EHMA 2025

Taking action to improve health for all

Early economic evaluation to develop & manage health services

Experience of an Action Learning Set within an Australian Local Hospital Network

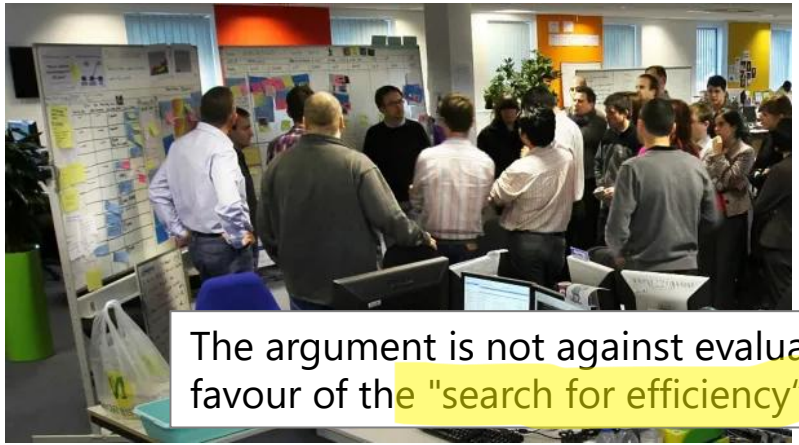
Flinders University | FHMRI

Andrew Partington
Research Fellow

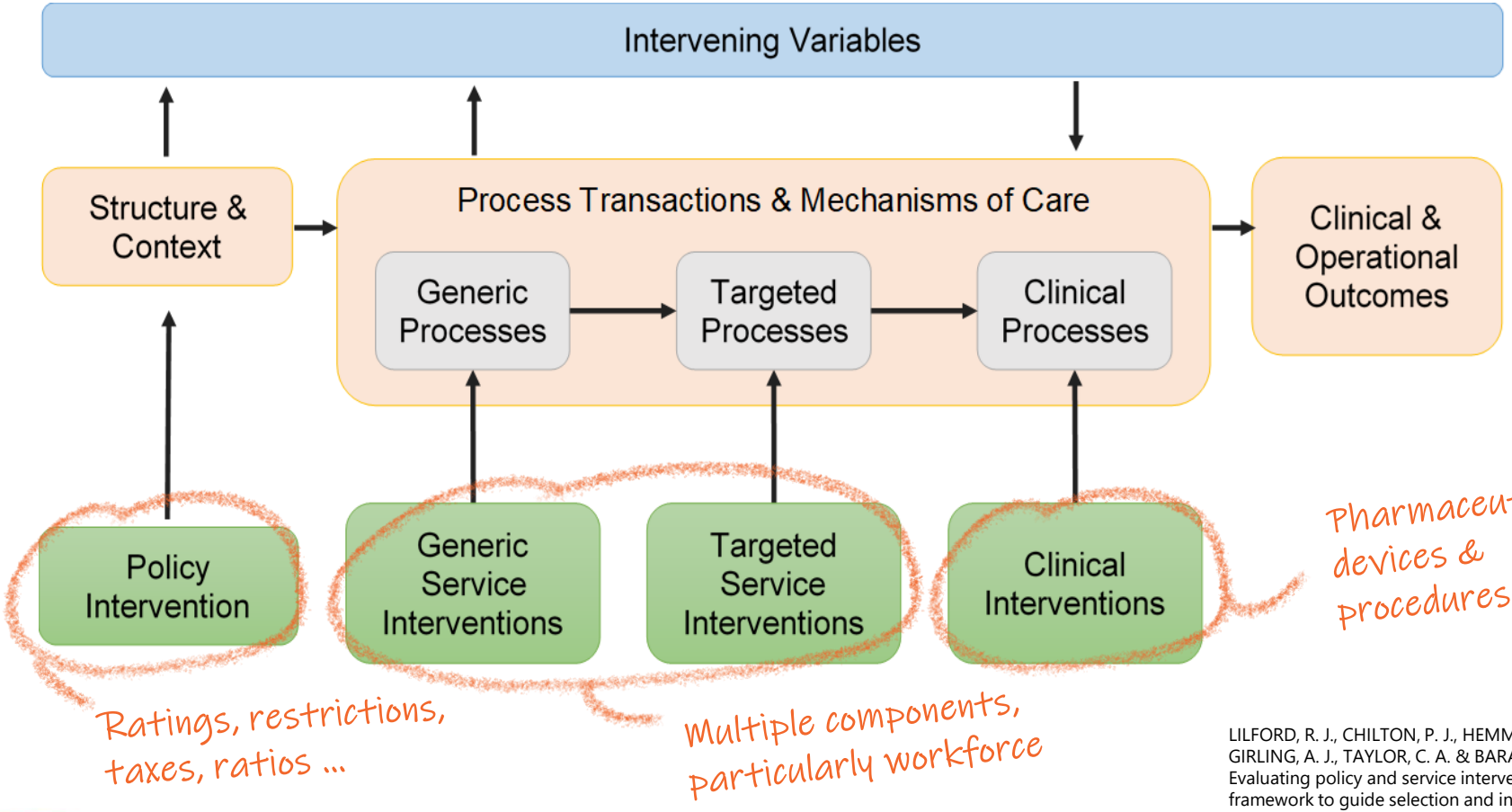
Jonathan Karnon
Professor


Adelaide, South Australia
Flinders University
Flinders Medical Centre
INDONESIA
PAPUA NEW GUINEA
PACIFIC OCEAN
EAST TIMOR
SOLOMON ISLANDS
Coral Sea
VANUATU
AUSTRALIA
NEW CALEDONIA (FRANCE)
SOUTH AUSTRALIA
ADELAIDE
CANBERRA
INDIAN OCEAN
Tasman Sea
NEW ZEALAND
ARCHITECTURAL IMPRESSION

