Research Poster Session 3, Diabetes/Endocrine/Metabolic Disorders, PDB19

The Bias of Ignoring Cardioprotective Effects in Cost-Effectiveness Analysis in Type 2 Diabetes

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Background

- People with type 2 diabetes have an increased risk of cardiovascular disease and mortality.
- Newer classes of diabetes drugs, e.g. SGLT-2 inhibitors and GLP-1 agonists, may have direct cardioprotective effects [1].
- The cardioprotective effects are not fully captured by risk equations which are traditionally used in economic modelling of type 2 diabetes [2].
- **Objective:** To investigate the bias of ignoring cardioprotective effects in cost-effectiveness analysis.

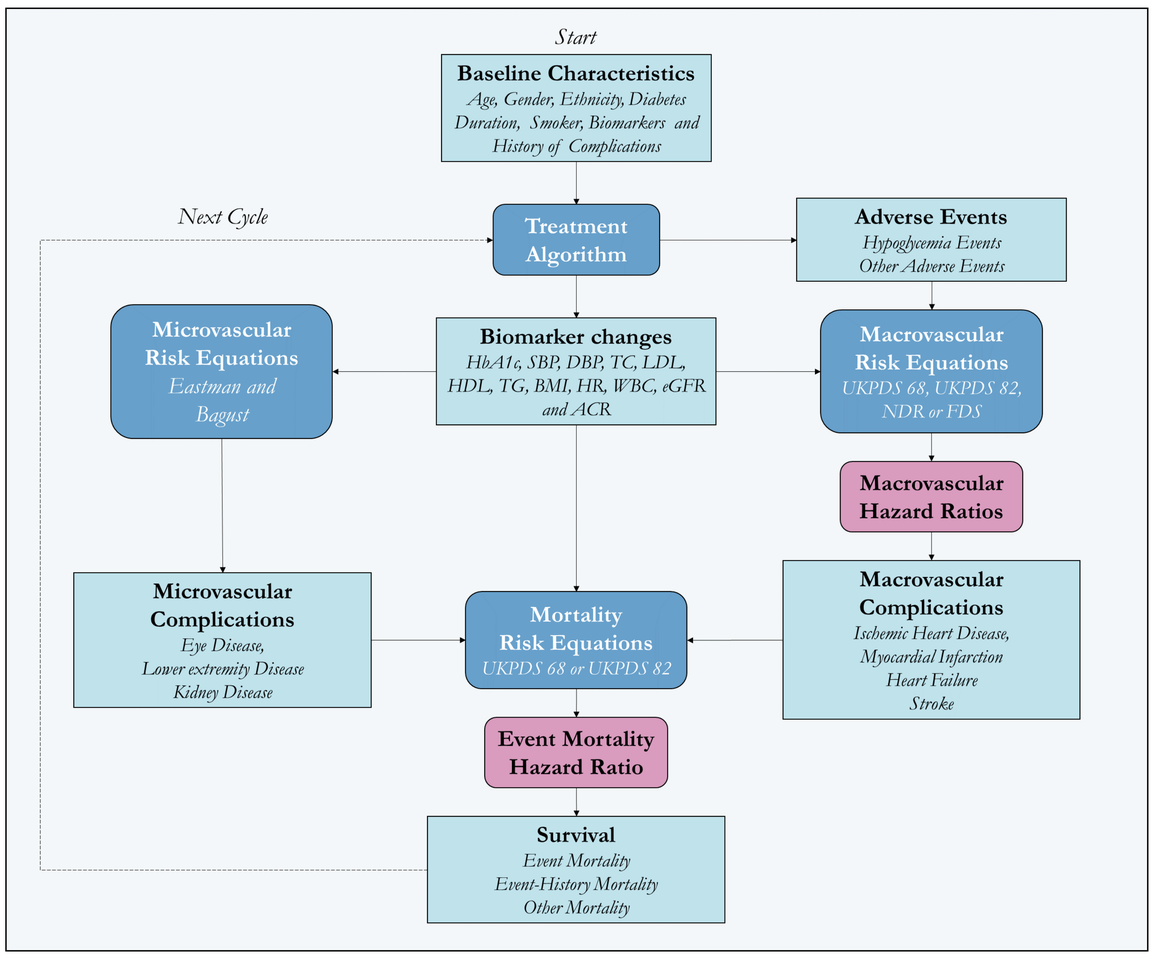

Figure 1. Model Schematic

Conclusion

- Health-economic modelling without explicitly accounting for cardioprotective effects substantially underestimates clinical and health-economic benefits.
- The largest underestimation was seen for Cardiovascular Mortality, implying a larger bias for the mortality risk equations than the macrovascular risk equations.
- Inclusion of cardioprotective effects may have considerable impact on cost-effectiveness results as well as reimbursement decisions.

