

Cost-effectiveness of Precision Screening for Atrial Fibrillation: a Decision-Analytic Model

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Background & Aim

- Clinical guidelines recommend atrial fibrillation (AF) screening for people aged ≥ 65 years.
- Recent studies show that age-based screening has limited yield.
- Screening based on estimated AF risk may be more efficient.

Aim: To compare the clinical & cost-effectiveness of AF screening guided by age vs. novel risk-informed approaches

Results

Figure 1. Age-standardized Clinical Event Rates per 100,000 PY

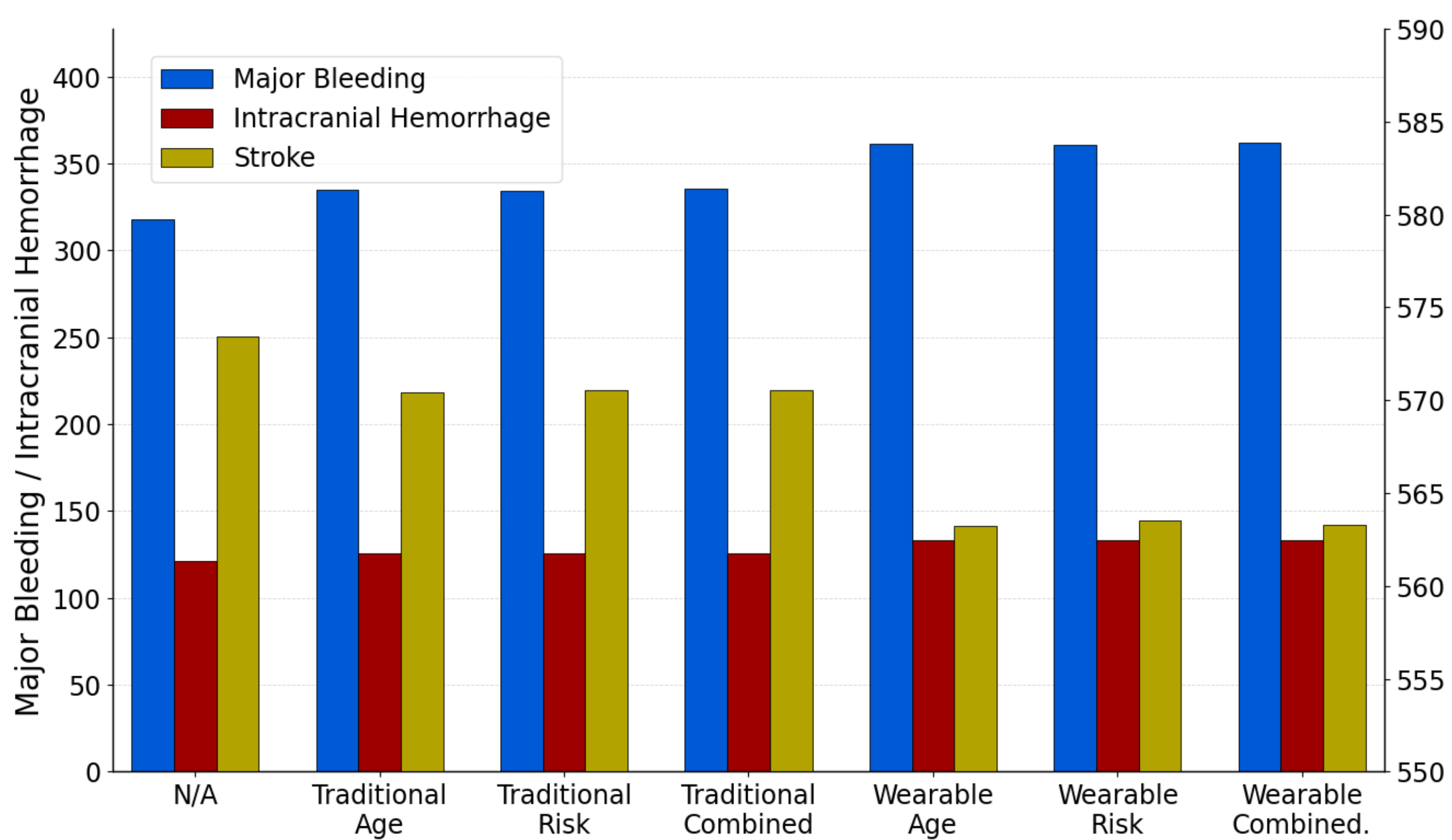


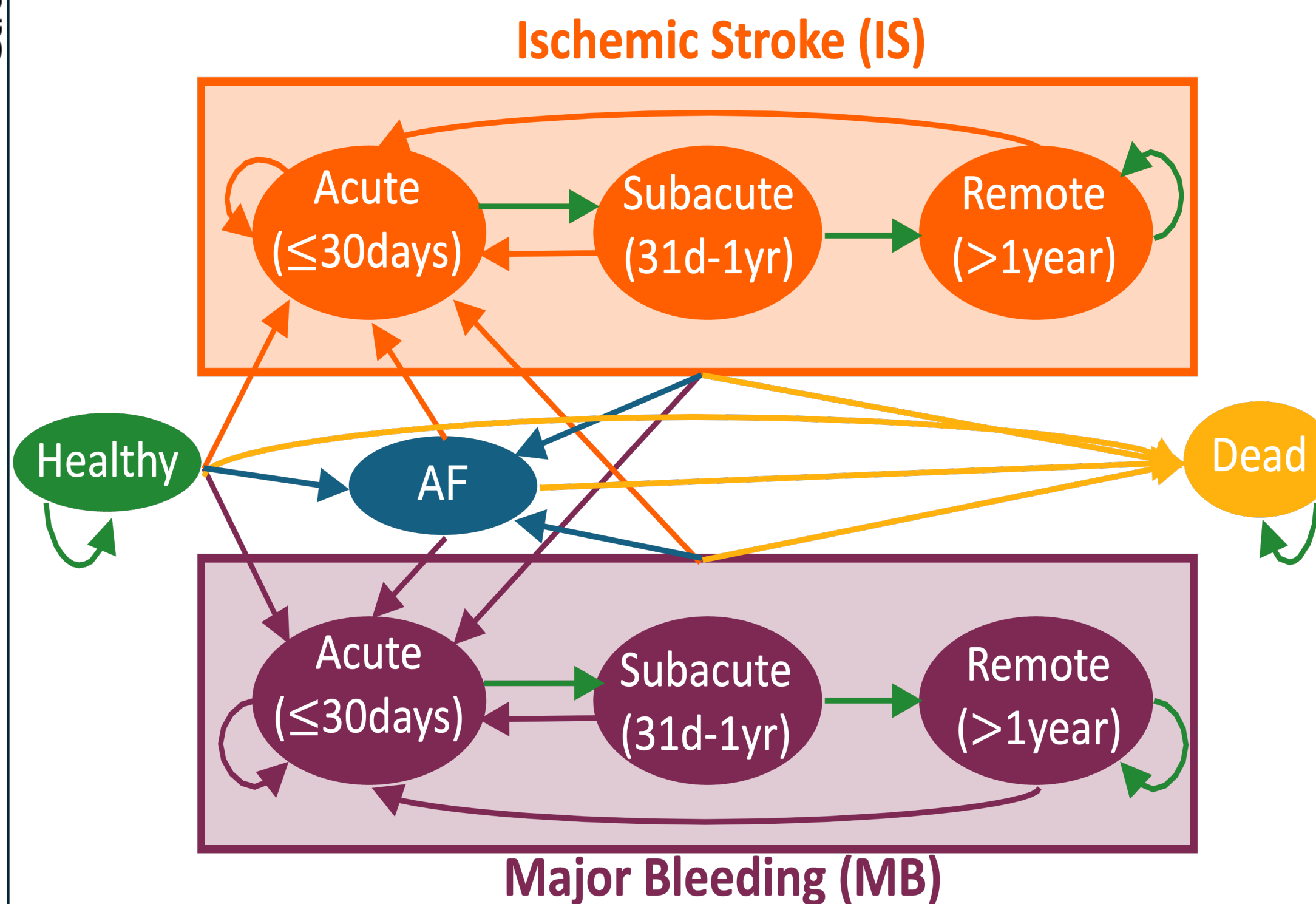
Table 1. Incremental Cost-Effectiveness Ratios (ICER)