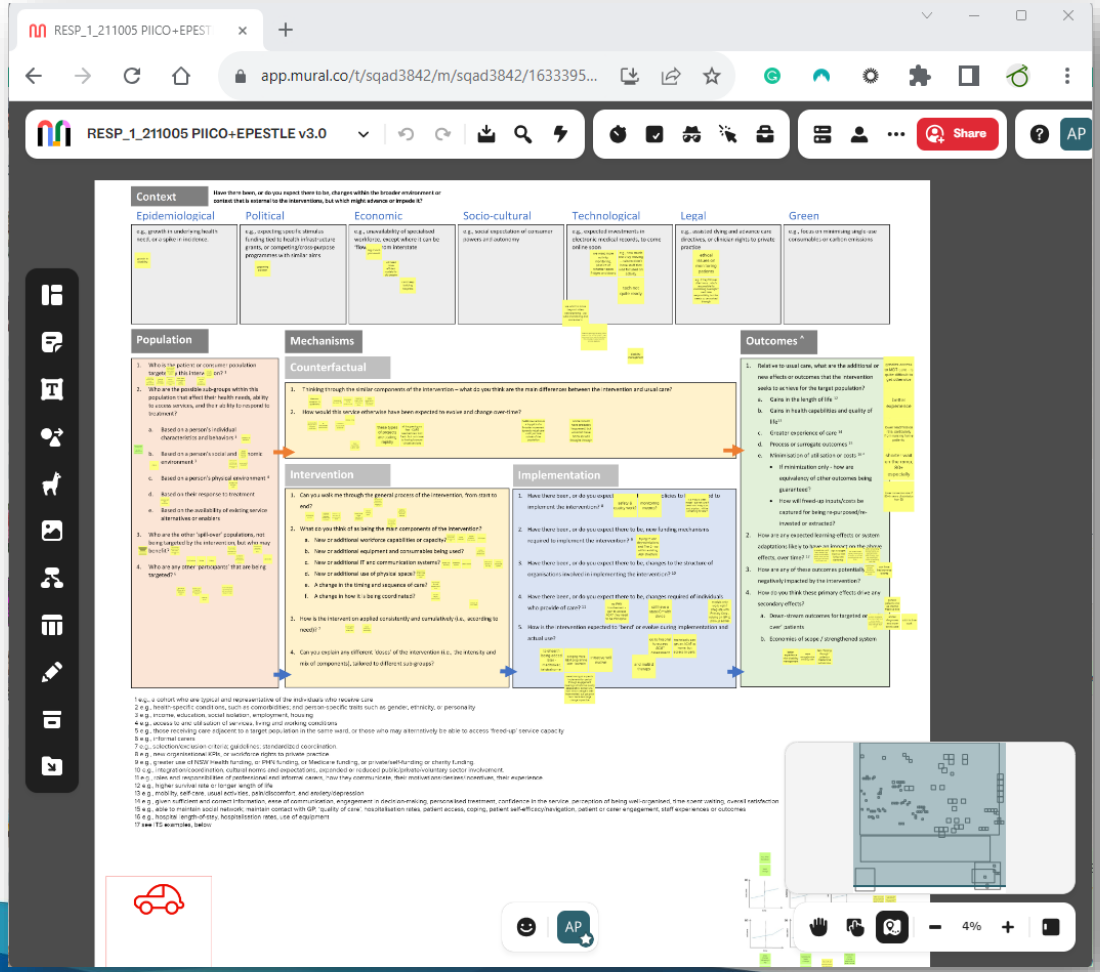
Health Technology Assessment (HTA) colleagues have become obsessed by technology adoption questions and have largely ignored 'technology management' questions - Bryan, Mitton, & Donaldson (2014)



The argument is not against evaluating new technologies but in favour of the "search for efficiency" - Scotland & Bryan (2017)

