Is AF Screening Cost-effective?

Some facts and some new thoughts

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Outline

- The cost-effectiveness of AF Screening.
- Is it possible to find an optimal screening design?

Incremental cost-effectiveness ratio (ICER)

– expressed as cost per QALY gained.

$$\frac{\text{Cost}_{\text{intervention A}} - \text{Cost}_{\text{intervention B}}}{\text{Effectiveness}_{\text{intervention A}} - \text{Effectiveness}_{\text{intervention B}}}$$

The ICER of an AF screening program

– expressed as cost per QALY gained.

$$\frac{\text{Cost}_{\text{AF Screening}} - \text{Cost}_{\text{No Screening}}}{\text{QALY}_{\text{AF Screening}} - \text{QALY}_{\text{No Screening}}}$$

The threshold of £20,000-£30,000 that is suggested by NICE to be the limit for treatments to be cost-effective.

Summary of cost-effectiveness studies*

Study	Setting	Perspective	Study (Costs)	Screening	Findings*
Maeda 2004[26]	Primary care Japan	Societal	Cost-utility analysis (2001 USD)	Pulse palpation and ECG	Screening by pulse palpation and screening by ECG are both cost-effective (ICERs <€17,000/QALY)
Hobbs 2005[19]	Primary care UK	Health service	Cost-utility analysis (2003 STG)	Pulse palpation and ECG	Screening by opportunistic pulse palpation has a 60% chance of being cost-effective). Systematic ECG screening is not cost-effective.
Lowres 2014[27]	Community pharmacies Australia	Health service	Cost-utility analysis (2012 AUD)	ECG	ECG screening using a mobile phone attachment is cost effective (€3,311/QALY)
Rhys 2013[28]	Flu vaccination clinics UK	Health service	Cost-effectiveness analysis (2011 STG)	Pulse palpation	Cost per new case of AF diagnosed was €292
Aronsson 2015[29]	Primary care Sweden	Societal	Cost-utility analysis (2014 EUR)	ECG	Prolonged, intermittent ECG recording was cost-effective (ICER €5,097/QALY)

* All results have been converted to 2014 Irish € using the relevant consumer price index and purchasing power parity

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*HIQA. *Health technology assessment (HTA) of a national screening programme for atrial fibrillation in primary care*. 2015.

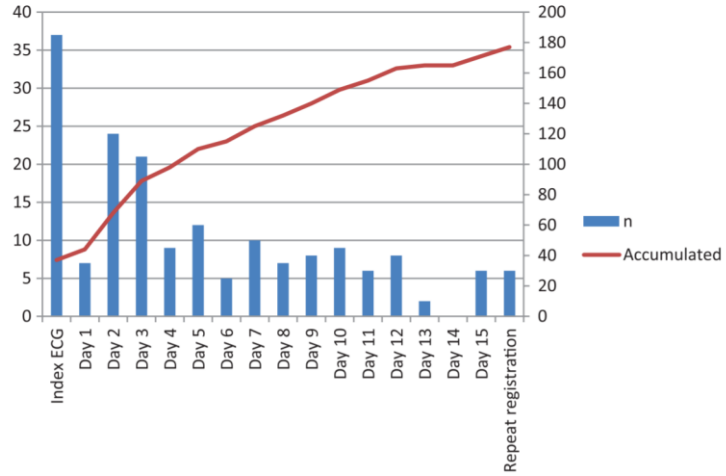
Why is AF-screening considered highly cost-effective?

- Stroke is a severe event associated with high;
    - Cost
    - Morbidity
    - Mortality
- Approximately 12 – 24% of all strokes are due to unknown AF*
- The stroke risk can be effectively reduced through oral anticoagulation treatment
- Most screening methods are relatively inexpensive

*Sposato, Lancet Neurol, 2015. **14**(4): p. 377-87.
Leyden, Stroke, 2013. **44**(5): p. 1226-31.

