Implementation science
Economic evaluation

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Outline

- Basics of implementation science
- Basics of economic analysis
- Extension to implementation interventions
- Some examples
- Conclusions

Based on: Severens H, Hoomans T, Adang E, Wensing M. Economic evaluation of implementation interventions. In: Grol & Wensing. Implementation of innovations in healthcare. Reed Business, 2011.

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Continuum of research

Key questions in implementation science

1. Who gets high-quality healthcare and does this change over time?

2. Which interventions and factors contribute to better implementation of recommended practices?

3. How can improvement become sustained?

Implementation interventions

- Continuing professional education
- Feedback, reminders, decision support to clinicians
- Organisational changes in skill mix, teams, institutional management
- Patient-mediated interventions, e.g. decision aids
- Changes in reimbursement, market and regulations

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Investment decision:

- ❑ Invest in the development of a new drug, medical device, or other treatment, or:
- ❑ Invest in better implementation of available drugs, devices and treatments in routine healthcare

For instance:

- Develop a drug that is more effective than statins and anti-platelets for reducing cardiovascular risk

- Improve prescribing and use of statins and anti-platelets in eligible patients (70 → 100%)

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Costs as barrier for change

- HTA studies take societal and long-term perspective, but …

- Clinical and organisational activities depend on practitioners and managers in their organisations:
  - ✓ Manpower and facilities are not fully variable costs
  - ✓ Changing from A to B induces costs by itself (‘transaction costs’)
  - ✓ Financial benefits are mostly earned elsewhere (e.g. preventive measures, primary care)

	Clinical evaluation	Economic evaluation	Implementation evaluation
Safety	X		
Efficacy	X		
Effectiveness	X		
Cost effectiveness		X (cea)	
Financially affordable		X (budget impact)	(x)
Implementation at reasonable costs		X (cea+)	X
Effective after implementation			X
Successful implementation			X

Some economic concepts

- **Value:** utilities related to health-related states (and healthcare received?) as perceived by the population

- **Costs:** all resources lost, which could have been used alternatively, again from a societal perspective, including
  - Medical costs, also when carried by the patient
  - Non-medical costs, particularly productivity losses

- **ICER:** incremental cost effectiveness ratio
  - Comparison with best alternative
  - Focus on marginal/change of costs per unit effect

Categories of cost from an implementation perspective

- Costs related to development of the treatment, guideline, etc.
  - *Often ignored*

- Costs related to development of implementation intervention
  - *Often ignored, or estimated at low level*

- Costs related to application of implementation intervention
  - *Mainly: time of health professionals, possibly also technologies, possibly also teachers/staff to support implementation*

- Costs related to changes in healthcare provision (e.g. more consultations, differently paid health professionals, etc.)

Extension to implementation: ICER of technology after implementation

$$\Delta KE_b = \Delta KE_z + \frac{1}{d.n_p.p_d.\Delta e_z} * \Delta Ke_i$$

- ICER of health policy (after large scale implementation): ΔKe_b
- ICER of treatment per patient ('traditional ICER'): ΔKe_z
- Duration of impact of implementation intervention *d*
- Mean number of patients per clinician: n_p
- Population prevalence of disease:p_d
- Incremental health gain: Δe_z
- Implementation costs Δk_i proportion of patient care improved by implementation Δe_i, cost-effectiveness of treatment per clinician ΔKE_i $(=\Delta k_i / \Delta e_i)$;

Mason, J. et al., When is it cost-effective to change the behaviour of health professionals? JAMA 2001; 286: 2988-2992.

