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Using whole disease models to inform resource allocation decisions

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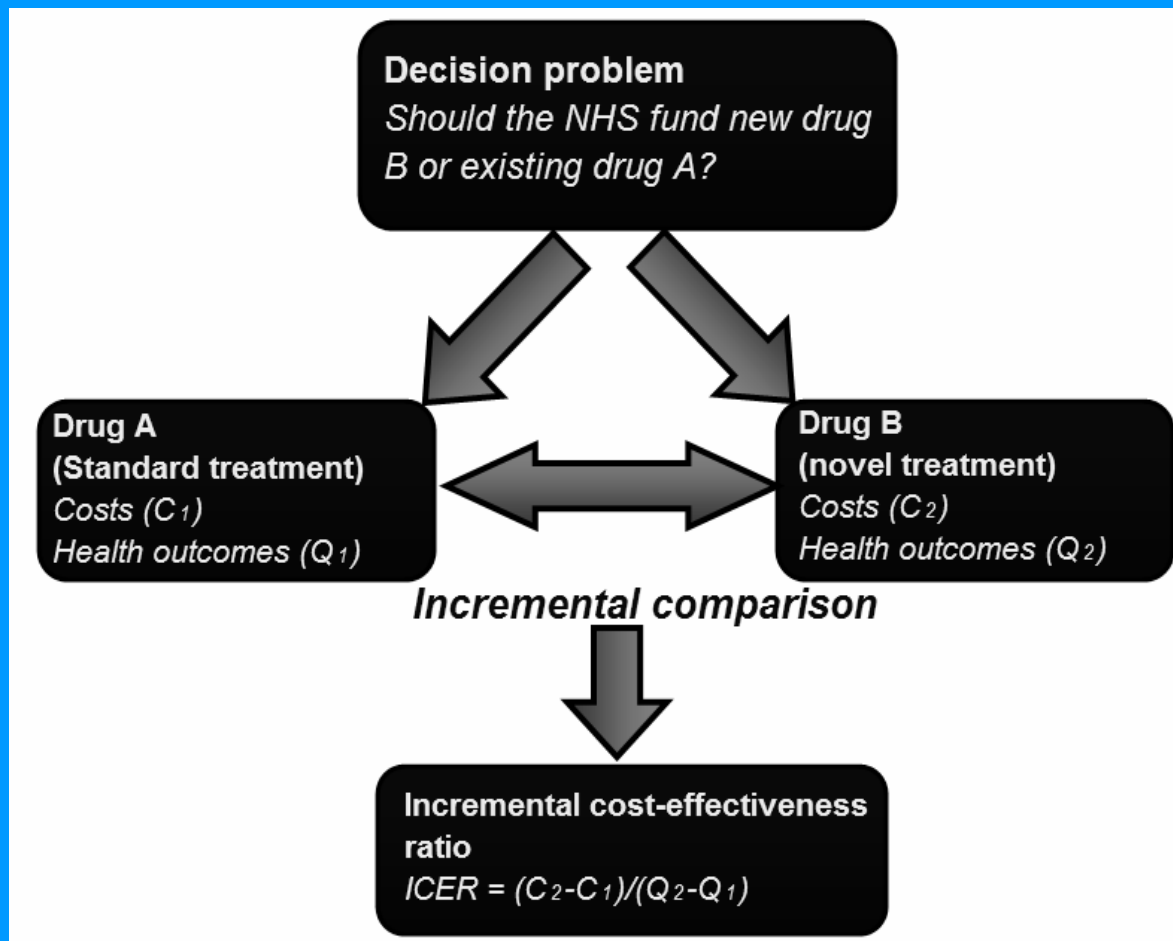


Overview of fellowship

- Funded through NIHR PAS Fellowship
- What is the role and value of Whole Disease Modelling in informing resource allocation decisions?
- Focus on cancer (specifically bowel) but wider transferability
- Mixed methods approach
 - Phase 1 Problem definition via methods review, economic analysis review & case study work → framework development
 - Phase 2 Application of framework within a large case study problem & qualitative examination of value from decision-makers' perspective
- Outstanding issues – feasibility, impact on results and value



Piecewise cost-effectiveness analysis



Theoretical approach to maximising health gains.