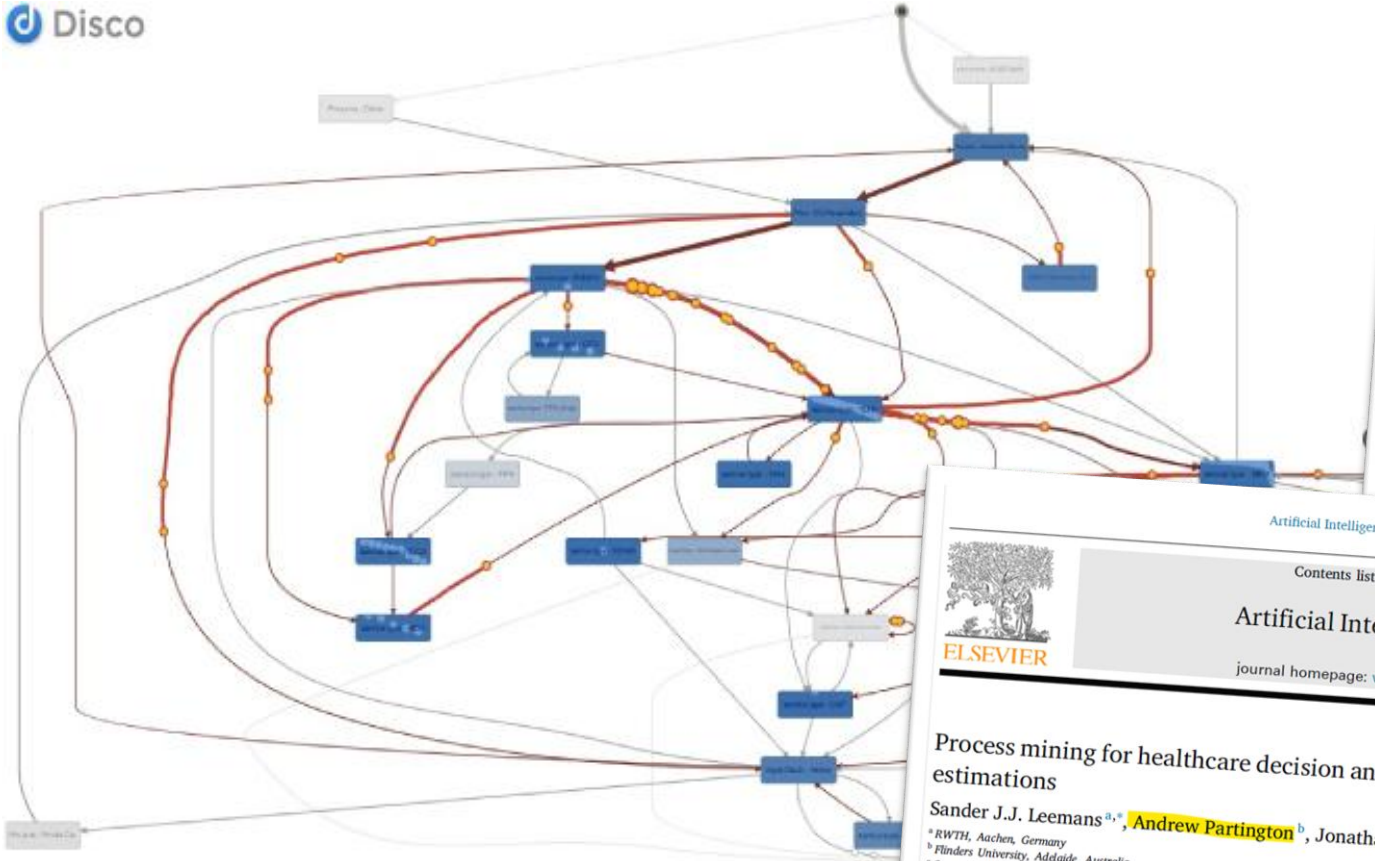


LILFORD, R. J., CHILTON, P. J., HEMMING, K., GIRLING, A. J., TAYLOR, C. A. & BARACH, P. 2010. Evaluating policy and service interventions: framework to guide selection and interpretation of study end points. *BMJ,* 341**,** c4413.



- Virtual whiteboard sessions to capture the PICO logic.
- The logic behind how the intervention was expected to work, for whom, in which contexts, and why.
- From this we can structure decision-analytic models and economic evaluations.
- Is a living document of ‘shared understanding’ – helps set bounds of the evaluation.

Disco



Artificial Intelligence In Medicine 135 (2023) 102473

Contents lists available at ScienceDirect

Artificial Intelligence In Medicine

journal homepage: www.elsevier.com/locate/artmed

Process mining for healthcare decision analytics with micro-costing estimations

Sander J.J. Leemans [a,*], Andrew Partington [b], Jonathan Karnon [b], Moe T. Wynn [c]

[a] RWTH, Aachen, Germany
[b] Flinders University, Adelaide, Australia
[c] Queensland University of Technology, Brisbane, Australia

