Use of Economic Modelling in Acupuncture

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Outline

- An introduction to economic modelling
  - Definition & types of models
  - Principles
  - Rationale
- Exemplar: Economic modelling in acupuncture
  - Key modelling opportunities in undertaking economic evaluation of acupuncture
  - Economic modelling methods for synthesising evidence
  - Preliminary effectiveness results

"All models are wrong….
some are useful" *On statistical models, George Box*

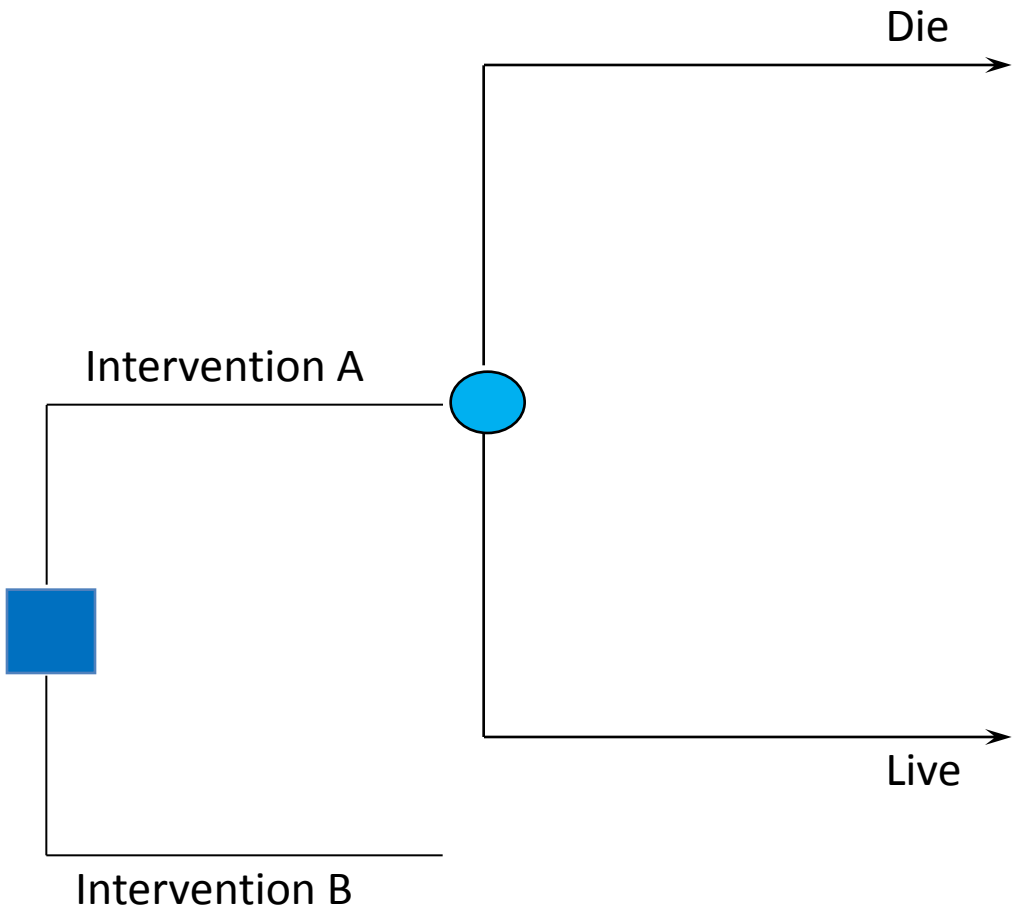
Decision models

- Prediction of health-related events/episodes
- Events linked to costs & health outcomes
- Synthesise evidence
- Uncertainty in inputs
- Focus on appropriate decision
- Clinical versus economic