Threshold determined by CE of last technology purchased.

HTA models involve forward projection from single decision node.

Comparison against threshold/range.

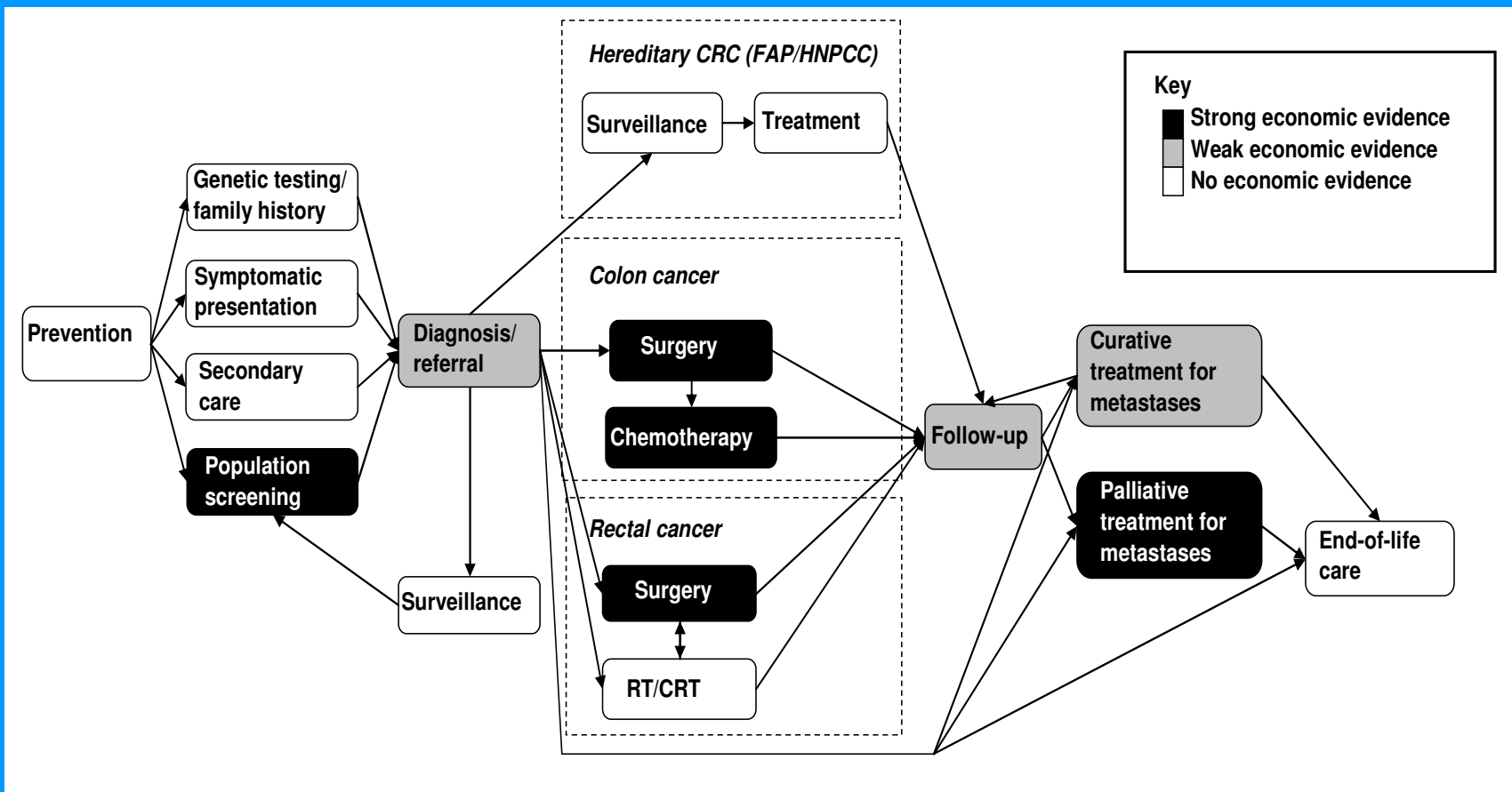


Limitations of “conventional” economic analysis

1. Interdependence of decisions, the healthcare budget and the cost-effectiveness threshold
 - Vague resemblance to optimisation framework
 - Assumes repeated use of threshold will move towards a QALY maximising solution