What is value from an implementation science perspective

- Not different from HTA, but:
  - May focus on indicators of professional performance or healthcare delivery (assuming a link with outcomes)
  - May consider a wider range of outcomes than health, eg. workload of health professionals, patient experiences with healthcare, accessibility of healthcare provision

Some issues

- Societal perspective may be complemented by perspective of specific stakeholders (healthcare providers, payers)
- Choice of comparison group is quite crucial: usual care, minimal implementation, alternative interventions, etc.
- Stochastic modelling is attractive for questions of implementation, but currently underused

Examples

Prevention of cardiovascular diseases (Lobo 2003)

- RCT of multifaceted implementation intervention (n=120 practices)

- Implementation intervention:
  - Outreach visits
  - Improvements in practice organisation
  - More involvement of nurses

Costs per practice

	Euro
Time costs visitor	2667 (522-4469)
Time costs GPs	2847 (644 – 1698)
Time costs assistants	1250 (0 – 4678)
Travelling costs	748 (0 – 3354)
TOTAL	8767 (1266 – 19113)

Example: costs of test ordering (Verstappen 2003)

- RCT of peer review groups on test ordering (n=194 GPs)

- Costs considered:
  - running costs: feedback reports, group meetings
  - tests ordered (all per 6 months)

(development costs not considered)

Results

	Intervention	Control
Running costs	93	17
Costs of tests ordered	- 301	- 161

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Implementation of CBT for CVS (Scheeres 2008)

- CBT in CVS is effective, but implementation is a challenge

- This observational study focusing on implementation of CBT for CVS in mental healthcare (n=125 included patients)

- Implementation interventions:
  - Training and supervision of CBT therapists
  - Redesign of work flow process at MHC institution
  - Repeated information leaflets to primary care physicians
  - Continuous monitoring and feedback on patient flows

Scheeres et al. Implementing cognitive behavioural therapy for chronic fatigue syndrome in mental healthcare: a costs and outcomes analysis. BMC Health Serv Res 2008;8:175.

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Some results

- 37% recovered after treatment
- Mean gained QUALY gained=0.03
- Reduced healthcare costs and productivity losses
- Thus: dominancy of implemented protocol
- Costs were 5320 euro per recovered patient

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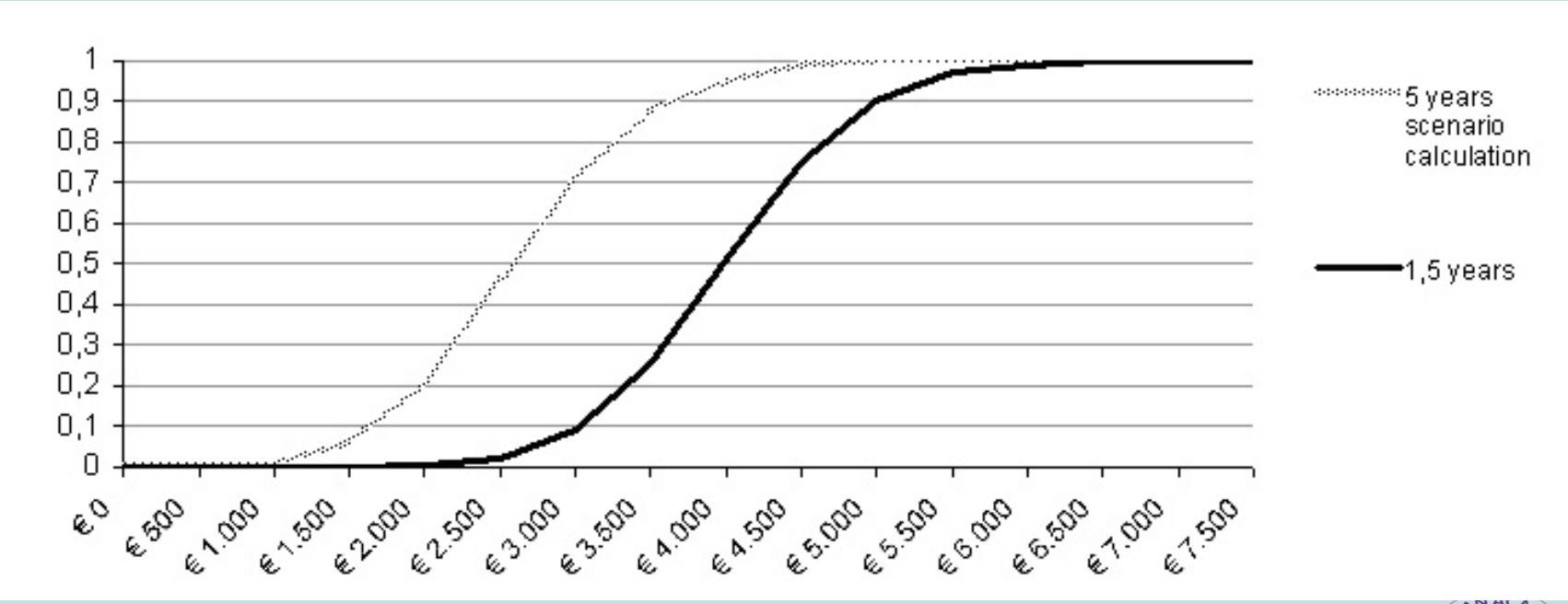
Acceptability curve

