

Decision support for cost-effectiveness analysis of healthcare interventions

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Outline

Context

Problems


Cost-effectiveness analysis

Live Demo

Limitations

Future work

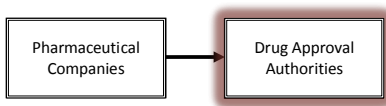
New interventions



Pharmaceutical
Companies

- Develop and manufacture medical interventions
- Interventions are (very) expensive
- New interventions have to be approved twice

Regulators 1/2



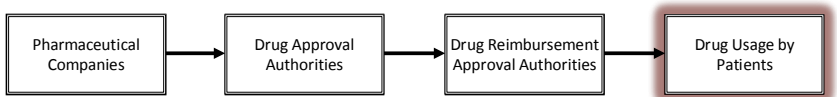
- Assess potential benefits of a new intervention
- Do the benefits outweigh the side-effects?

Regulators 2/2



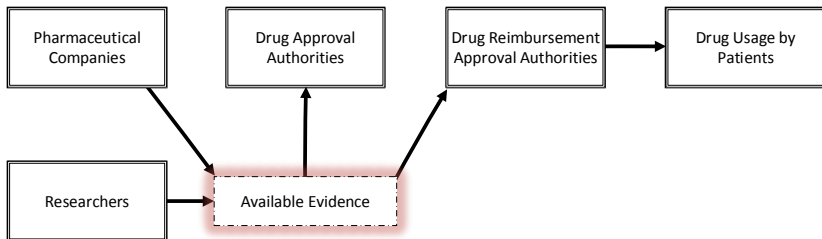
- Governments are faced with rising costs concerning health care
- A second decision assess the benefits in relation to the cost of the new intervention

Usage



- When both decisions are met with a positive response

Evidence



- Both decisions are informed by high quality evidence
- Evidence is published as scientific articles
- A decision is informed by a consolidated view of the available evidence, *meta analysis*

Problems 1/2

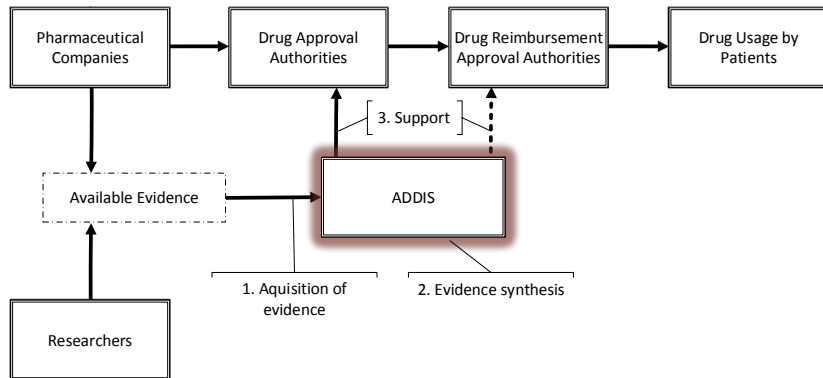
- No repository containing structured data exists, evidence needs to be obtained manually.
- An average time per review of 1110 person-hours (Allen and Olkin, 1999).

Problems 2/2

- Analysis are carried out using a series of disconnected tools
- These tools are hard to use, even for experts
- For every new intervention: A new analysis

ADDIS

- Software that captures the entire workflow



Subject

- Right now ADDIS supports the *approval* decision
- But does not support the *reimbursement* decision

How can ADDIS support decision makers concerned with the reimbursement of medical interventions?

Cost-effectiveness analysis 1/2

- The *approval* decision is informed by an *efficacy analysis*
- An *efficacy analysis* reports the data as-is
- The *reimbursement* decision is informed by a *cost-effectiveness analysis*
- A cost-effectiveness analysis extrapolates for future effects, through the use of a *disease state model*
- A *disease state model* aims to approximate all effects and costs per patient, and offer a consolidated view of these outcomes

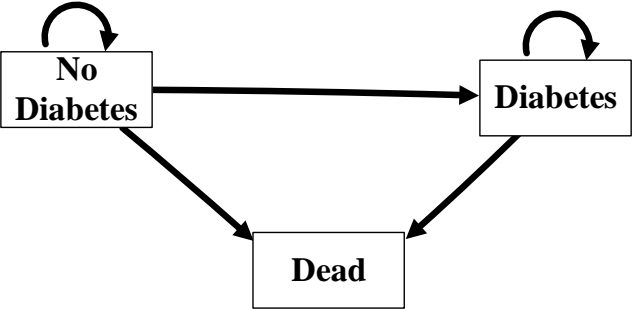
Cost-effectiveness analysis 2/2

- A patient can reside in a state, e.g. 'Alive' or 'Dead'
- During simulation, a patient can travel to another state, modeled on either a *discrete cycle* of e.g. a year, or the time until a transition is measured, *sojourn time*
- Based on the time a patient spends in a cycle, effects and costs are achieved
- Costs and benefits are discounted for future effects
- Results are reported in a consolidated view

Model

- Let's explain through a simplified model
- Suppose we need to make the decision to allow the reimbursement of a diabetes intervention

Disease states



Transition Probabilities

Suppose we obtained the following transition parameters for the no intervention on a yearly basis:

- Patients who do not suffer from diabetes: 90 people **do not** develop diabetes, 7 people **do** develop diabetes and 3 people die
- Patients who do suffer from diabetes: 90 people stay the same, 10 people die

From clinical trials we obtain that the intervention has a positive effect on people that do not have diabetes, a 0.8 hazard ratio is reported.

Utility Weights

Suppose we obtained the following effects with regards to diabetes:

- Patients that do not have diabetes report a 0.84 effect on quality of life on a yearly basis
- Patients that do have diabetes report a 0.65 effect on quality of life on a yearly basis

Costs

Suppose we obtained the following Costs with regards to diabetes:

- Diabetes treatment costs EUR 1805 on a yearly basis
- The intervention costs EUR 300 on a yearly basis
- Furthermore, patients that have been selected to receive the intervention have gone through a screening process, which costs EUR 400
- In accordance with zorginstituut (CvZ) guidelines we assume a yearly discount rate of 1.5% for effects and 4% for costs

Demo

- At this point the analyst resorts to Excel/R/tool of choice to obtain results
- While obtaining results can be complex, it always follows a general method
- Instead of using those tools: current integration into ADDIS, live demonstration (cea.drugis.org)

Limitations

- Does not address patient heterogeneity
- Only a select set of modeling choices available
- All inputs are just numbers. Ideally inputs are derived, in an automated way, from the available (clinical) evidence
- Mis match between the timescales of the *efficacy analysis* and the *cost-effectiveness analysis*

Future work

- Better link with underlying data, its semantics and prerequisite statistical analysis
- Modeling proposition based on obtained parameters
- Integration between both decisions is anticipated (Bergmann et al., 2014)

Questions

Thank you for your attention!



Any questions?

Bibliography

- Allen, I. and Olkin, I. (1999). Estimating time to conduct a meta-analysis from number of citations retrieved. *Journal of the American Medical Association*, 282(7):634–635.
- Bergmann, L., Enzmann, H., Broich, K., Hebborn, a., Marsoni, S., Goh, L., Smyth, J. F., and Zwierzina, H. (2014). Actual developments in European regulatory and health technology assessment of new cancer drugs: what does this mean for oncology in Europe? *Annals of oncology : official journal of the European Society for Medical Oncology / ESMO*, 25(2):303–6.