

Introduction

- The Vertebrobasilar Flow Evaluation and Risk of Transient Ischemic Attack and Stroke (VERITAS) study demonstrated posterior circulation distal flow status, as determined by quantitative magnetic resonance angiography (qMRA), is a robust predictor of vertebrobasilar (VB) stroke risk in patients with symptomatic atherosclerotic VB disease.
- In this study we examined the cost-effectiveness of qMRA screening to identify patients who may benefit from submaximal angioplasty to restore VB flow.

Methods

- A Markov model (Figure 1) was created comparing a “no screening” strategy with medical management alone vs a “screening” strategy with qMRA imaging and submaximal angioplasty for treatable patients with low VB flow.
- A 30 year time horizon was modeled.
- Outcomes included the average number of quality-adjusted life years (QALY) and lifetime costs.
- Stroke, death rates were obtained from VERITAS, and disability rates and costs from VERITAS and the literature.

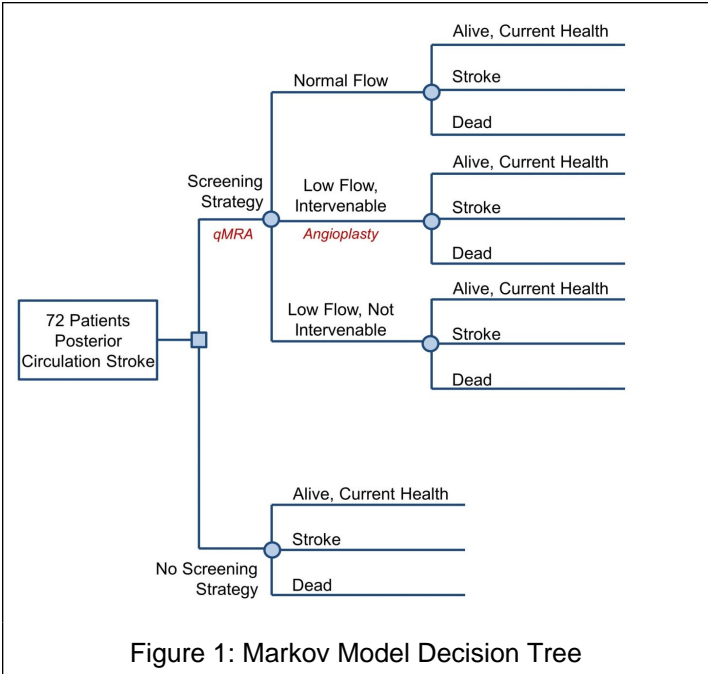


Figure 1: Markov Model Decision Tree

Results

- At a 6% periprocedural stroke risk, a QALY advantage was observed at the end of the first year, and economic savings at the end of year six for the screening strategy (Figure 2).
- At a 6% risk, the “screening” strategy saved an average of 0.364 QALYs per patient, and a lifetime cost savings of \$8,346 versus the “no screening” strategy.
- Amongst patients with low flow suitable for intervention, the benefit was substantially higher, averaging 1.485 QALYs saved and lifetime cost savings of \$28,017. The benefit of screening declined at higher periprocedural risk.

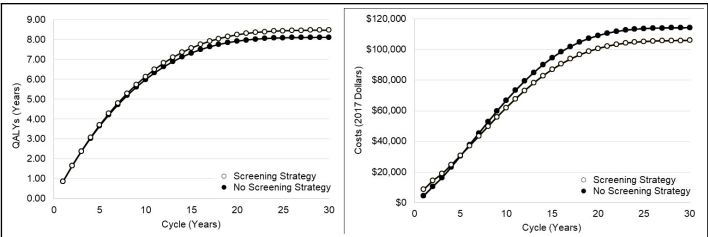


Figure 2: QALY, Lifetime Costs, Screening vs No Screening Strategies, 6% Event Rate.

- A sensitivity analysis was performed to identify patients who may benefit from qMRA screening and submaximal angioplasty at different life expectancies and periprocedural stroke rates (Table 1).
- The screening strategy generated a net gain in QALYs after only one year up to a 9% event rate, and a net gain after three years at the highest periprocedural stroke rate studied, 12%.
- Cost savings were identified as early as five years for event rates of 4% or less, and at latest seven years at the the 12% event rate.
- Using a \$50,000 per QALY threshold, the screening strategy was found to be cost-effective at life expectancies of four years or greater at a periprocedural event rate of 6% or less, and at five years for event rates from 7-12%.

Table 1: Benefit of Screening Strategy, All Patients: Sensitivity Analysis

		Time Horizon				
		2 years	5 years	10 years	20 years	30 years
Periprocedural Stroke Risk	6%	<b>+0.007y</b> <i>+\$3,781</i>	<b>+0.049y</b> <i>+\$300</i>	<b>+0.150y</b> <i>-\$4,771</i>	<b>+0.319y</b> <i>-\$8,464</i>	<b>+0.364y</b> <i>-\$8,346</i>
	9%	<b>+0.002y</b> <i>+\$4,089</i>	<b>+0.037y</b> <i>+\$760</i>	<b>+0.130y</b> <i>-\$4,214</i>	<b>+0.292y</b> <i>-\$7,921</i>	<b>+0.336y</b> <i>-\$7,818</i>
	12%	<i>-0.004y</i> <i>+\$4,396</i>	<b>+0.025y</b> <i>+\$1,220</i>	<b>+0.110y</b> <i>-\$3,656</i>	<b>+0.265y</b> <i>-\$7,378</i>	<b>+0.308y</b> <i>-\$7,290</i>

Values in **bold** represent gain of QALYs or cost savings in the screening strategy  
Values in *italics* represent loss of QALYs or economic costs in the screening strategy

Conclusions

- qMRA screening and submaximal angioplasty in suitable patients is cost-effective both in terms of QALY and lifetime costs for patients with symptomatic VB occlusive disease.
- With potential health and economic savings, a clinical trial examining the peri-procedural risk of submaximal angioplasty is warranted.

Learning Objectives

- By the conclusion of this session, participants should be able to:
  - 1) Describe the QALY and lifetime cost benefits of qMRA screening and submaximal angioplasty in patients with symptomatic VB occlusive disease.
  - 2) Identify if a specific patient with symptomatic VB occlusive disease may benefit from qMRA screening given their life expectancy and institutional peri-procedural angioplasty stroke risk.
  - 3) Recognize the utility of Markov computational models to evaluate the effectiveness of different treatment strategies.

References

Amin-Hanjani S, Pandey DK, Rose-Finnell L, Du X, Richardson D, Thulborn KR, et al. Effect of hemodynamics on stroke risk in symptomatic atherosclerotic vertebrobasilar occlusive disease. JAMA Neurol. 2016;73:178-185