Using the EIP on AHA monitoring tool for the early technology assessment of a planned device to predict falls in the elderly

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The views expressed are those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission!
Early modelling of falls prediction device*

- A number of indoor falls happen while rising from beds/chairs, and in some cases this may be due to postural hypotension

- To which extent is it possible to predict falls due to standing hypotension by using HRV and wearable devices?

* With permission from L. Pecchia, Applied Biomedical Signal Processing and Intelligent eHealth (ABSPIE) Lab, University of Warwick
Example for early HTA within MAFEIP

Technology use by patients

Product life cycle

Very early HTA
Early HTA
Conventional HTA

Decision uncertainty

MAFEIP case study I on falls prediction

MAFEIP case study II on mobile monitoring & training for frailty

First clinical use

Market Access
Coverage & adoption

Basic research on Mechanisms
Targeting for specific product
Proof of principle
Prototype product development

*Adapted from IJzerman & Steuten, Appl. Health Econ & Health Pol. 2011*
Adapting the MAFEIP model

Before fall
- HRQoL
- Cost
- P-death (baseline)
  (baseline mortalities provided by MAFEIP-tool)

After fall
- HRQoL
- Cost
- P-death (deteriorated health)
  (baseline + excess mortality from falls)

Dead
- P=1

P (fall)
- 1-P(fall)
Early modelling based upon:

**Expert Opinion:**

- Which proportion of falls among elderly at home / in nursing homes / in the hospital could be avoided with a device that can predict a sudden drop in blood pressure based on the ECG of an individual during the last five minutes before rising?

**Secondary data:**

<table>
<thead>
<tr>
<th>Discount factors (NICE, 2008)</th>
<th></th>
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<tbody>
<tr>
<td>Costs</td>
<td>3.50%</td>
</tr>
<tr>
<td>Effects</td>
<td>3.50%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Alive transition probabilities (mainly UK-DH, 2009)</th>
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<tbody>
<tr>
<td>Incidence (current care scenario)</td>
<td>0.3</td>
</tr>
<tr>
<td>'Recovery' (current care scenario)</td>
<td>0.7</td>
</tr>
<tr>
<td>Incidence (intervention scenario)</td>
<td>0.2541</td>
</tr>
<tr>
<td>'Recovery' (intervention scenario)</td>
<td>0.7459</td>
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<tr>
<th>Relative risks (mortality) (human mortality database)</th>
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<tr>
<td>Deteriorated health (current care scenario)</td>
<td>1.373</td>
</tr>
<tr>
<td>Baseline health (intervention scenario)</td>
<td>1</td>
</tr>
<tr>
<td>Deteriorated health (intervention scenario)</td>
<td>1.373</td>
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<th>Resource use weights (various sources)</th>
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<tr>
<td>Baseline health</td>
<td>0</td>
</tr>
<tr>
<td>Deteriorated health</td>
<td>3674.92</td>
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<tr>
<th>HRQoL weights (Thiem et al., 2014 &amp; EuroQol)</th>
<th></th>
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<tbody>
<tr>
<td>Baseline health</td>
<td>0.811</td>
</tr>
<tr>
<td>Deteriorated health</td>
<td>0.7553</td>
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<th>Cost of intervention (by analogy – REFINE-study)</th>
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<tr>
<td>GBP per user per year</td>
<td>130.00</td>
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</table>
Results

The planned device would be cost neutral at an effectiveness of 13.7% (reduction in fall probability).

Device reaches WTP threshold of 30.000 GBP/QALY at a reduction in falls probability of 5.8%.

The planned device would be cost neutral at an effectiveness of 13.7% (reduction in fall probability).

**Base case:** assuming achievable reduction in falls of 15% and cost of device of 130GBP / year would result in annual cost savings of **149GBP** and **0.065 QALYs** gained.
Results

ICER vs. device effectiveness

Minimum 'reimbursable effectiveness' at $\lambda = 30.000$

Maximum reimbursable cost of intervention at $\lambda = 30.000$

ICER vs. device cost

$0 \leq \lambda \leq 30.000$

$\lambda = 0$

$\lambda = 30.000$

145 GBP $\lambda = 0$

341 GBP $\lambda = 30.000$
Results

Probabilistic analysis

- 30,000 GBP/QALY threshold
- 1000 iterations
- Base case

Parameter distributions

Minimum reimbursable effectiveness at $\lambda = 30.000$

Maximum reimbursable cost at $\lambda = 30.000$
Results

Population level impact

Average catchment population of a small NHS foundation trust

Discounted cost savings around 1.5 million GBP* in 25 years

Discounted QALYs gained around 620* in 25 years

* Results refer to the modelled target cohort only and **DO NOT** take into account that each year additional individuals would enter the group of eligible individuals (i.e. no dynamic modelling)
Conclusions

• The MAFEIP-tool can be applied to assess technologies even at an early stage of development

• It does so by using methods conventionally used for informing ‘decisions to buy’ (demand-side) into the development process of a new technology ('decision to invest')

• Hence, with MAFEIP we can take on an 'investors perspective', which is particularly interesting for the EIP on AHA (and other policy initiatives) as
  – The Partnership aims at identifying and scaling up innovations to improve active and healthy ageing
  – It is still a 'young' policy initiative, where many interventions are also at an early stage of development and
  – The information available about respective technologies is typically scarce and scattered

• In this context, early HTA can be a useful tool for assessing the potential of a new technology, which in turn, may provide valuable information for
  – The developer of a technology to decide upon further investment and
  – The EIP on AHA, to provide the right support for respective innovations so that they can progress faster to the next stage of development
Buxton's Law*

*It is always too early (for an economic evaluation) until, unfortunately, it’s suddenly too late!*

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