Screening Pathway	Candidate Selection	Lifetime Costs, \$	QALYs	ICER
No Screening	No Screening	20,231	14.842	-
Traditional	Age	20,354	14.869	16,274 (vs. No Screening)
	Risk	20,663	14.869	Dominated (weak)
	Combined	20,715	14.871	Dominated (weak)
Wearable	Age	21,566	14.904	25,369 (vs. Traditional Age)
	Risk	21,604	14.904	Dominated (strong)
	Combined	21,694	14.906	95,533 (vs. Wearable Age)

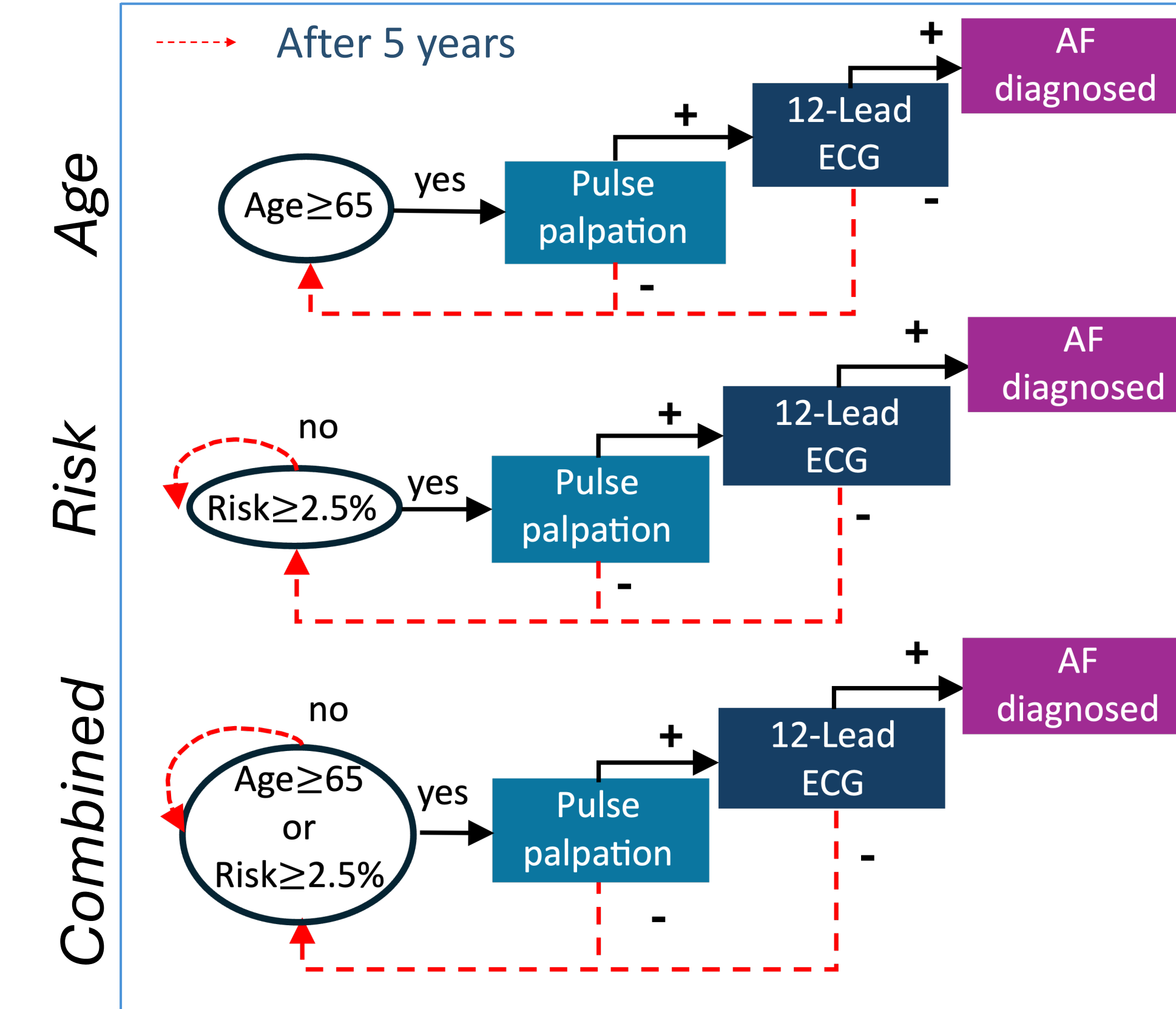
Methods

- Individual-level Multi-state Decision Analytic Model^{1,2}
- 30 million individuals aged 50 years
- Clinical Events:**
 - Stroke (IS) & Intracranial hemorrhage (ICH)
 - Bleeding & CHA₂DS₂-VASC risk factors
- 2 Screening Pathways:** Traditional vs. Wearable
- 3 Screening Candidate Selection Criteria:**
 - Age-guided:** individuals aged ≥ 65
 - Risk-guided:** individuals w/ 5-year risk $\geq 2.5\%$
 - CHARGE-AF score**
- Combined:** age + risk-guided
- Treatments: warfarin, DOAC (w/ or w/o aspirin)
- "Multiverse" screening modeling to minimize noise