 - Separation of budget constraint and decision rule ignores disinvestment
2. The interdependence of health technologies
 - Difficult not to treat decisions as independent
 - Upstream and downstream impacts e.g. screening ↔ follow-up
3. The model development process
 - Absence of shared agreement about how to develop models both conceptually and mathematically



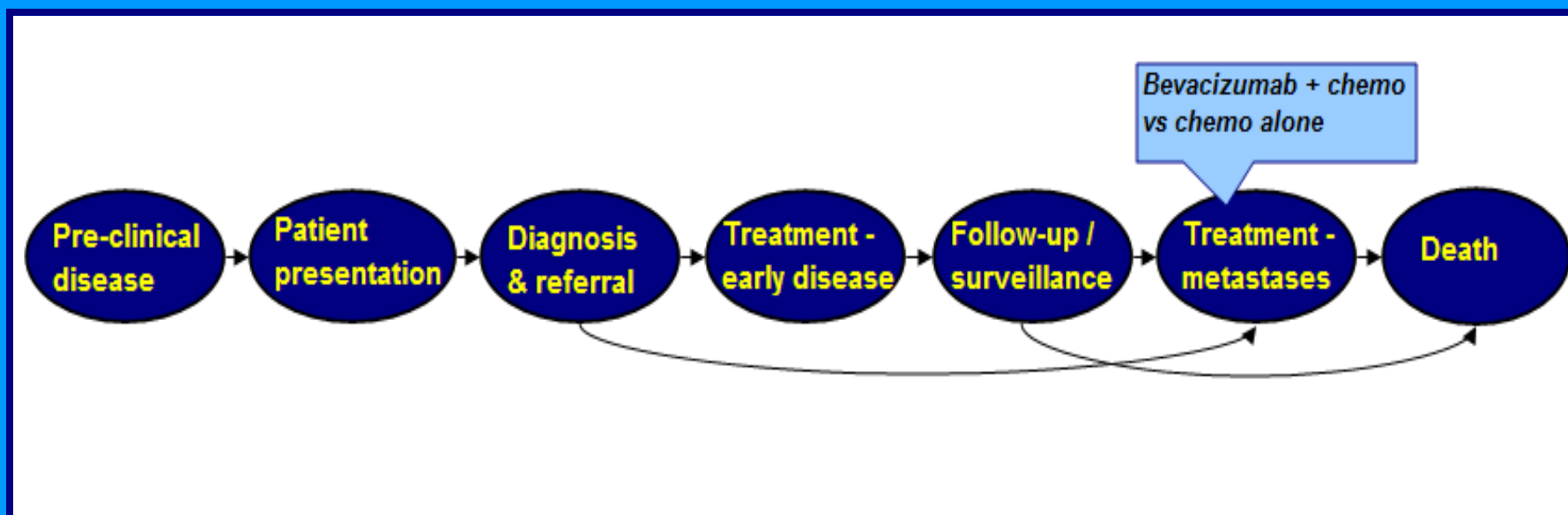
Economic evidence to inform resource allocation in bowel





