Cost-Effectiveness of Intensive Versus Standard Hypertensive Therapy among Type 2 Diabetic Patients with Hypertension

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BACKGROUND

- More than two-thirds of patients with type 2 diabetes have high blood pressure (BP).[1,2]
- Comorbid hypertension and type 2 diabetes are linked to increased all-cause and cardiovascular mortality in U.S. adults.[3,4]
- In 2025, the BPROAD clinical trial showed that the incidence of major cardiovascular events was significantly lower with intensive treatment (a systolic BP goal <120 mm Hg) than with standard treatment (systolic BP <140 mm Hg).[5]

OBJECTIVE

- This study aimed to assess the cost-effectiveness of intensive vs standard therapy among hypertensive type 2 diabetic patients using a U.S. healthcare payer perspective.

METHODS

Study Design and Participants

- A Markov model, with event-free hypertension and type 2 Diabetes, myocardial infarction (MI), stroke, heart failure, and death states, was constructed and analyzed using TreeAge Pro 2025 (Figure 1).
- The model simulated a lifetime horizon with monthly cycles to estimate costs, quality-adjusted life years (QALYs), and the Incremental cost effectiveness ratio (ICER).

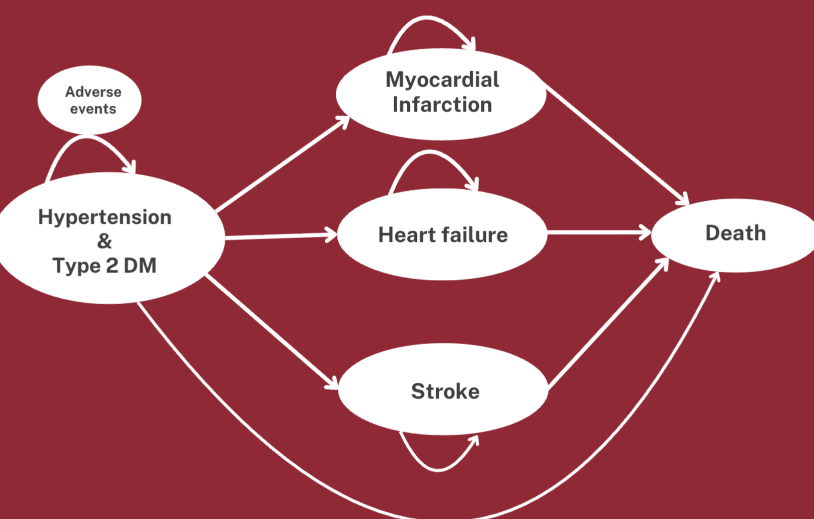

Figure 1: Markov Model

Model inputs and Sensetivity Analysis

- Model inputs were derived from the BPROAD trial and published literature. The model was then calibrated to match the trial's primary outcome across treatment arms (Figure 2).
- Lifetime direct medical costs were estimated for the simulated cohort, including the recurring annual expenditures, the costs associated with acute and long-term cardiovascular events, and adverse events.
- The overall health-related quality of life utility was assessed on a scale from 0 (death) to 1 (perfect health).
- One-way and probabilistic sensitivity analyses (10,000 Monte Carlo iterations) were conducted to assess parameter uncertainty and model robustness.

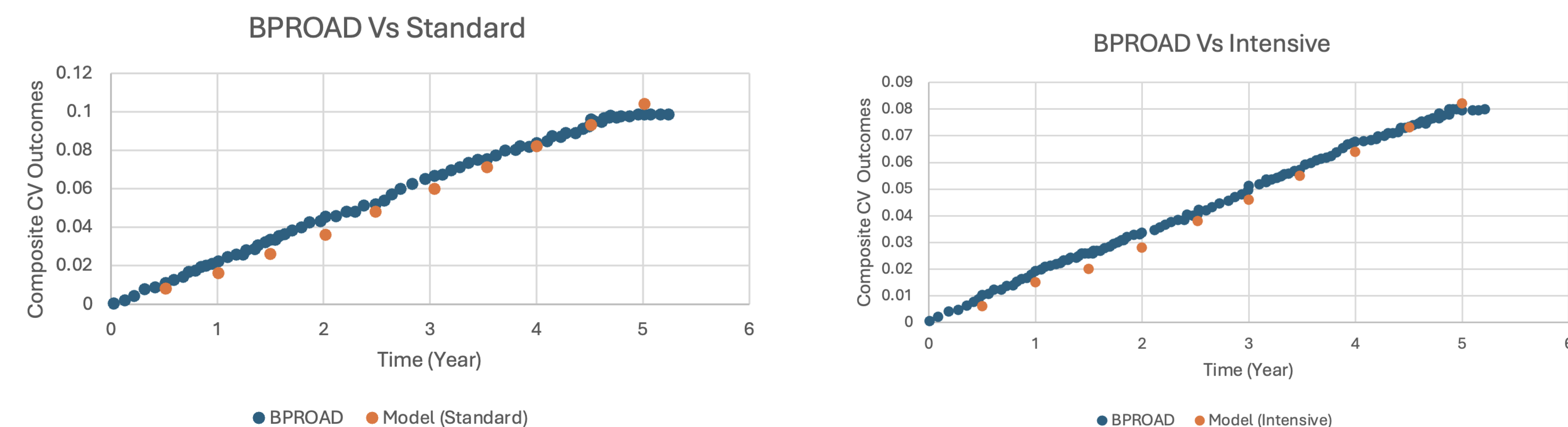

Figure 2: Model Calibrated Composite CV Outcomes Compared to BPROAD Trial

RESULTS

- At 5 years, patients in the standard treatment arm had higher event rates than patients in the intensive treatment arm for MI (3.1% vs 2.6%), stroke (2.1% vs 1.7%), heart failure (1.5% vs 1.0%), and all-cause death (6.6% vs 5.1%).
- In the base-case analysis, intensive treatment was associated with 15.19 life-years compared with 14.08 life-years for standard treatment, resulting in an incremental gain of 1.11 life-years.