Examples of Types of Models

- Trial based
- Decision tree
- Markov model
- Trial based network meta-analysis

Decision Tree



Life expectancy=0 years
Cost=£20
Probability = 0.2

Life expectancy=30 years
Cost=£100
Probability = 0.8

Decision tree: Expected Values

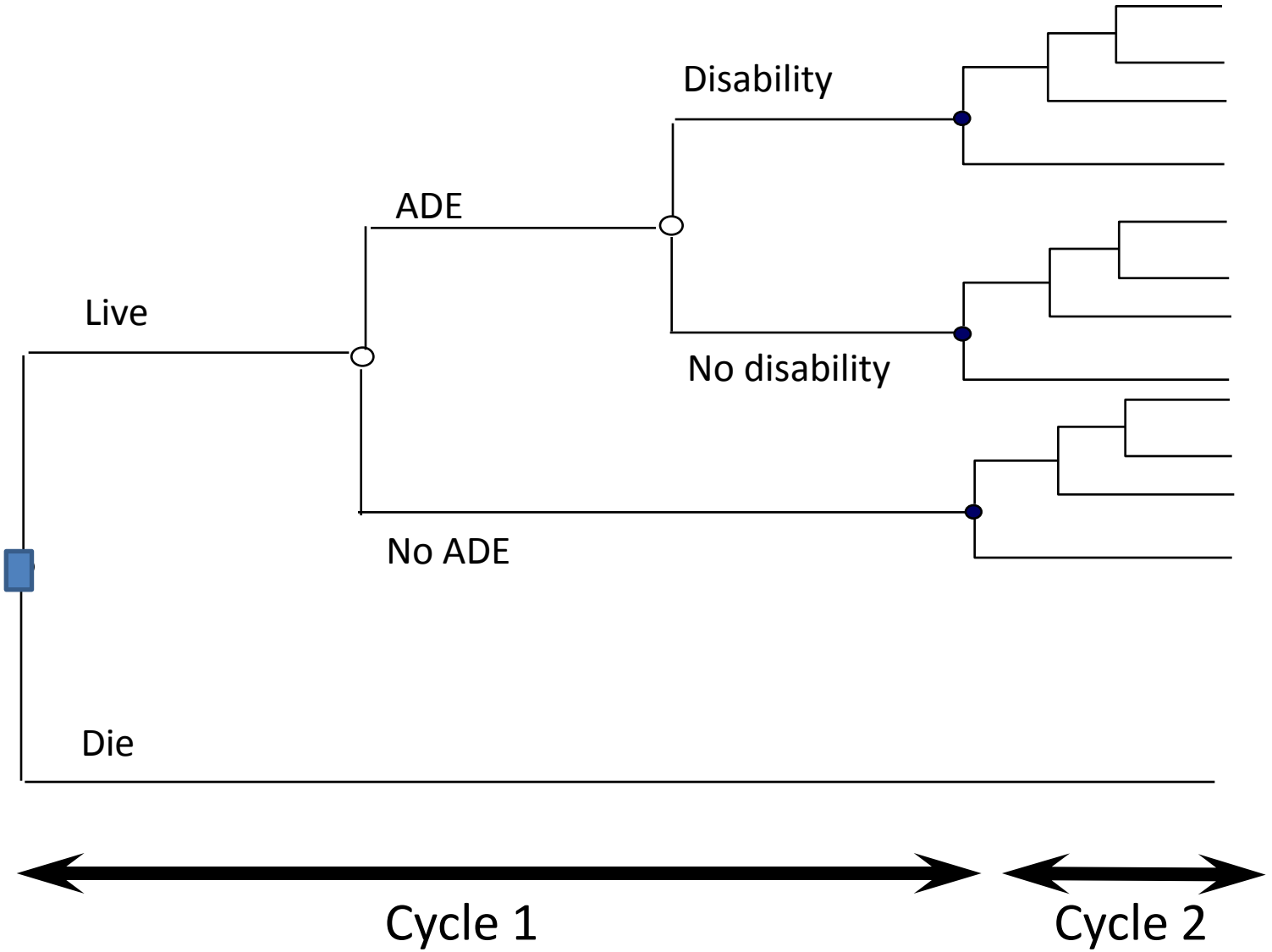
Expected survival duration: (0.2 x 0 yrs) + (0.8 x 30 yrs)