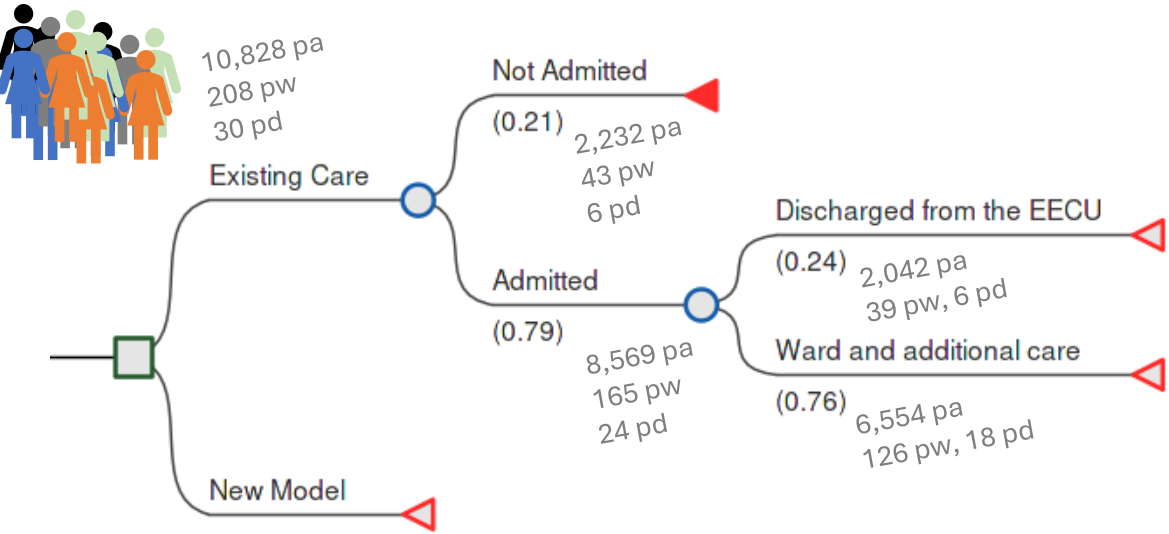
ARTICLE INFO

Keywords:
Process mining
Decision analytics
Healthcare economics

ABSTRACT

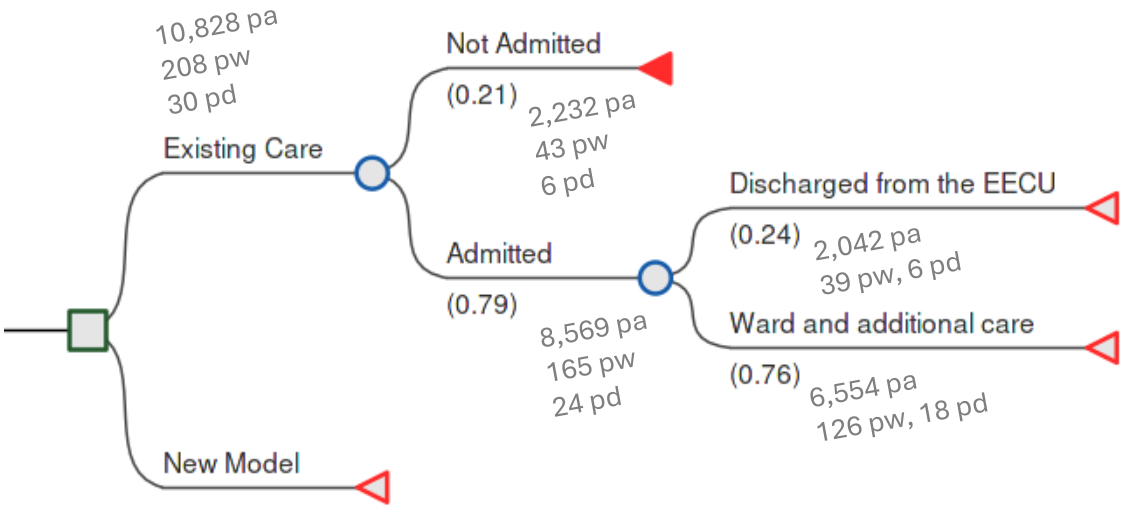
Managing constrained healthcare resources is an important and inescapable role of healthcare decision makers. Allocative decisions are based on downstream consequences of changes to care processes: judging whether the costs involved are offset by the magnitude of the consequences, and therefore whether

65+y, via Ambulance, Triaged 3-5



	ED ALOS (Hours)	Inpat ALOS (Days)	Financial Gap	ED Re-Pres Rate
Not Admitted	5.6	-	-	0.22
Discharged from the EECU	4.1	0.3	405	0.20
Ward and additional care	5.4	4.1	-771	0.14

65+y, via Ambulance, Triaged 3-5

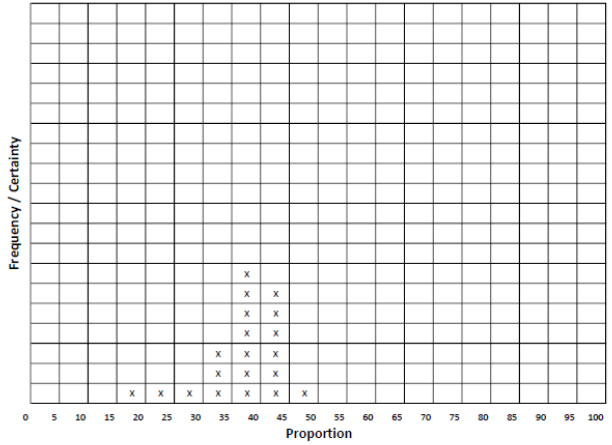


	ED ALOS (Hours)	Inpat ALOS (Days)	Financial Gap	ED Re-Pres Rate
	5.6	-	-	0.22
	4.1	0.3	405	0.20
	5.4	4.1	-771	0.14