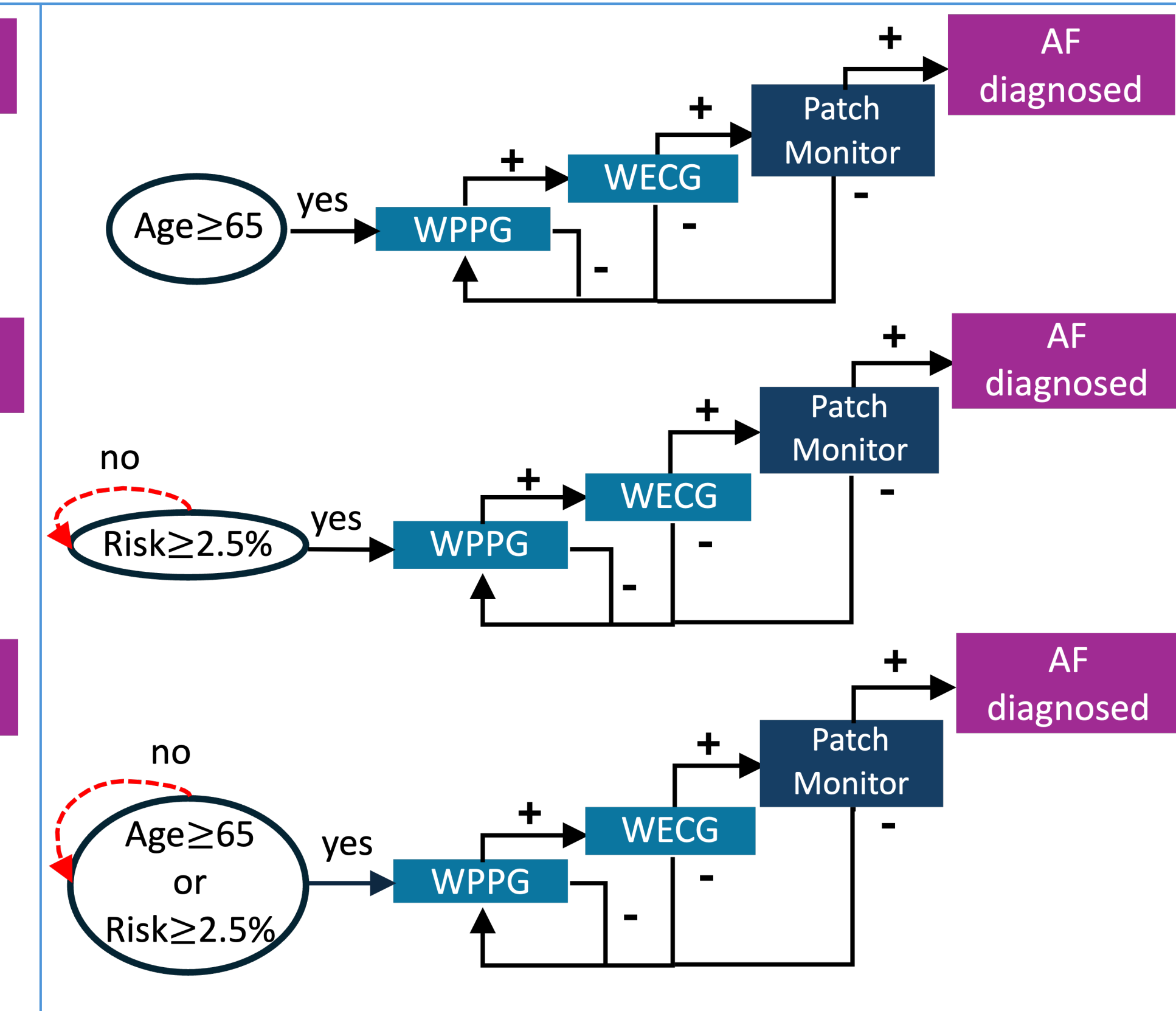
Clinical Event Model Schematic:



Discrete Traditional



Continuous Wearable



- Traditional:** Pulse palpation \rightarrow 12L ECG (electrocardiogram)
- Wearable:** Wearable PPG (photoplethysmography) \rightarrow Wearable 1L ECG \rightarrow Patch Monitor
- Risk Threshold = 2.5%;** Intermediate risk (2.5%-5%): 3-fold increased hazard for incident AF.³

"Multiverse" Screening Modeling – Example:

Screening Strategies	Month t	Month $t + 1$	Month $t + 2$	Month $t + 3$	Month $t + 4$...
No-Screening	No Event	Major Bleeding	Intermediate Stroke	Death	
Strategy A	No Event	Major Bleeding	Intermediate Stroke	Death	
Strategy B	No Event	Major Bleeding	No Event	No Event	No Event ...

AF detected (either True/False positive) is indicated by a green starburst at the transition from Month $t+2$ to Month $t+3$ in Strategy B.

Simulation persists until death or age 100 is indicated at the end of the timeline.

Table 2. Sensitivity Analysis: Age & AF Risk Threshold

Initial Age	AF Risk Threshold	Preferred Strategy	vs.
50	1%	Wearable Age	T-comb
50	5%	Wearable Age	W-Risk
65	1%	Wearable Combined	T-Age
65	2.5%	Wearable Combined	T-Age
65	5%	Wearable Age	W-Comb

Conclusion

- Combined (age and risk-based) wearable screening** was the most cost-effective strategy for individuals entering the model at age 50 years at a 5-year AF risk threshold of 2.5%.
- Variation in preferred strategies across initial age and AF risk thresholds highlights the **importance of tailoring precision AF screening** programs to target populations.
- Incorporating AF risk into wearable screening eligibility may support **value-based implementation** by concentrating monitoring on populations with higher expected clinical benefit.

References:

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