= 24 years

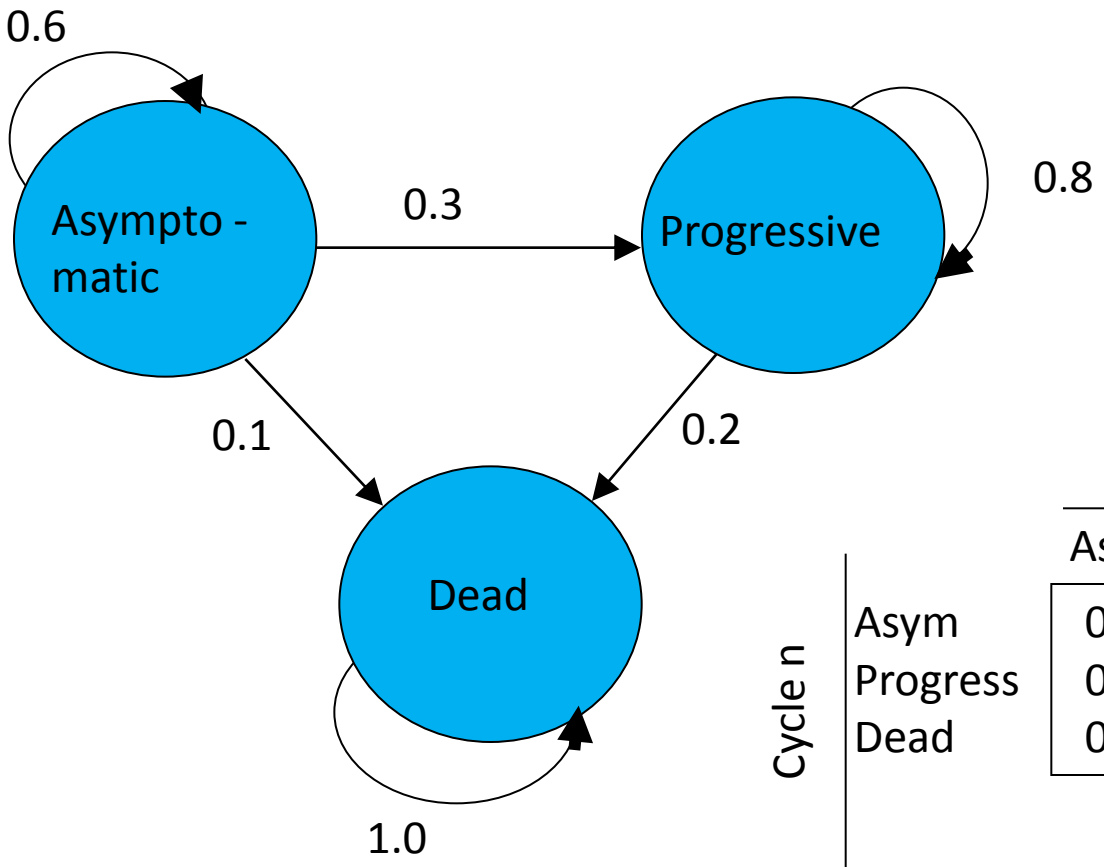
Expected cost: (0.2 x £20) + (0.8 x £100)