Cost-effectiveness estimation based on STROKESTOP

- 13 331 individuals aged 75/76 years invited to screening
- 53% participated
- 3% had previously unknown AF



Svennberg E, et al. Mass Screening for Untreated Atrial Fibrillation: The STROKESTOP Study. Circulation 2015; 131(25):2176-84.

Is population screening cost-effective?

Aim:

- Estimate the ICER of systematic mass screening for unknown AF

Method:

- Simulation model
- Based on STROKESTOP data
- Long-term costs and health effects from published literature

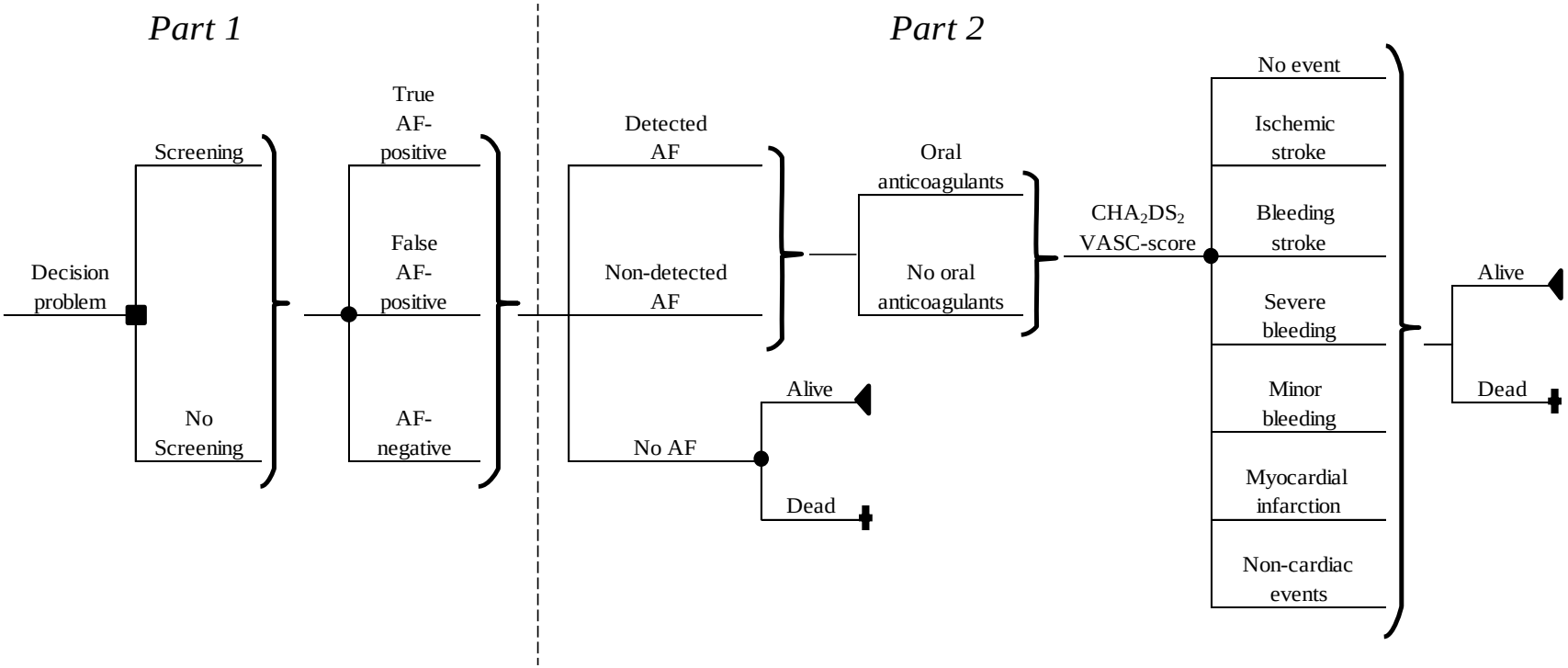
Aronsson, M., et al., *Cost-effectiveness of mass screening for untreated atrial fibrillation using intermittent ECG recording.* Europace, 2015. **17**(7): p. 1023-9.

Why are simulation models necessary?