An alternative approach – Whole Disease Modelling

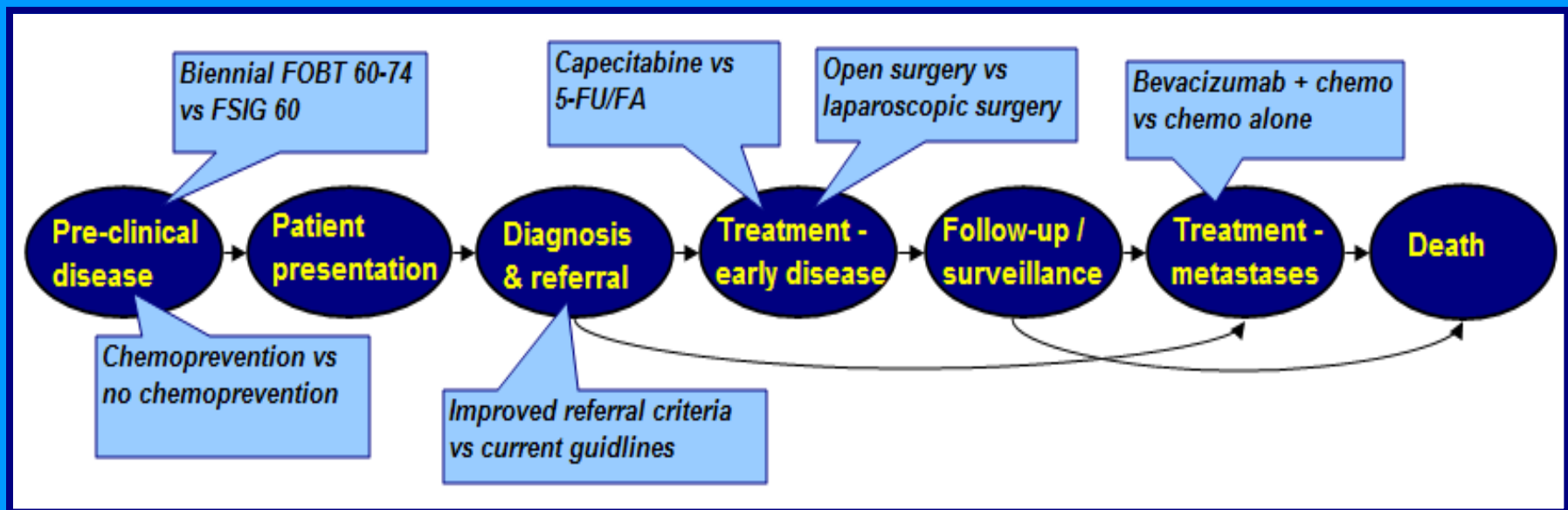
- Usefulness of models is in part determined by the scope of the decision it is intended to inform.
- Single isolated point versus whole pathway model.





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A lot of effort – so why bother?

- Framework to allow evaluation of any intervention at any point in a disease/treatment pathway.
- Consistent underlying worldview of disease and treatment systems across all evaluations
- Capture knock-on impacts both upstream and downstream
- Flexibility in terms of resource allocation decision rules
 - Piece-wise cost-effectiveness analysis
 - Combined investment/disinvestment approach - PBMA, BSG
 - Disease-level constrained optimisation - using evolutionary programming (e.g. GAs) to search for best service configurations in defined set



Methods framework

- 3 basic framework principles
 1. Ensure model boundary breadth captures all relevant aspects
 - From preclinical disease through to presentation, referral, diagnosis, staging, early treatments, follow up, treatment of potential metastases, end-of-life care and eventual death
 2. Ensure transferability of decision node to any point in model
 - Enable comparison of alternative service configurations
 3. Model events, costs and outcomes in a dependent fashion
 - Disaggregate the consequences of specific interventions