Methods

- The IHE Diabetes Cohort Model (Figure 1) was used to simulate a hypothetical intervention with and without cardioprotective effects, as compared to standard of care.
- The model has been thoroughly validated, both internally and externally [3], and has been used by reimbursement authorities in several countries.
- The intervention, excluding cardioprotection, as well as standard of care were simulated using risk equations from the United Kingdom Protective Diabetes Study (UKPDS) [4].
- The intervention, including cardioprotection, was then simulated by applying a new model feature of hazard ratios (HRs) for the risks of Cardiovascular Mortality, Heart Failure and Myocardial Infarction.
- Baseline patient characteristics, treatment effects and hazard ratios were sourced from a recent cardiovascular outcomes trial [5]. The HRs were taken directly from the trial, which may overestimate the cardioprotective effects, as these are partially captured by the risk equations.
- Costs and utility weights were mainly sourced from the UKPDS [6-7], all costs were inflated to £2018 values. Simulations used a discount rate of 3.5% and a time frame of 40 years.

Results

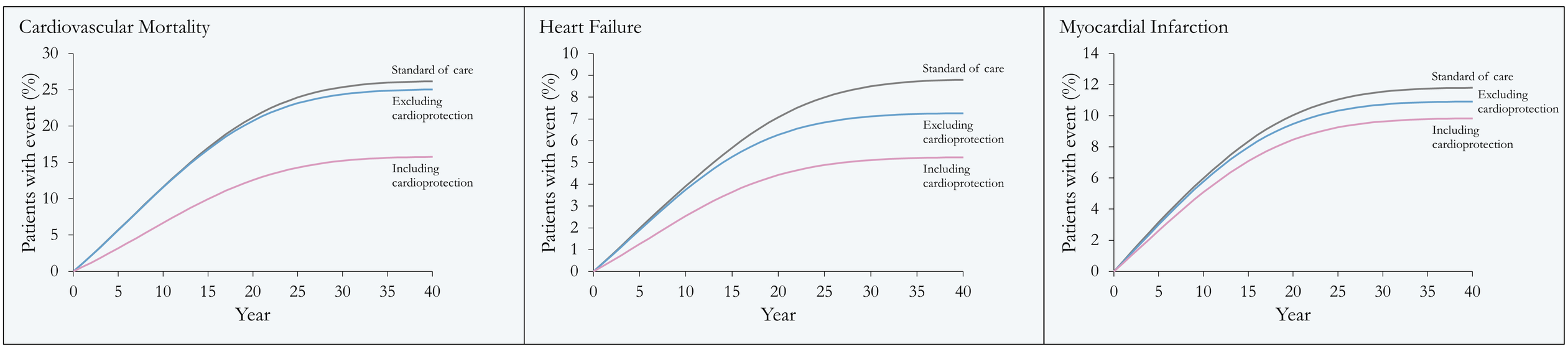

Figure 2. Cumulative incidence of Cardiovascular Mortality, Heart Failure and Myocardial Infarction

- The intervention, excluding cardioprotection, decreased the cumulative incidences by 1.1% for Cardiovascular Mortality, 1.5% for Heart Failure and 0.9% for Myocardial Infarction, compared to standard of care (Figure 2).
- The intervention, including cardioprotection, decreased the cumulative incidences by 10.4, 3.6%, 2.0% for Cardiovascular Mortality, Heart Failure and Myocardial Infarction, respectively.
- Inclusion of cardioprotective effects lead to additional health gains of 0.341 QALYs while costs increased by £2,992 due to increased survival (Table 1).
- The incremental cost-effectiveness ratio (ICER) decreased from £36,426 to £16,373 per QALY when the cardioprotective effects were included.

Table 1. Cost-effectiveness results

	Absolute			Increment vs. standard of care	
		Intervention		Intervention	
	Standard of care	Excluding cardioprotection	Including cardioprotection	Excluding cardioprotection	Including cardioprotection
QALYs	**6.485**	**6.614**	**6.956**	**0.130**	**0.471**
Total Cost (£)	**37,403**	**42,123**	**45,115**	**4,720**	**7,712**
- Treatment	1,107	6,425	6,789	5,317	5,682
- Iscemic Heart Disease	2,877	2,749	2,934	-128	57
- Myocardial infarction	6,267	6,244	6,560	-23	293
- Stroke	3,563	3,458	3,805	-105	242
- Heart Failure	2,210	2,137	2,027	-73	-183
- Microvascular Complications	21,379	21,111	23,000	-268	1,621
ICER				**36,426**	**16,373**

References

1. Cefalu WT, et al. Diabetes care. 2018;41(1):14-31. 2. Kuo, Shihchen et al. Diabetes Research and Clinical Practice, Volume 141,181-189. 3. Lundqvist, A. PLoS ONE 9(10):e110235. 4. Hayes, A.J., Leal, J., Gray, A.M. et al. Diabetologia (2013) 56: 1925. 5. Zinman et al. N Engl J Med 2015:373:2117-2128. 6. Alva et al. Diabetic medicine 2015;32(4):459-466. 7. Clarke et al. Medical decision making 2002;22(4):340-349.

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