- Time horizon
- Incorporate all evidence

Aronsson, M., et al., *Cost-effectiveness of mass screening for untreated atrial fibrillation using intermittent ECG recording.* Europace, 2015. **17**(7): p. 1023-9.

The Screening Simulation Model

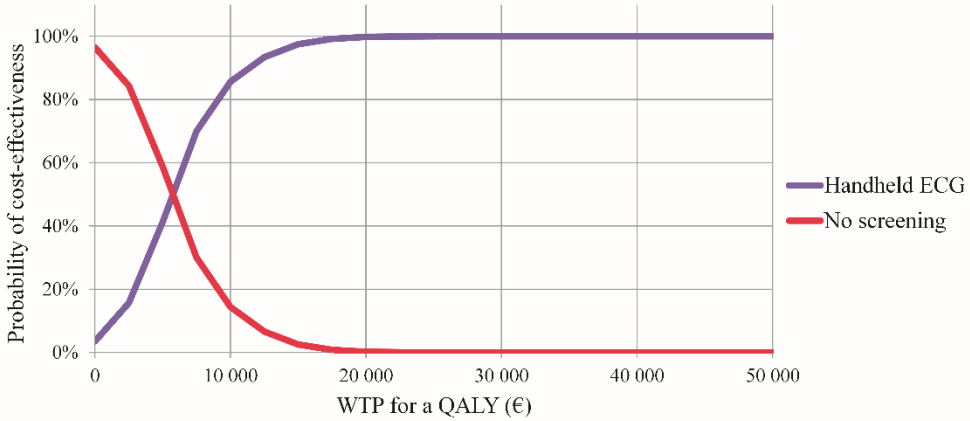


Aronsson, M., et al., *Cost-effectiveness of mass screening for untreated atrial fibrillation using intermittent ECG recording.* Europace, 2015. **17**(7): p. 1023-9.

Results of the simulation model screening 75 year olds

Per 1000 individuals:

- 8 fewer stroke
- 11 won life-years
- 12 gained QALYs
- Inc. cost of €50 012



<u>€4313 per gained QALY</u>

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Aronsson, M., et al., *Cost-effectiveness of mass screening for untreated atrial fibrillation using intermittent ECG recording.* Europace, 2015. **17**(7): p. 1023-9.

Policy design and optimization of the screening program

- STROKESTOP CE-study ’answers’ whether screening at 75 years is cost-effective.
- There is substantial a non-statistical uncertainty associated with its implementation.
- In particular, the question of optimal design of the screening program itself is a large source of uncertainty as a screening program may potentially be implemented in very different ways.
- Design issues concerns the timing of initiation of screening; whether screening should be repeated, and if so, at what time intervals.
- This vastly increases the number of possible screening program designs that have to be studied well beyond the reach of clinical studies, where normally only one, or a few, particular designs are studied.
- We have used computer simulations based on the scientific literature to suggest at which age screening for AF should be initiated and whether it should be repeated.