Guideline scope

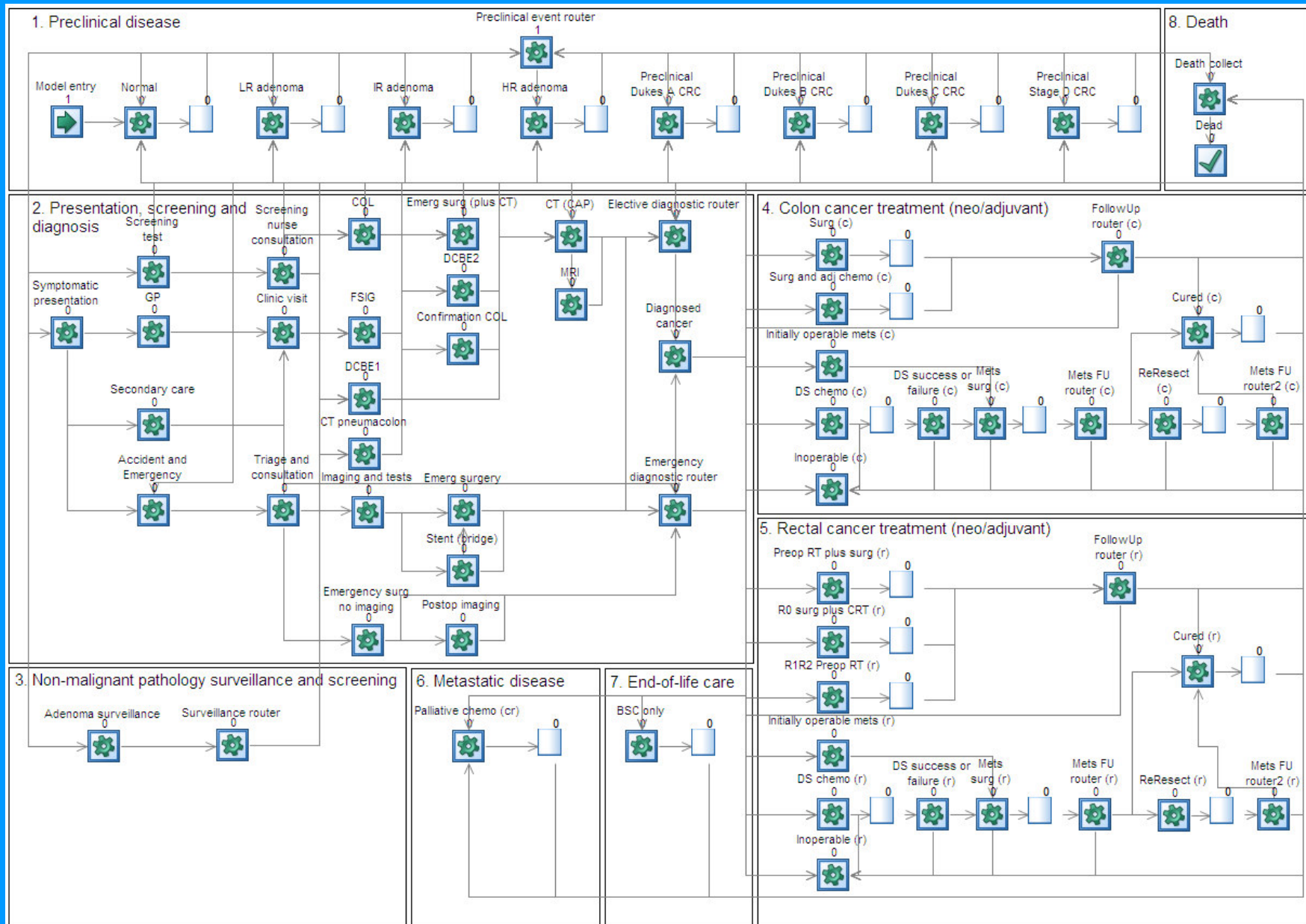
- Diagnostic modalities/sequences
- Management of suspected obstruction
- Pre-operative staging
- Stenting (bridge to surgery)
- (Neo-)adjuvant radiotherapy/chemotherapy
- Imaging for detection of hepatic/extrahepatic metastases
- Follow-up schedules
- Palliative chemotherapy
- Patient support

- Screening & increased-risk outside of remit



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A Whole Disease Model for bowel cancer





Conclusions so far...

- Feasible...subject to certain simplifications.
- Hard...but not impossibly so.
- Valuable...but not perfect.
- Non-trivial investment of time and resource at outset. But the longer-term payoff may be considerable.
- Value of approach particularly apparent in supporting guidelines and PCT commissioning.