Cost-Effectiveness of a Hypothetical Dementia Prevention Treatment for Stroke Survivors

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Background

- 1 million Canadians will be living with dementia by 2030 (Alzheimer Society, 2025)
- $40B in annual healthcare expenditures attributed to dementia in Canada (CANCEA, 2023)
- 9 hours of additional unpaid caregiving for those with dementia (CIHI, 2025)
- 1 year delay in dementia onset, reduces health expenditures by 10% (CANCEA, 2023)
- 2.6x higher risk of dementia in first year after stroke (Corraini et al., 2017)
- Post-stroke dementia incidence is severity-specific (Pendlebury & Rothwell, 2019)

Objective

We aimed to estimate the cost-effectiveness of a dementia prevention treatment, currently in early-stage clinical trials, for stroke survivors

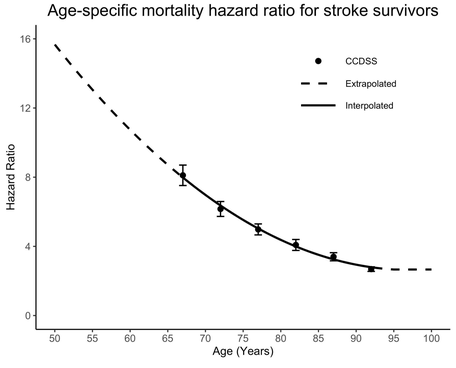
Objectives:
1. How dementia prevention affects overall age of dementia onset for stroke survivors
2. Identify stroke-severity cohorts with greatest benefit
3. Which combination of treatment effectiveness and costs are cost-effective

Methods

Developed a cost-utility Markov model in R with 739 health states, where the cohort transitioned in one-month time steps

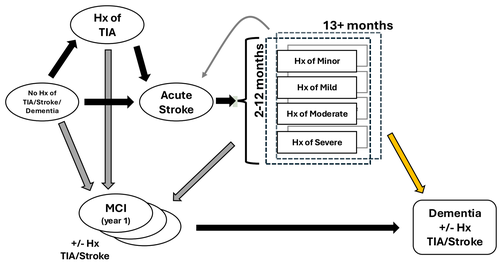
Age-specific parameters were smoothed with parametric curve fitting (Exponential, Quadratic, Cubic) to model progressive changes in rates, probabilities, and hazard ratios. If there was no good curve fit, we used a linear piecewise assumption.

Quadratic fit for hazard ratios for stroke mortality by age

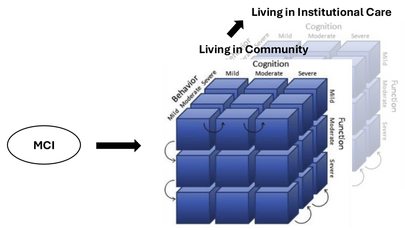


Model

- Monthly post-stroke tunnel states to capture post-stroke dementia incidence.
- Most dementia is facilitated through mild cognitive impairment (MCI); also a direct path from stroke to dementia (yellow arrow) to model the immediate on-set of dementia post-stroke.
- Annual MCI tunnel states to capture time-dependent probability of transitioning to dementia.



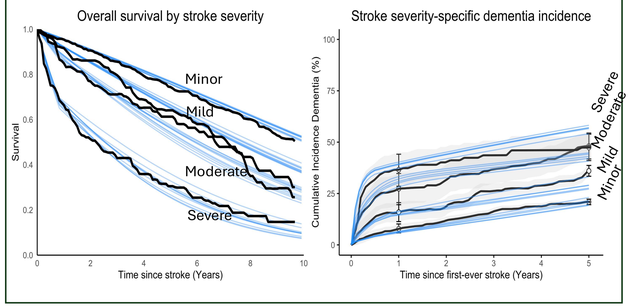
- Dementia component structure and parameterization relied on an open-source framework modelling the transition from MCI to dementia and the progression of dementia across three dimensions, with three levels of severity (Green et al., 2019)



Calibration

Parameters estimated via calibration
- Stroke-severity-specific mortality hazard ratios
- Dementia-severity-specific mortality hazard ratios
- Post-stroke dementia incidence.