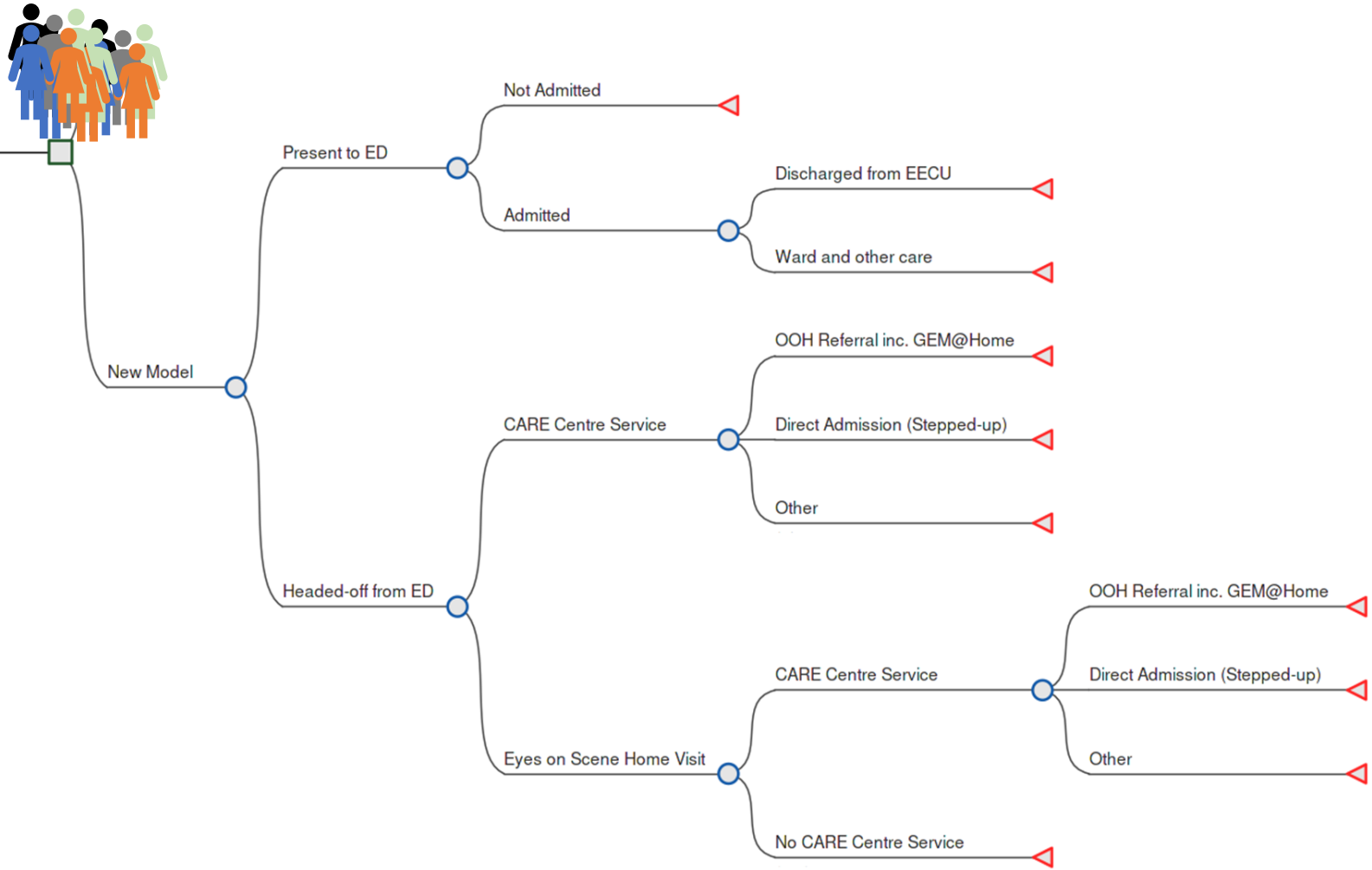
Expert elicitation

Where there's no, biased, or non-generalisable data and evidence …

*Elicitation as a formal way to translate implicit **knowledge**, **interpretations** and **expectations** into a statistical format*



Capturing **uncertainty** and **disagreement**, so that it can be modelled


New Model
Present to ED
Not Admitted
Admitted
Discharged from EECU
Ward and other care
Headed-off from ED
CARE Centre Service
OOH Referral inc. GEM@Home
Direct Admission (Stepped-up)
Other
Eyes on Scene Home Visit
CARE Centre Service
OOH Referral inc. GEM@Home
Direct Admission (Stepped-up)
Other
No CARE Centre Service

New Model

Present to ED

Not Admitted

Admitted

Discharged from EECU

Ward and other care

Headed-off from ED

CARE Centre Service

OOH Referral inc. GEM@Home

Direct Admission (Stepped-up)

Other

Eyes on Scene Home Visit

CARE Centre Service

OOH Referral inc. GEM@Home

Direct Admission (Stepped-up)

Other

No CARE Centre Service

New Model

Present to ED

Not Admitted

Admitted

Discharged from EECU

Ward and other care

Headed-off from ED

CARE Centre Service

OOH Referral inc. GEM@Home

Direct Admission (Stepped-up)