Acceptability curve showing the probability that implementing CBT for CFS has a favorable cost outcome ratio over a range of willingness to pay regarding health care costs per recovered patient.



Urinary tract infections in children

- UTI in young children is expected to enhance renal failure in later life, thus improved UTI management would reduce renal failure in the population

- Hypothesis is based on reflux (VUR), although others argue that congenital causes of renal failure are more relevant (e.g. NICE guidelines 2007)

- Only few children with UTI in childhood will actually develop chronic renal failure in later life (perhaps 1/ 300)

Harmsen M. Improving primary care for children with urinary tract infections. Ph.D. thesis , Radboud University, 2008.

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Observational studies of current practice

	Triage nurses	Diagnostics	Prescribing
Design	Survey	Chart review	Chart review
Sample	N=145 nurses (59%)	N=148 children from 49 practices	N=284 children with UTI from 59 practices
Measures	Vignettes with questions	Case registration form	Extraction from medical records
Results	>90% consistent with guidelines	Both over and underuse of tests	66% received antiobiotics; 14% was referred
Conclusion	Little room for improvement, or social desirable answers?	Room for improvement	Room for improvement, or invalid data?

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Maximum care for UTI

- Maximum care implies that more children are referred to hospital rather than treated in primary care
- From a quality improvement perspective, this is an organisational intervention to improve health outcomes
- Note that it would have important implications for the capacity needed in hospital (e.g. VCU and DMSA tests)

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Why modelling?

- Costs may be saved in later life (our focus was on fewer renal scarring), but few studies take a perspective of 30 years or more

- Effectiveness of better UTI treatment may be limited in the short run, but substantial in the long run

- Health improvements in later life are likely to occur in only few children with UTI, so required numbers become too high for empirical research

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Modelling methods

- Often: probabilistic modelling with Markov models, using Monte Carlo simulation
- This is based on a model of the different states, in which figures are inputed on transition probabilities, expected costs and expected health outcomes
- We performed a systematic literature review to identify studies that provided the required numbers
- Practical: the study probably required 6 months full time researcher