= £84

Decision Tree



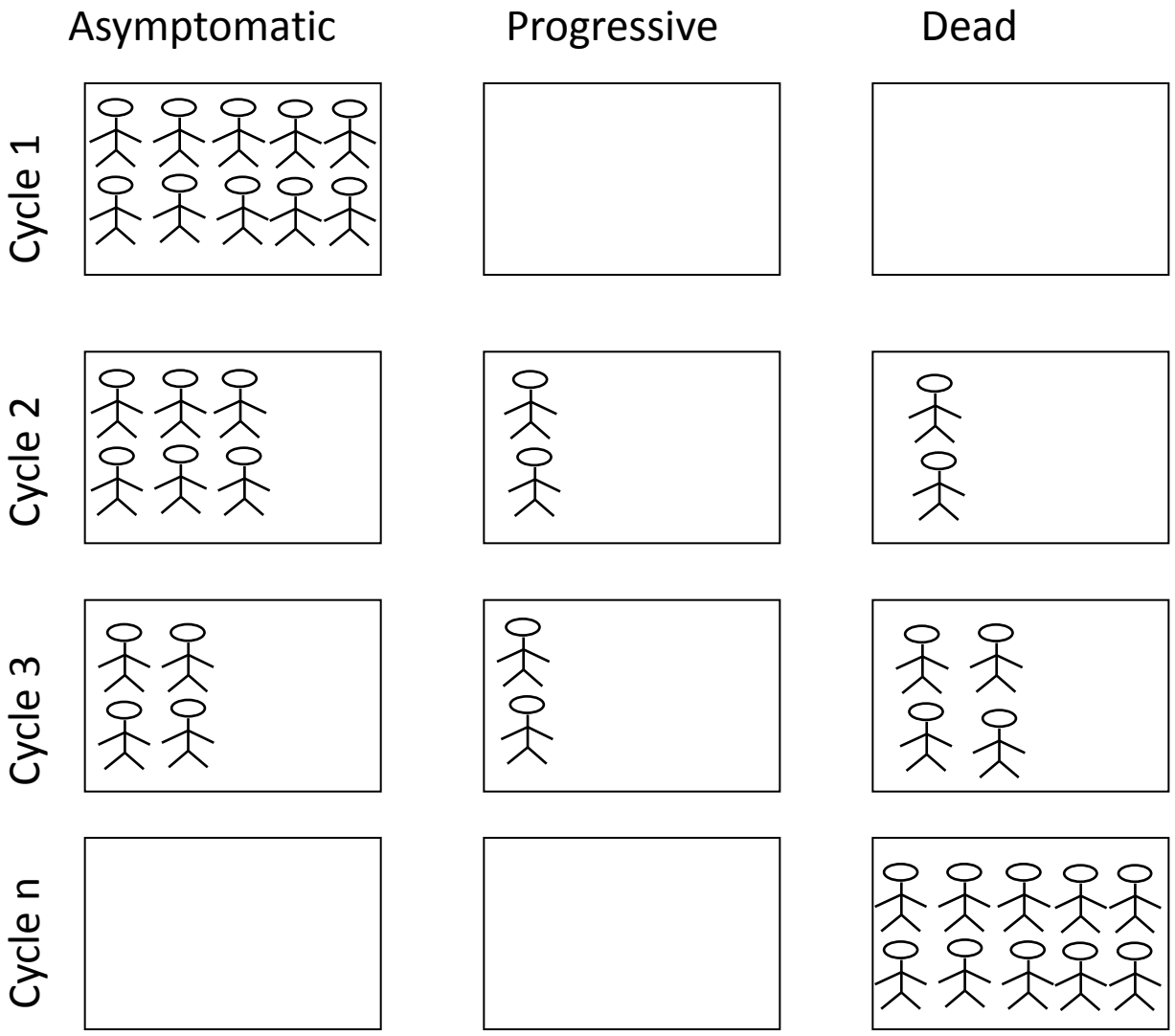
Markov Process



Cycle n	Cycle n + 1: Asym	Progress	Dead
Asym	0.6	0.3	0.1
Progress	0.0	0.8	0.2
Dead	0.0	0.0	1.0

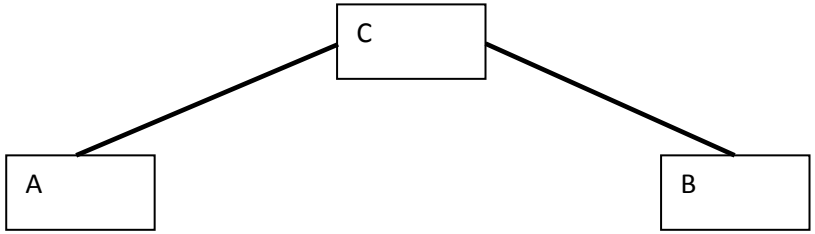
Adapted from Sonnenberg and Beck. *Medical Decision Making* 1993;13:322-338

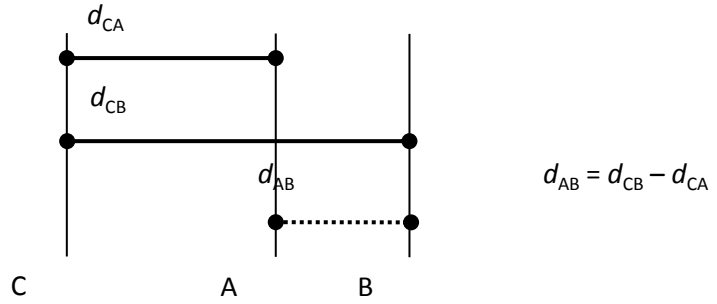
Markov Cohort Simulation: the concept



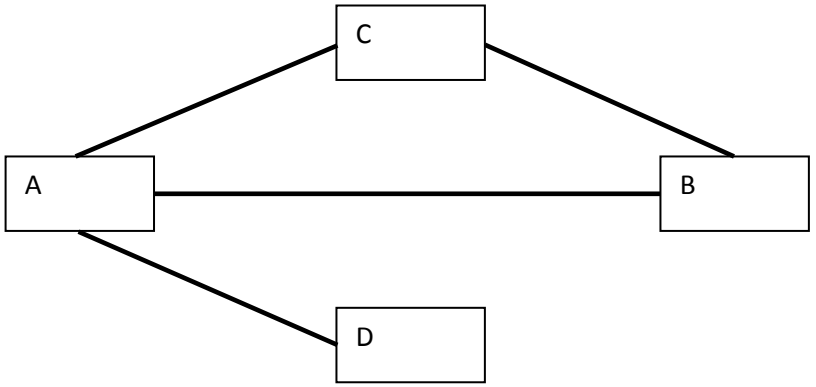
Network Meta-Analysis
(a) Indirect comparison of A:B
(b) Mixed Treatment Comparison