Calibration targets
- Severity-specific stroke survival Kaplan-Meier
- Stroke-severity-specific dementia incidence curves



Results

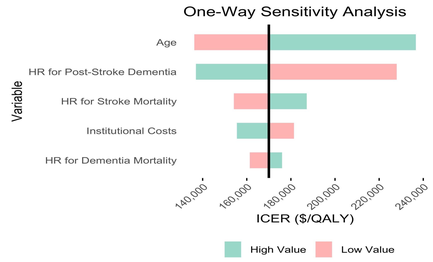
Cohort
- The cohort used for this study was a population of 70-year-old stroke survivors.

FINDING 1: At any level of treatment effectiveness, moderate stroke survivors have the greatest delay in dementia onset

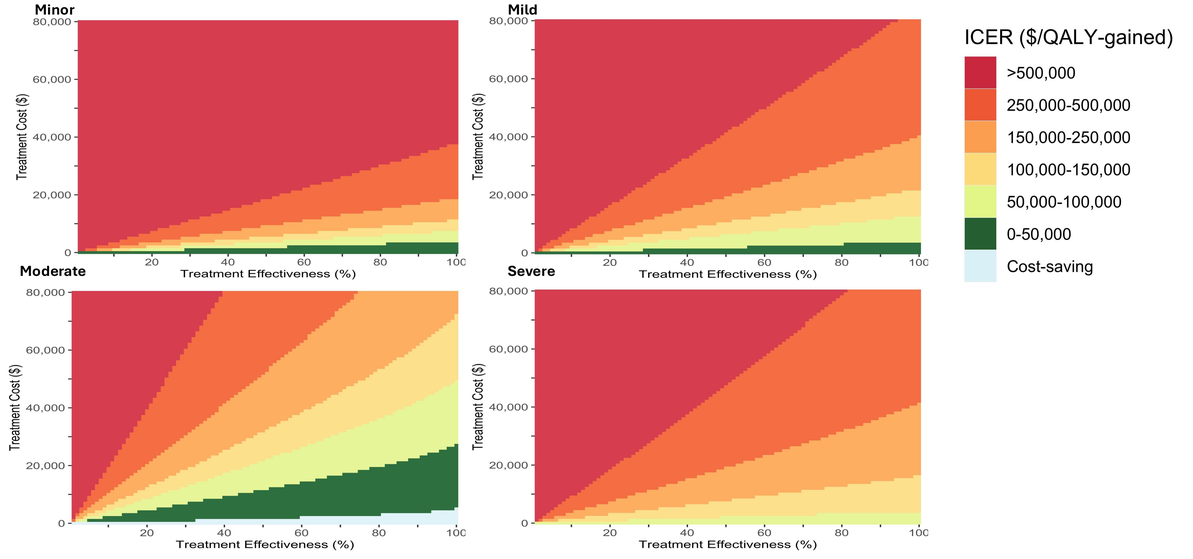
Delay in dementia onset (Years)

Stroke Severity	25% Effectiveness	50% Effectiveness	75% Effectiveness
Minor	0.12	0.25	0.38
Mild	0.51	1.06	1.70
Moderate	0.82	1.87	3.28
Severe	0.49	1.23	2.51

FINDING 2: At a specific treatment effectiveness (50% reduction in increased dementia risk) and cost ($35,775), ICER ($ per QALY gained) was sensitive to parameter uncertainty related to age, post-stroke dementia, mortality, and institutional costs



FINDING 3: At price points consistent with on-market biologics, dementia prevention therapeutic in post-stroke patients needs to be highly effective to be cost-effective from a health sector perspective.



Insights & Implications

- Even a modestly effective dementia prevention treatment (25-50% reduction in dementia incidence) can meaningfully delay dementia onset (~1 year).
- Region of efficacy and price where a novel therapeutic would be cost effective is largest for Moderate stroke survivors because of balance between incremental risk of post-stroke dementia, competing mortality risk (life-expectancy), and post-stroke quality of life
- Region of efficacy and price where a novel therapeutic would be cost effective is smaller for Minor and Mild stroke survivors (vs. Moderate) because the incremental risk of post-stroke dementia is lower
- Very small region of efficacy and price where novel therapeutic would be cost-effective for Severe stroke survivors because of short life expectancy (high competing mortality risk) and low post-stroke quality of life
- Societal perspective, especially the inclusion of unpaid caregiving, increased the region of price-efficacy combinations at which a novel therapeutic would be cost-effective

Conclusion

A novel therapeutic for dementia prevention in stroke survivors can be cost-effective.

Availability at total treatment price less than $10,000 will ensure that it is cost-effective in the majority of stroke survivors (Minor, Mild, and Moderate). More costly treatment will only be cost-effective in a small subset of Moderate stroke survivors.