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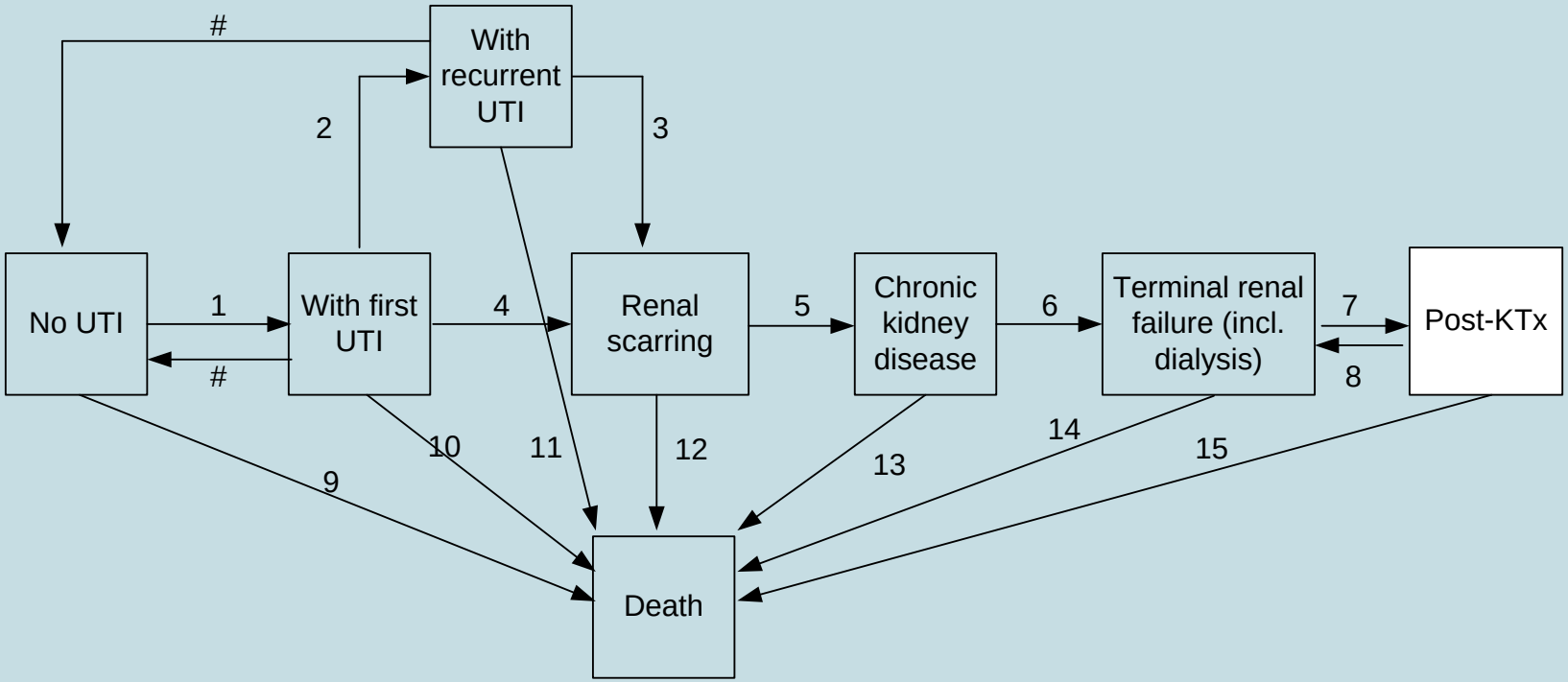

UTI = urinary tract infection, KTx = kidney transplantation

Figure 1: Markov model

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Some figures

	Maximum care	Current care	Improved current care
Quantitative urine culture in first first to GP	100%	40%	100%
Serum creatinine and blood pressure in first visit to GP	100%	0%	100%
Visit to pediatrician with VCU, DMSA and abdominal radiograph	100%	17% (m) and 7% (f)	35%
Antibiotics treatment	100%	66%	100%
Antibiotics prophilaxis	100%	17% (m) and 5% (f)	35%
UTI recurrence after UTI	10% (m) and 11% (f)	13% (m) and 15% (f)	12% (m) and 13% (f)

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Some findings

- Maximum care gained 0.00102 (boys) and 0.00219 (girls) QUALYs and saved 42.70 euro (boys) and 77.81 euro (girls) in 30 years compared to current care

- Maximum care was also dominant over improved current care (which implies more treatment in primary care), although less than to current care

- Estimates were not sufficiently accurate to find significant differences between the study groups

Harmsen M, Adang E, Wolters RJ, van der Wouden JC, Grol R, Wensing M. Prevention of renal failure in children with urinary tract infections: a literature review and economic analysis. Value in Health 2008;12:466-472.

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Some reflections

- Modelling is always limited by the quality of data (economists seem bother less about this)
- Population based models differ from decision models for individual patients
- Particularly poor evidence existed on the transition from renal scarring to chronic kidney disease (one old study from Sweden with small sample size)

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Conclusions

- More investment in implementation of specific treatments may be more efficient than more investment in innovation of treatment
- Economic analysis of technologies is limited if it does not consider costs and effects of implementation interventions
- Economic analysis offers a useful set of concepts and methods, which is also relevant for implementation research
- Many clinicians are less interested in costs, except when this translates into their time – which is the case regarding implementation

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