# The Oxford Risk Engine: A Cardiovascular Risk Calculator for Individuals with or without Type 2 Diabetes

Ruth L. Coleman, Richard J. Stevens, Rury R. Holman

Most cardiovascular risk calculators and charts use Framingham equations to estimate cardiovascular disease (CVD) risk. These work well in the general population but often underestimate the higher CVD risks seen in type 2 diabetes. Although the Framingham equations were created using data from 5573 individuals followed for 12 years, only 337 were known to have diabetes. The UK Prospective Diabetes Study (UKPDS) Risk Engine is a diabetes-specific risk calculator which uses data from 3,465 UKPDS patients with over 22,000 person years of follow-up. It includes duration of diagnosed diabetes and HbA1c as well as traditional CVD risk factors. Designed to estimate coronary heart disease risk and stroke risk separately, we have derived new equations that estimate CVD risk directly (defined as first occurrence of fatal or non-fatal myocardial infarction, sudden cardiac death, other ischaemic heart disease, fatal or non-fatal stroke, or fatal peripheral vascular disease). These have been validated externally using Collaborative Atorvastatin Diabetes Study (CARDS) data. For ease of use in everyday clinical practice, we have produced the Oxford Risk Engine which incorporates both the Framingham CVD risk equations and the UKPDS CVD risk equations in a single risk calculator that estimates CVD risk in subjects with or without type 2 diabetes. To illustrate the importance of using a diabetes-specific risk calculator when appropriate, we used the Framingham equations to estimate ten-year CVD risk for a hypothetical 50 year old, white Caucasian, non-smoking, non-diabetic male with blood pressure 145/85 mmHg, total cholesterol 5.2 mM and HDL cholesterol 1.1 mM as 13.8%. His corresponding ten-year CVD risk, estimated using the UKPDS risk equations and assuming he has type 2 diabetes with an HbA1c of 8.5%, is almost doubled at 24.2%. The Oxford Risk Engine runs on a range of computing platforms including Windows, Mac OS, Palm OS and Windows CE as a standalone application. The Oxford Risk Engine can aid cardiovascular disease management by providing accurate CVD risk estimations for people with or without diabetes in a single user-friendly calculator.