Other

Eyes on Scene Home Visit

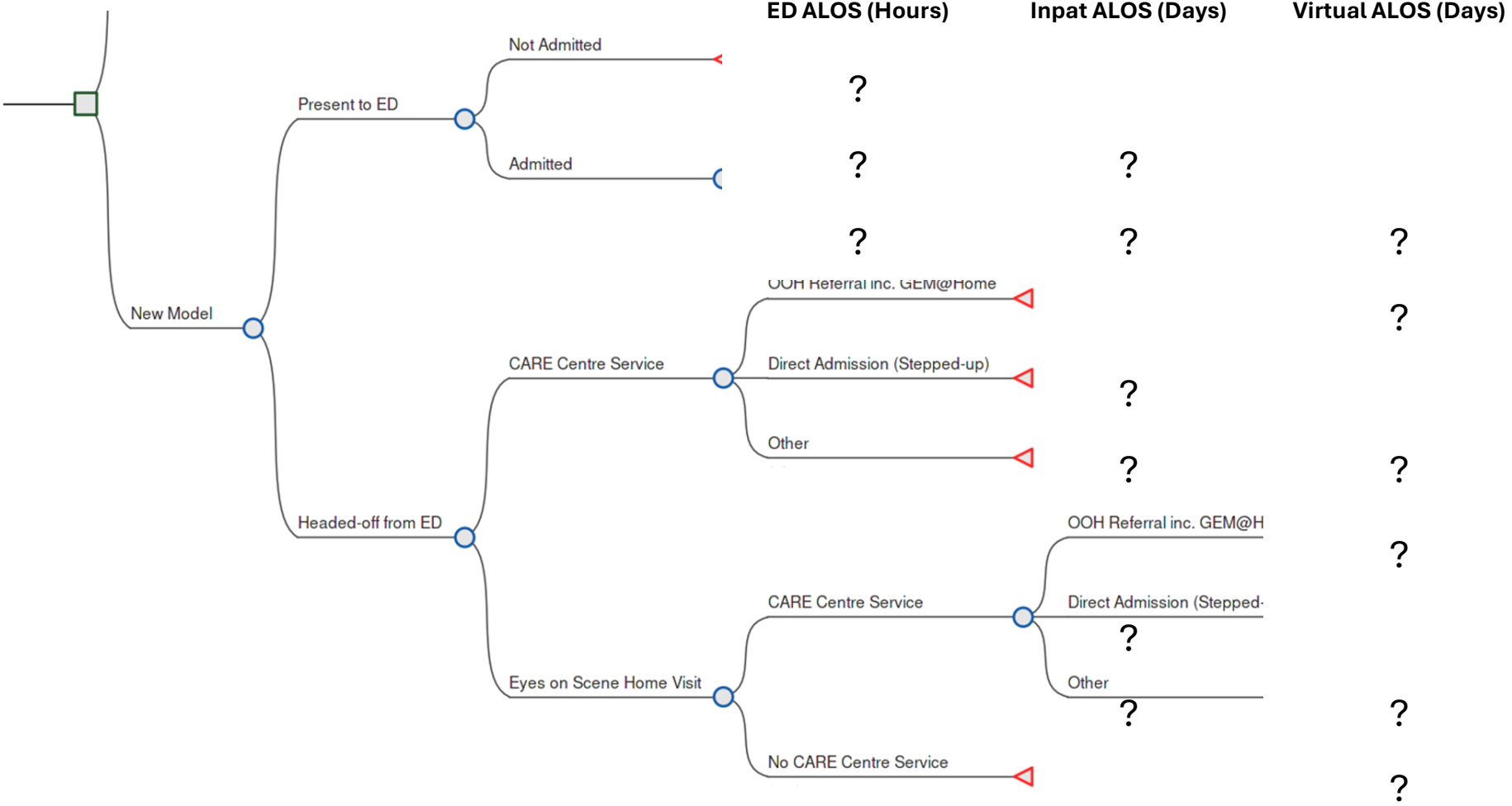
CARE Centre Service

OOH Referral inc. GEM@Home

Direct Admission (Stepped-up)

Other

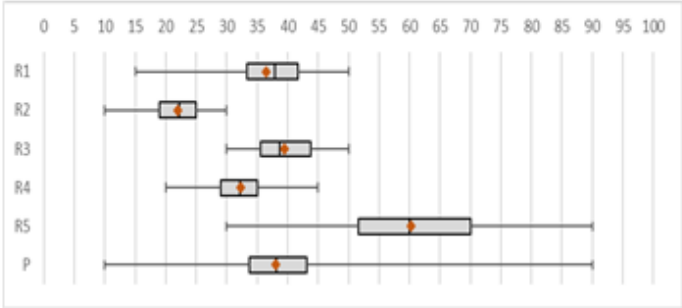
No CARE Centre Service


ED ALOS (Hours)
Inpat ALOS (Days)
Virtual ALOS (Days)
Not Admitted
Present to ED
Admitted
New Model
OOH Referral inc. GEM@Home
CARE Centre Service
Direct Admission (Stepped-up)
Other
Headed-off from ED
OOH Referral inc. GEM@H
CARE Centre Service
Direct Admission (Stepped-
Eyes on Scene Home Visit
Other
No CARE Centre Service
?

Feeding back causal reasoning

Of those who would otherwise present to the ED, but would not be admitted

What % or proportion would you expect to be 'headed-off from the ED' *via the Care Centre* ?

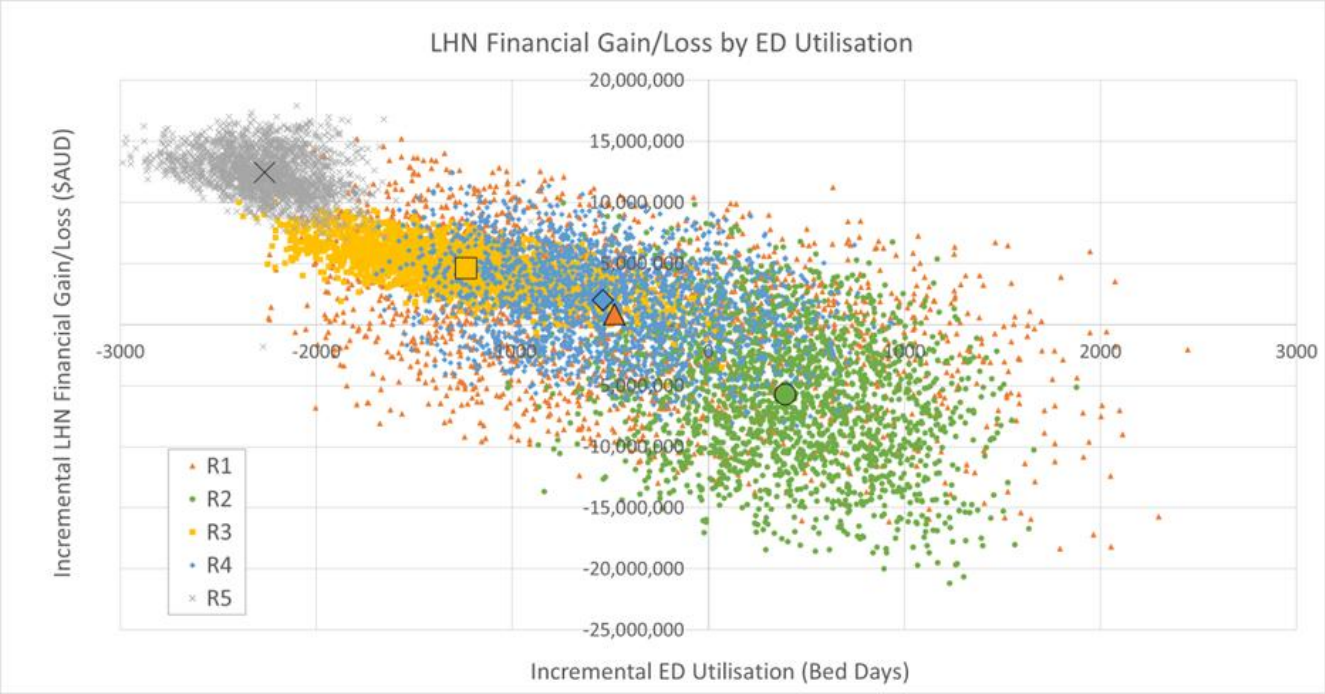


	Minimum possible	Most likely (average)	Maximum possible
Your original estimates:	15	37	50
Updated estimates?			