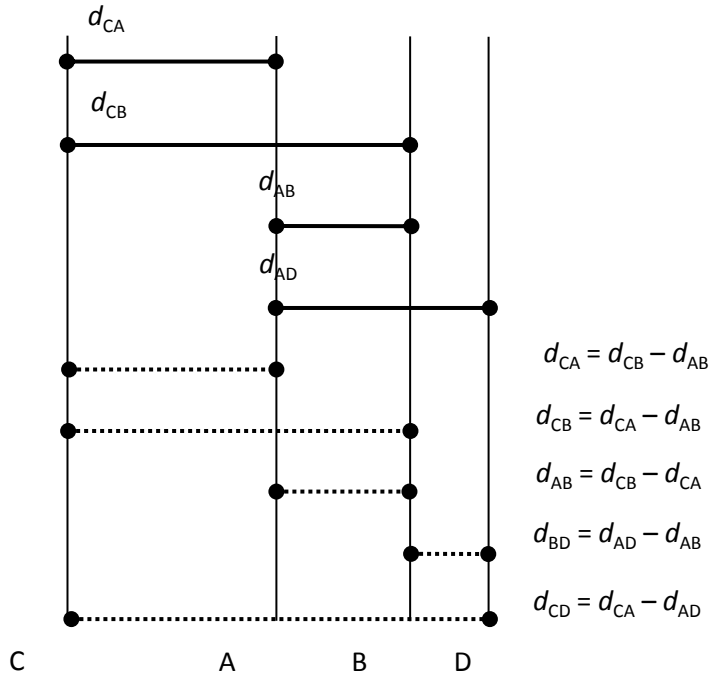
(a)





(b)





Principles

- Use of cost-effectiveness data to explicitly inform resource allocation decisions on value for money
- Make best use of all available data, potentially synthesising different types of data from different sources
- Quantify decision uncertainty

Rationale for models

Contrasting two paradigms

Measurement

- Testing hypotheses about individual parameters
- Relatively few parameters of interest
- Primary role for trials
- Focus on parameter uncertainty

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Decision analysis/Economic

- What do we do now based on all sources of current knowledge?
- Decisions cannot be avoided
- A decision is always taken under conditions of uncertainty
- Decision making involves synthesis
- Can be implicit or based on explicit (decision) analysis

Measurement is necessary but not sufficient for decision making

Limitations of Trials as a Vehicle for Decision Making

Trial limitations	NICE Examples
Inappropriate or partial comparisons	Temozolomide (recurrent malignant glioma)
More than one trial	Drugs for Alzheimer's
Partial measurement	Riluzole (resource use)
Unrepresentative practice	Glycoproteins
Intermediate outcomes	Beta interferon (MS)
Limited follow-up	Implantable cardioverter defibrillators
No trials	Liquid-based cytology

Whither Trial-Based Economic Evaluation?

- Often trials are not sufficient for decision making
- But are key source of data for relative treatment effect
- Provide vehicle for collection of economic data
- But other data sources may be needed

Sculpher MJ, Claxton KC, Drummond MF, McCabe C. Whither trial-based economic evaluation for health care decision making? *Health Economics* 2006;15:677-687.

Case Study:
Assessing the Effectiveness & Cost-Effectiveness of Acupuncture for Treating Chronic Pain in Primary Care

Economic Modelling Methods (1)

- Defining the decision problem
  - Study perspective: UK NHS and out of pocket costs
  - Comparators: Usual care, Acupuncture, Sham acupuncture
  - Population:
    - Adults with chronic pain;
    - 3 conditions; headache, musculo-skeletal, osteo-arthritis of the knee (OAK)
  - Output:

$$\text{Cost/QALY} = \frac{\text{Cost of A} - \text{Cost of B}}{\text{Quality-adjusted Life Year (QALY) of A - QALY of B}}$$