Table 1: Lifetime Cost, QALY and ICER

Treatment group	Total		Incremental		ICER ($/QALY)
	Cost ($)	QALY	Cost ($)	QALY	
Standard	369,693	10.52	35,643	0.81	43,857
Intensive	405,336	11.33			

- The Probabilistic sensitivity analyses showed that intensive management was cost-effective in 100% of iterations at a willingness to pay threshold of $100,000/QALY (Figure 3).
- None of the 1-way sensitivity analyses yielded an ICER > $100,000/QALY, indicating that the cost-effectiveness results were robust to parameter uncertainty (Figure 4).

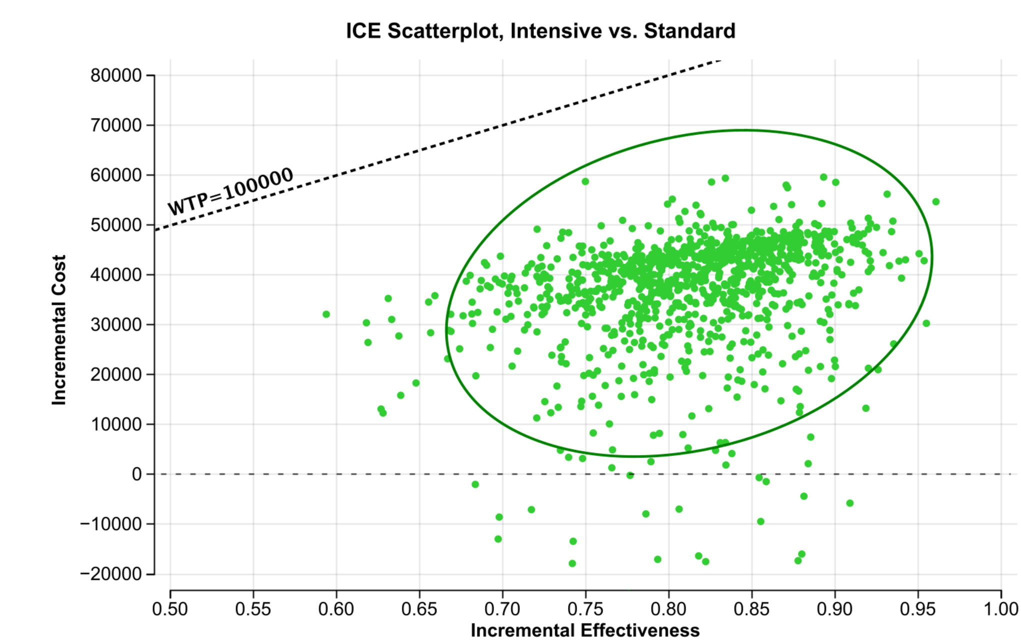

Figure 3: Sensitivity Analysis - Scatterplot

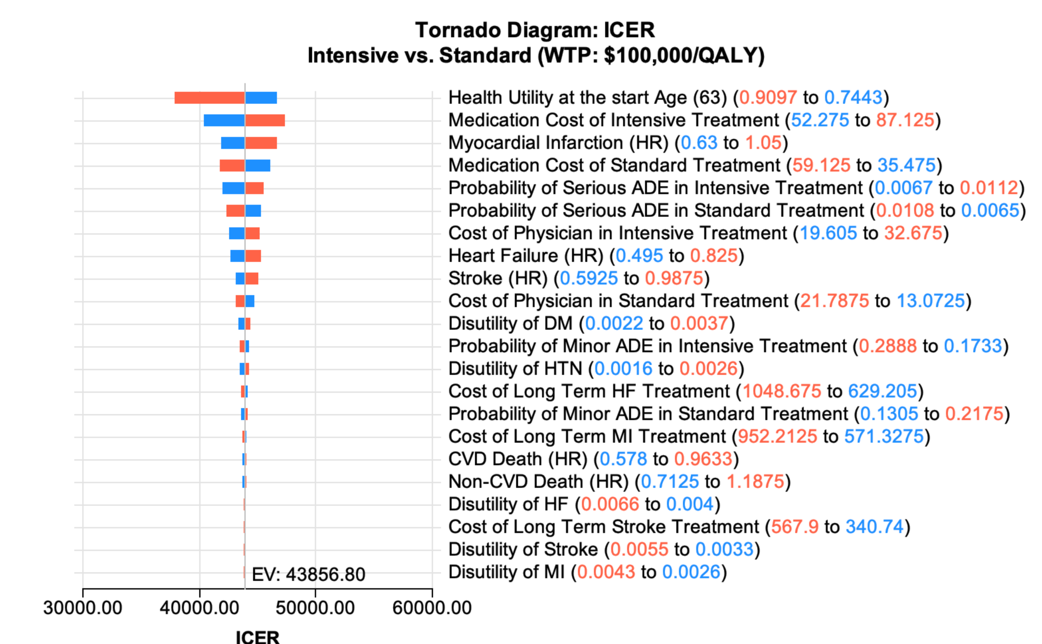

Figure 4 : Tornado Diagram of One-way Sensitivity Analysis

DISCUSSION & CONCLUSIONS

- Intensively managing hypertension of type 2 diabetics is expected to generate an additional 9.7 months of quality-adjusted survival and would be considered a cost-effective strategy at commonly accepted willingness to pay thresholds in the U.S.
- This is largely driven by the superior clinical effectiveness of intensive treatment in reducing the incidence of major cardiovascular events, resulting in reduced healthcare utilization and improved survival and quality adjusted survival.

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