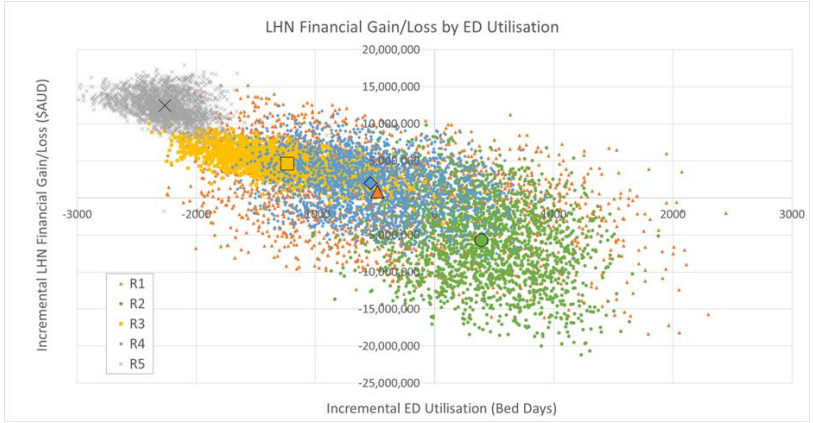
Themes of thoughts expressed aloud by respondents during the exercise:

Patient group	Existing care context	Early trialling of intervention	Adaptations to intervention	External factors and confounders
• In practice, the CARE population is an older subset of the pre specified 65yo+ target population (~80yo). • Often those who would be in 'grey zone' between needing short admission vs. could be discharged from ED. • The older and more fragile you get, the more likely you are to get admitted – not for long, but still get admitted.	• If not given an alternative, all CARE patients will present to an ED.	• We have some personal experience in watching the numbers. • Of 10 people in the CARE centre, about 1/3 are admitted, so they're clearly in the CARE stream. • I would have hoped we can capture most if not all of those presenting to the ED who are discharged home with simple presenting complaints and issues.		

Modelling outputs



Modelling outputs



1. -14,030 bed days of *net* savings, across the LHN due to avoided hospitalisations ✓
2. LHN services for population expected to shrink from $85.6 million in funded activity to $65.0 million ✗
3. -$20.6 million revenue reduction expected to be offset by -$26.0 million reductions in costs ✓
4. LHN expected to be +$5.4 million better off though total services for target population still expected to run at -$11 million "loss" ✗
5. The pooled expectation was a 0.75 probability that the intervention would be dominant i.e., has both a positive budget impact and saves ED bed days. ✓

✓✓✓

Stakeholders engaged in modelling to understand the drivers of value

Development & funding support

Cost Headroom

Q: “What is the maximum allowable cost (ceiling), given expected effects and funder WTP for effects?”

- LHN originally provided a financial envelope of $4.0Mpa, within which to fit a service to fix a problem.
- Given expected financial impact and bed day savings that can be repurposed (or extracted), it’s reasonable to expect the intervention’s value to the system is approx. $6.9Mpa*.

Effectiveness Legroom

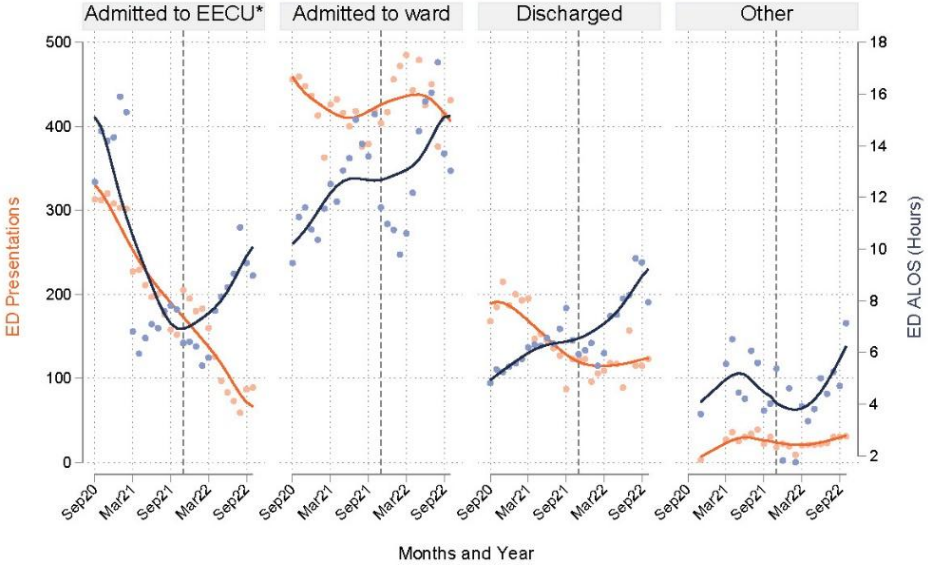
Q: “What is the minimum necessary effectiveness (floor), given the expected costs and funder WTP for effects?”

- Modelling suggested LHN intervention was expected to deliver -9,531 bed day savings.
- Given expected service costs of approx. $3.0Mpa and hypothesised WTP price of $396 per bed day, the service would need to save at least -7,319 bed days *ceteris paribus*.

