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Assessing the relationship between improved life expectancy due to better cardiovascular risk factor management and the likelihood of microvascular complications in type 2 diabetes mellitus

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Introduction

- Type 2 diabetes mellitus (T2DM) is a chronic disease associated with increased risk of cardiovascular disease (CVD) and microvascular complications. Initiatives to prevent and treat CVD have resulted in a reduction in event rates observed in clinical practice in recent years; owever, significant levels of clinical inertia persist with respect to the management of hyperglycemia [1].
- The IMS CORE diabetes model has recently been validated to a large number of macro vascular and microvascular endpoints reported in recent major outcomes trials and been shown to have good predictive validity [2].
- A UK costing study reported that 34% and 23% of the £9.8bn annual direct healthcare expenditure were related to managing CVD and micro vascular complications respectively [3]
- Given the significant burden of microvascular disease to both the patient and health care system the objective of this study was to better understand the relationship between increased life expectancy, due to a reduction in CVD morbidity and mortality, and the incidence of microvascular complications for a range of glycemic control levels.

Methods

- For this this study we undertook a lifetime analysis using the CORE diabetes model (CDM) [4], Figure 1.
- Newly diagnosed T2DM simulated patients with a UKPDS baseline profile were generated: aged 52 years at baseline with HbA1c 7.1%, SBP 135.1 mmHg, total cholesterol:HDL 5.2 mmol/l were modeled. The progression of risk factors over time was modeled using the CDM's standard settings, based on the UKPDS 68 risk factor panel equations [5].
- The impact of HbA1c on microvascular complications was first assessed by running the CDM with baseline HbA1c +1% (Scenario 1) versus baseline HbA1c -1% (Scenario 2) over a 50 year time horizon assuming 0% CV risk factor management.
- We then explored the impact of increasing the percentage of the population with CV risk factor management from 0% to 100% to calculate any increase in microvascular complications.

Results

- Improved CV risk factor management reduced the predicted cumulative incidence of fatal myocardial infarction (MI) from 27% to 18%, increasing life expectancy by an average of 2 years.
- For scenario 1 (baseline HbA1c +1%) highest cumulative incidence of complications was associated with neuropathy, recurrent ulcers and micro albuminuria; these were 65.3%, 50.5% and 30.4% respectively; for scenario 2 (baseline HbA1c -1%) the cumulative incidence of neuropathy, recurrent ulcers and micro albuminuria reduced to 39.7%%, 25.7% and 14.9% respectively.
- Figure 2 reports the cumulative incidence of complications across all microvascular complications for scenario 1 and 2.
- Figure 3 illustrates the increase in microvascular complications expected as a consequence of improved cardiovascular risk factor management assuming a baseline HbA1c of 7.1%.
- The greatest increase in microvascular endpoints was expected for recurrent ulcers (35.4% versus 41.7%) and microalbuminuria (21.4% versus 28.8%). Across all endpoint, except background diabetic retinopathy, improved CV risk factor management was associated with increase in the cumulative incidence of microvascular complications.

Conclusions

- This modeling study suggests that improvements in blood pressure and cholesterol management may result in increased rates of microvascular complications, in particular renal disease and recurrent ulcers, over the long term as patient survival increases.
- Treatment strategies to optimize blood glucose control are crucial to ensuring that microvascular complications are minimized in type 2 diabetes.