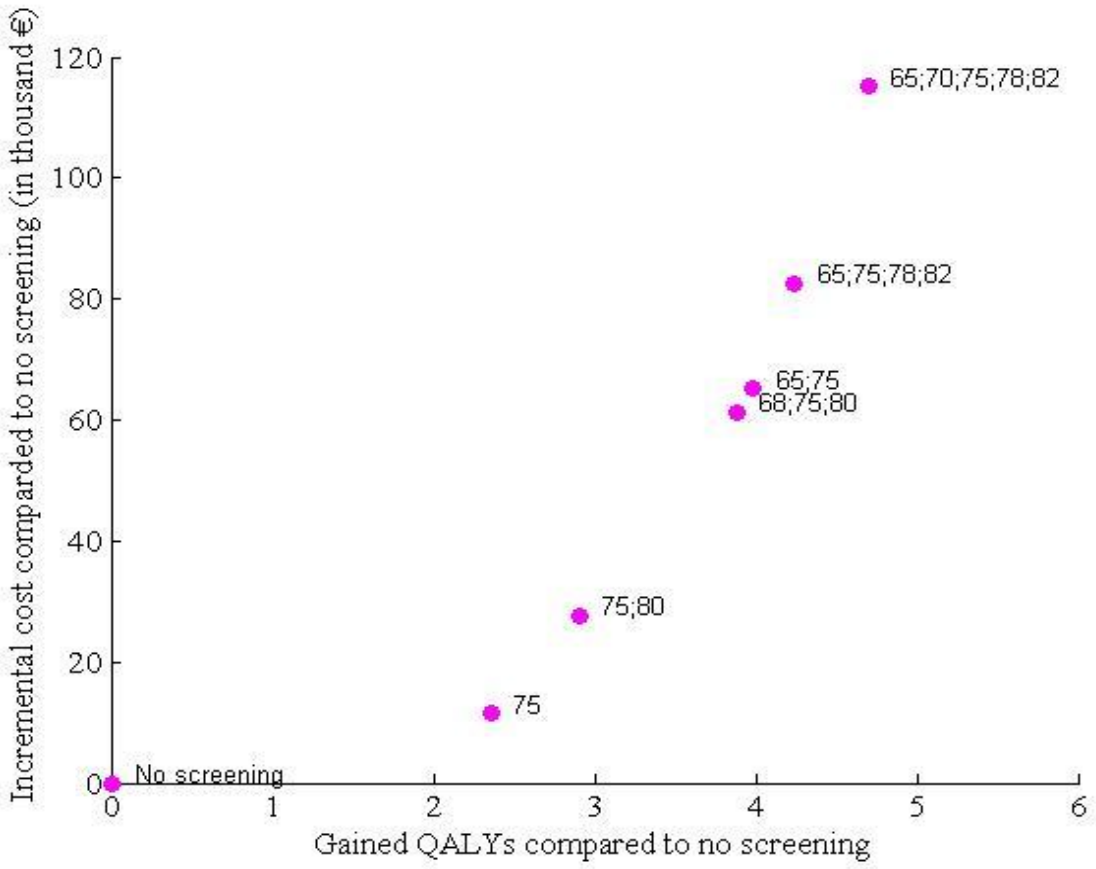
Possible number of different population screening program designs

Program design	Design definition
1	Screening at the age of 55 years
2	Screening at the age of 56 years
3	Screening at the ages of 55 and 56 years
4	Screening at the age of 57 years
5	Screening at the ages of 55 and 57 years
…	…
34 635 776	Screening at the ages of 70, 75 and 80 years
…	… …
2 147 483 647	Screening every year from age 55 to 85 years.

Decision rules to reduce the number of designs

- Used the same simulation model as in STROKESTOP –CE
- From the total number of possible designs, many were excluded if they indicated worse outcome to higher costs compared to another program design.
- Additionally, the program designs which implied inferior clinical outcome and were less effective (in terms of cost per gained QALY) compared to any of the other programs were also removed.

Costs and effects of the potentially optimal designs for screening for AF with handheld-ECG in 1000 hypothetical individuals



Outcome of the optimal designs of screening for AF with handheld-ECG

Age when screening is conducted (years)	Cost per gained QALY compared to no screening	Design optimal when a QALY is worth between(€):
No Screening	-	<4800
75	4 800	4800 – 31 000
75,80	9 484	31 000 – 37 000
68,75,80	15 773	37 000 – 40 000
65,75,80	16 357	40 000 – 74 000

Conclusions

- Screening to identify unknown AF seems cost-effective.

- Our calculations indicate that repeated screening can gain health benefits at a reasonable cost
- Need for further research:
  - Optimal screening design in terms of screening:
    - Technique (Device vs. Pulse palpation)
    - Type (Opportunistic vs population)
    - Initiation (At what age?)
    - Repeated and intervals

Thank you!