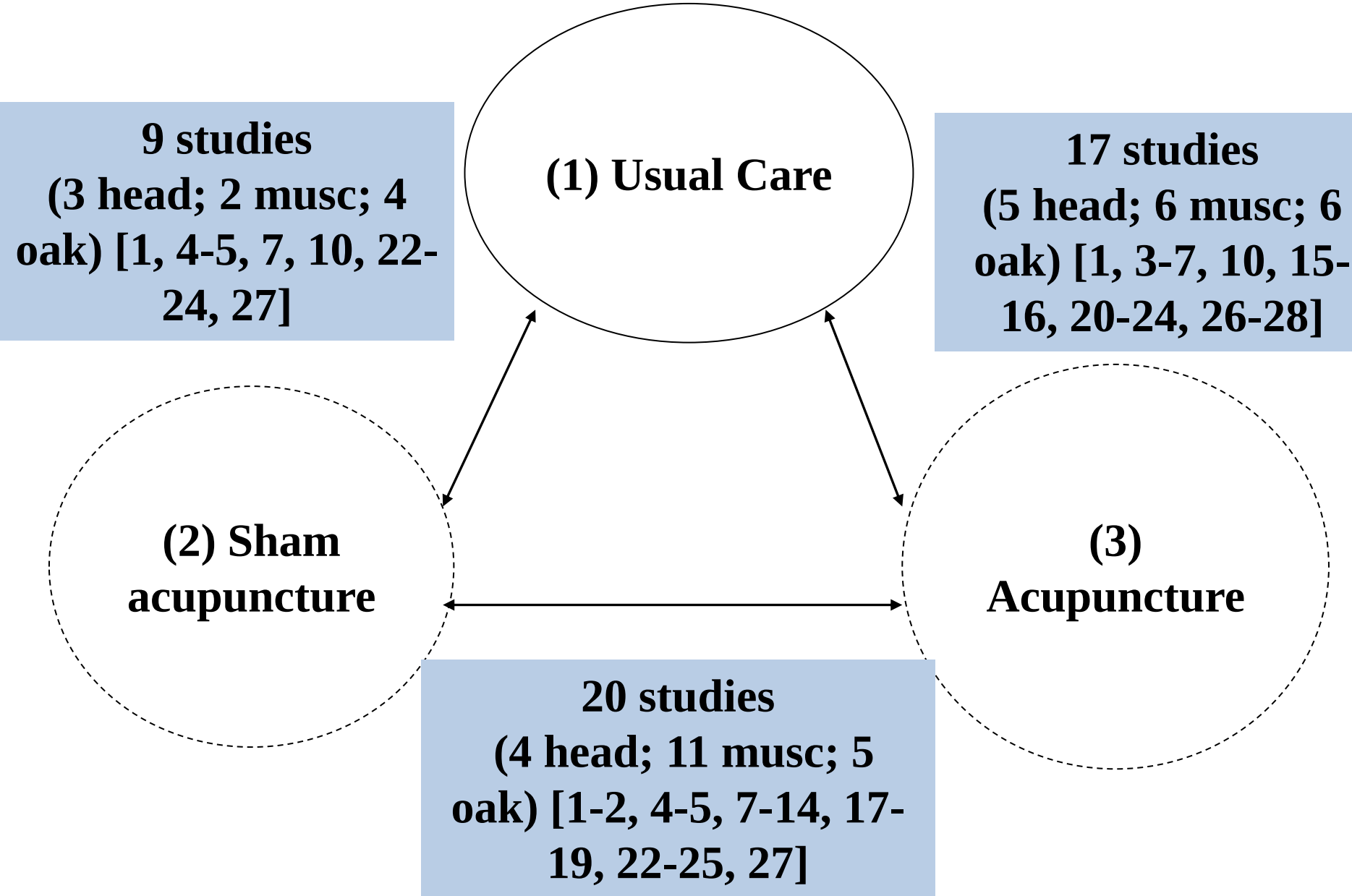
Economic Modelling Methods(2)

- Analyzing the available data
  - Lots of data: 28 RCTs, individual patient level data (IPD), 18,000 observations
  - Limited UK resource use data
  - Multiple outcome
  - Multiple time horizons
  - Within and between study variation
  - Time horizon considerations

Economic Modelling Methods(3)

- Choosing appropriate modelling methods
  - Mapping multiple & heterogeneous outcomes to utility values
  - Evidence synthesis
    - Trivariate model: utility values, pain scores and costs for CEA
    - Network of studies reflecting Mixed Treatment Comparison of trials
- Exploring uncertainty
  - Sensitivity analysis

Evidence Synthesis



Generating Utility Values

- Aim: Generate utility values for calculating Quality-adjusted Life Years (QALYs)
- Methods:
  - Published literature
    - Generic instruments: SF36, SF12
    - Specific instruments: WOMAC algorithms
  - Specifically developed mapping
    - Constant-Murley-score (CMS) to pain to utility value

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