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