Figure 1) Flow diagram of the CORE Diabetes Model

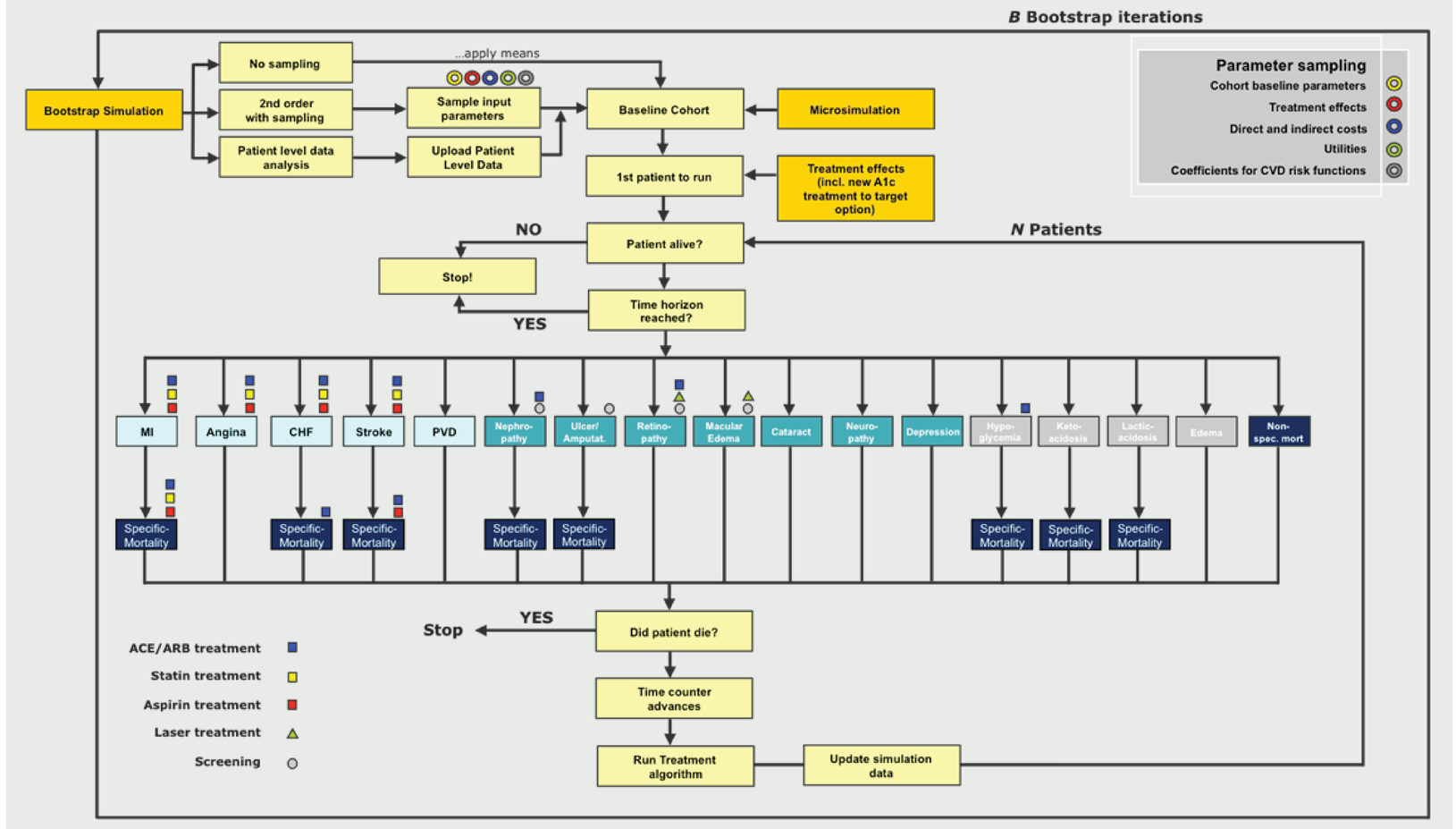
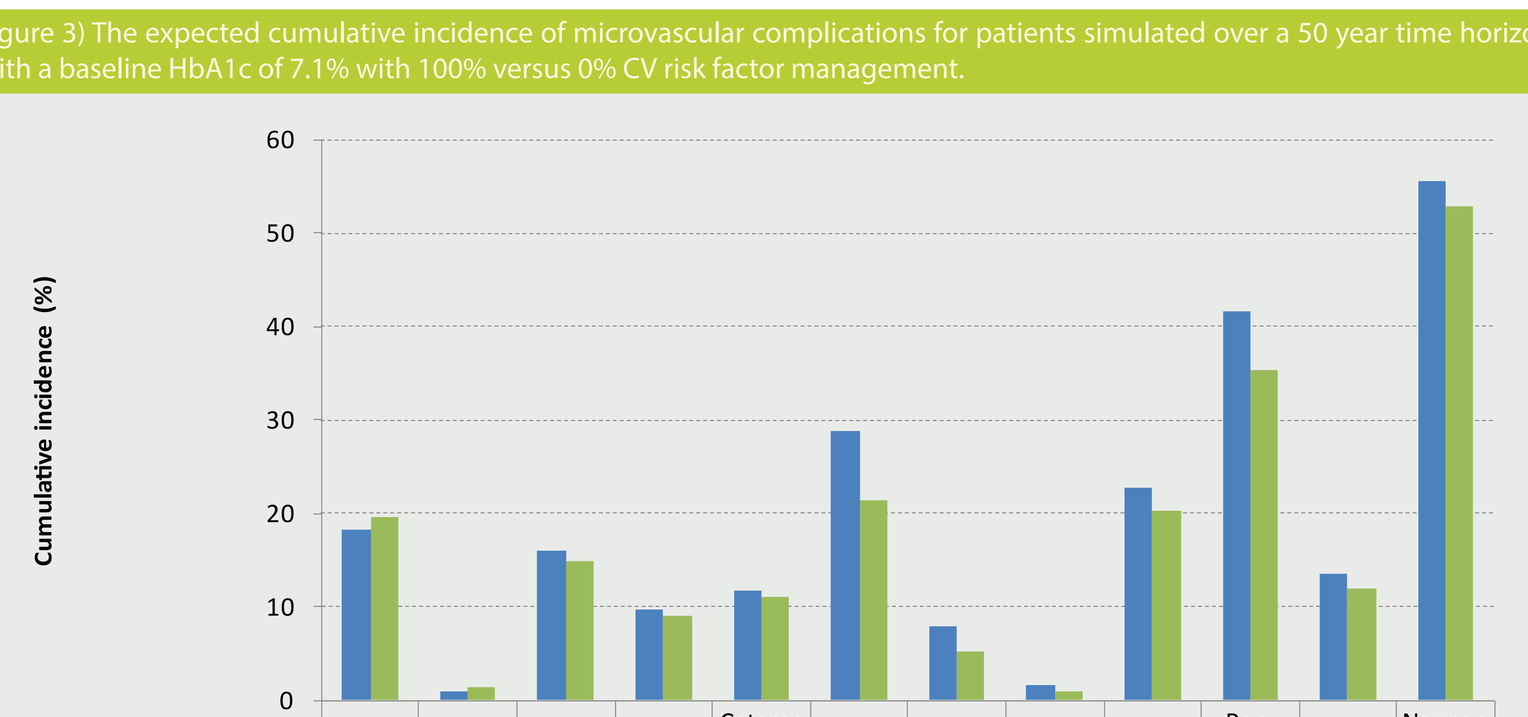


Figure 2) The expected cumulative incidence of microvascular complications for patients simulated over a 50 year time horizon with a baseline HbA1c of 7.1% +/- 1%

Figure 3) The expected cumulative incidence of microvascular complications for patients simulated over a 50 year time horizon with a baseline HbA1c of 7.1% with 100% versus 0% CV risk factor management.



	BDR	PDR	ME	SVL	Cataract	MA	GRP	ESRD	Ulcer	Rec. ulcer	Amp.	Neurop.
100% CV Management	18.349	0.974	16.012	9.656	11.752	28.756	7.843	1.726	22.752	41.716	13.586	55.576
0% CV Management	19.582	1.38	14.852	9.048	11.156	21.409	5.136	1.022	20.368	35.352	12.032	52.799

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