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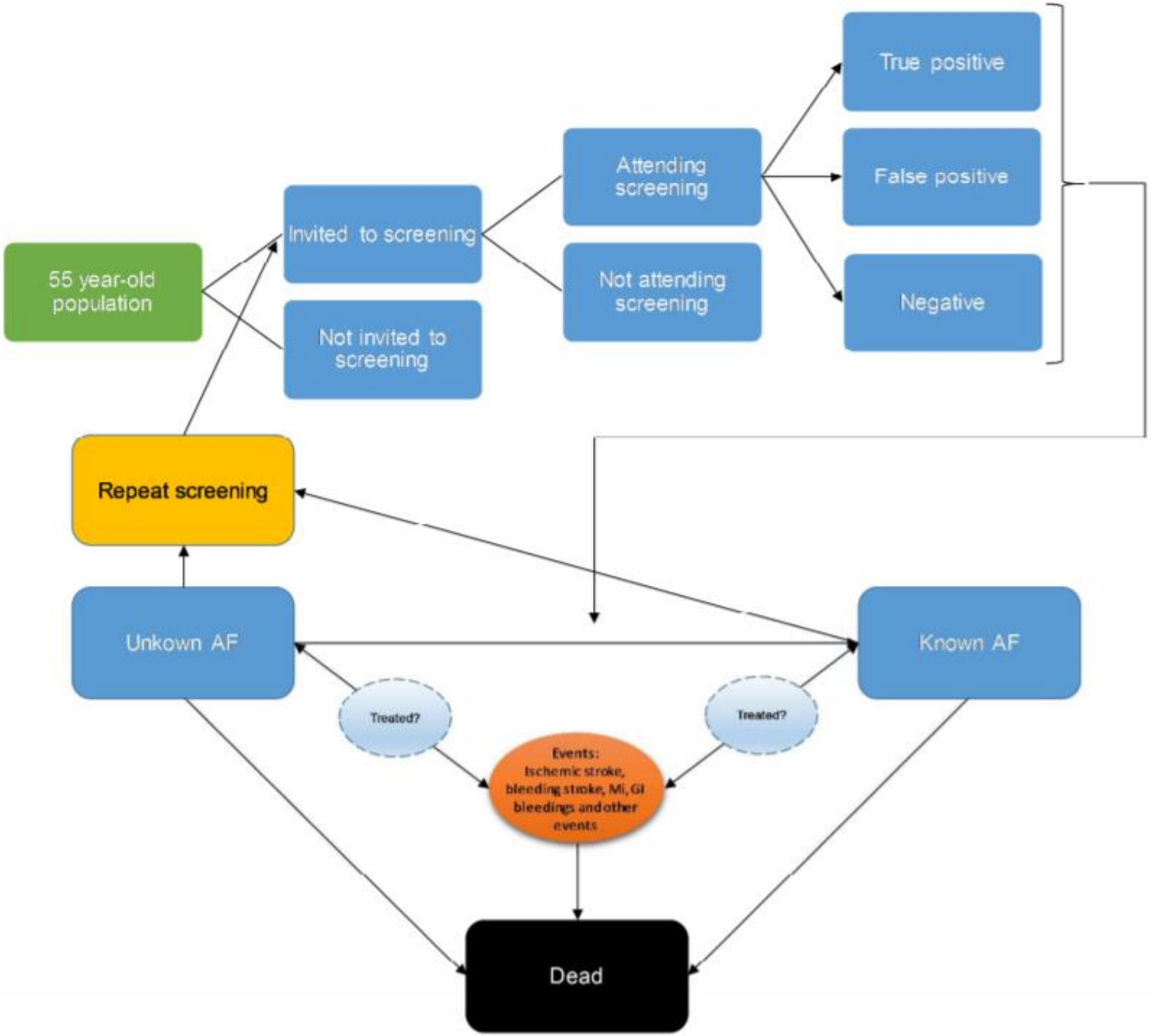
55 year-old population
Invited to screening
Not invited to screening
Attending screening
Not attending screening
True positive
False positive
Negative
Repeat screening
Unkown AF
Known AF
Treated?
Treated?
Events: Ischemic stroke, bleeding stroke, Mi, GI bleedings and other events
Dead