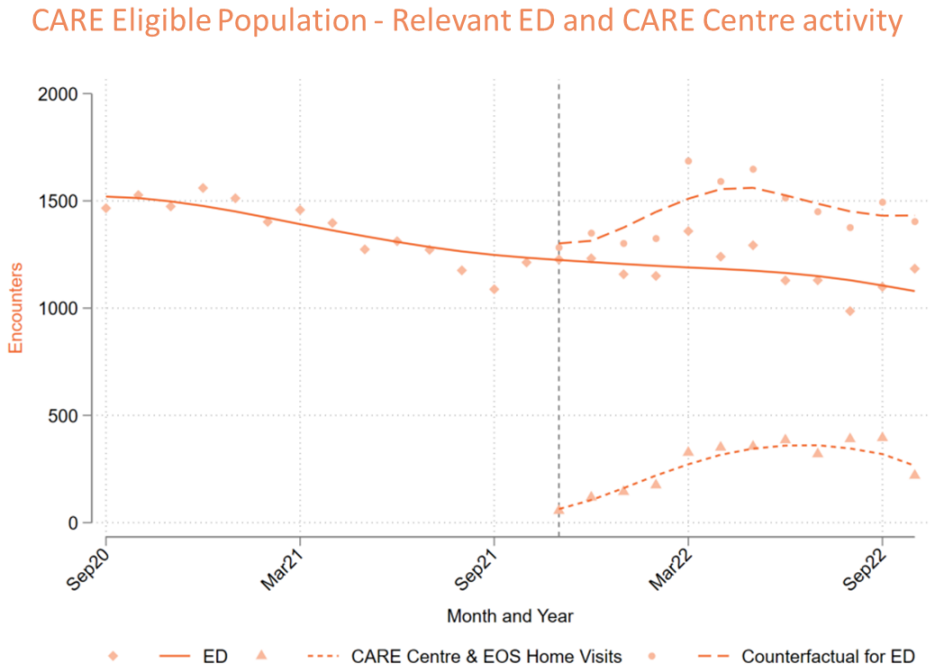
* Not suggesting LHN should capture all value, but trying to buy them some “slack”

Observational analyses *ex post*

1. The early expectations for patient volumes within the intervention arm were 15% higher than delivered in practice – not too bad.
2. Lengths of Stay within the intervention service aligned with elicited expectations.
3. Confirmation of at least non-inferior care being delivered, wrt number of days spend at home following discharge.
4. No broader observable/attributable systems effect – Intervention only a "drop in the bucket" and many confounders.



Counterfactual scenarios



1. The observed ED activity following the intervention might be -23% lower than it would have otherwise been, for the target population.
2. This suggests that -911 bed days may have been saved within the ED over 12-months
3. Using pre-intervention admission rates, there could have been +2,532 additional admissions, or +240 EECU and +14,253 ward bed days.

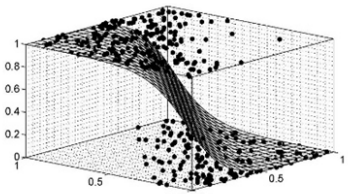
Ongoing work:
Elicitation and DES of counterfactuals

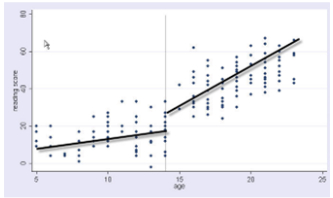
Positive

Normative

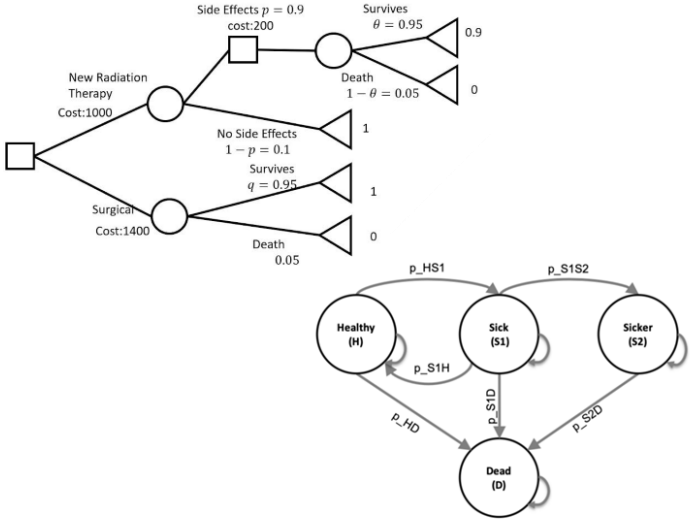
A backward ← look at ‘what was’, maybe ‘what is’ & ‘what might be’

A forward → look at ‘what could be’ and ‘what should be’, given rules





Iterative “living” analyses



Statistical modelling is important for inferring new knowledge, but often *insufficient* (incomplete) to directly inform decisions and future actions …

Mathematical (computational) modelling is necessary to profile the expected future value of decisions and actions, but *require robust evidence* to be reliable … (GIGO)

Closing reflection

“All models are wrong,

but some are useful”

George E. P. Box

“In preparing for battle I have always found that plans are useless, but planning is indispensable.”

models

modelling

~~Dwight D. Eisenhower~~

http://ijhpm.com
Int J Health Policy Manag 2021, 10(1), 36–38

doi 10.15171/ijhpm.2020.04

Commentary

IJHPM International Journal of Health Policy and Management

It’s Not the Model, It’s the Way You Use It: Exploratory Early Health Economics Amid Complexity

Comment on “Problems and Promises of Health Technologies: The Role of Early Health Economic Modelling”

Andrew Partington[1,2*], Jonathan Karnon[1]

Article History:
Received: 29 October 2019
Accepted: 7 January 2020
ePublished: 18 January 2020

Abstract

recently published in this journal, Grutters et al outline the scope and impact of their early health innovations. Their reflections shed light on ways that health economists port, towards a broader role of facilitating the healthcare services.

EHMA 2025

Connect & collaborate

We're keen to learn about your experiences

Andrew Partington
@arpartington.bsky.social

Visiting Fellow, L'École des Hautes Études en Santé Publique (EHESP)

Research Fellow, Flinders Health & Medical Research Institute, Flinders University

Honorary Fellow, Australian Institute of Health Innovation, Macquarie University

Deputy Editor, International Journal of Technology Assessment in Health Care, Cambridge University Press

Health Economics | Health Services Research | Process Mining

Health Technology Assessment | Implementation Science