



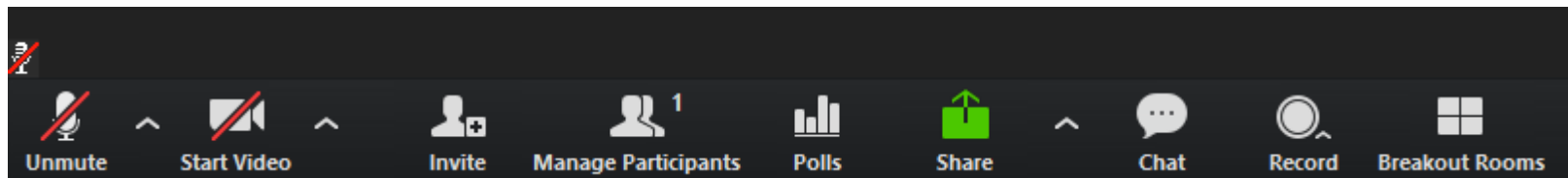
RESEARCH
ADVANTAGE

ZOOM ETIQUETTE

➤ This Education session is being recorded

➤ WELCOME

➤ Please MUTE YOUR MICROPHONE & turn off your video



HEALTH PROFESSIONALS RESEARCH EDUCATION PROGRAM –

Session 3: **ECONOMIC EVALUATION**



12.30 – 2.00pm Thursday 3 September 2020
Online via Zoom:



ACKNOWLEDGEMENT OF COUNTRY

TRADITIONAL OWNERS

The University of Newcastle acknowledges the traditional Aboriginal owners of the lands within our footprint areas:

- Awabakal Nation
- Darkinjung Nation
- Biripai Nation
- Worimi Nation
- Wonnarua Nation
- Eora Nation

Callaghan and NUSpace
Central Coast, Ourimbah Campus
Port Macquarie Campus
Williamstown Hub
Upper Hunter Hub
Sydney Campus

We also pay respect to the wisdom of our Elders past and present.



SCENE SETTING

PROFESSOR JOHN WIGGERS



Director

Hunter New England Research Office

HNELHD



Health
Hunter New England
Local Health District



Health
Central Coast
Local Health District

MS PENNY REEVES



**Health Research Economist
Hunter Medical Research Institute**

**Research Fellow
School of Medicine and Public Health
Faculty of Health and Medicine**



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Health Professionals Research Education

Applied economic evaluation

3 September 2020



Applied economic evaluation



Why including economic analyses in your evaluations of health and medical interventions will facilitate translation of your research

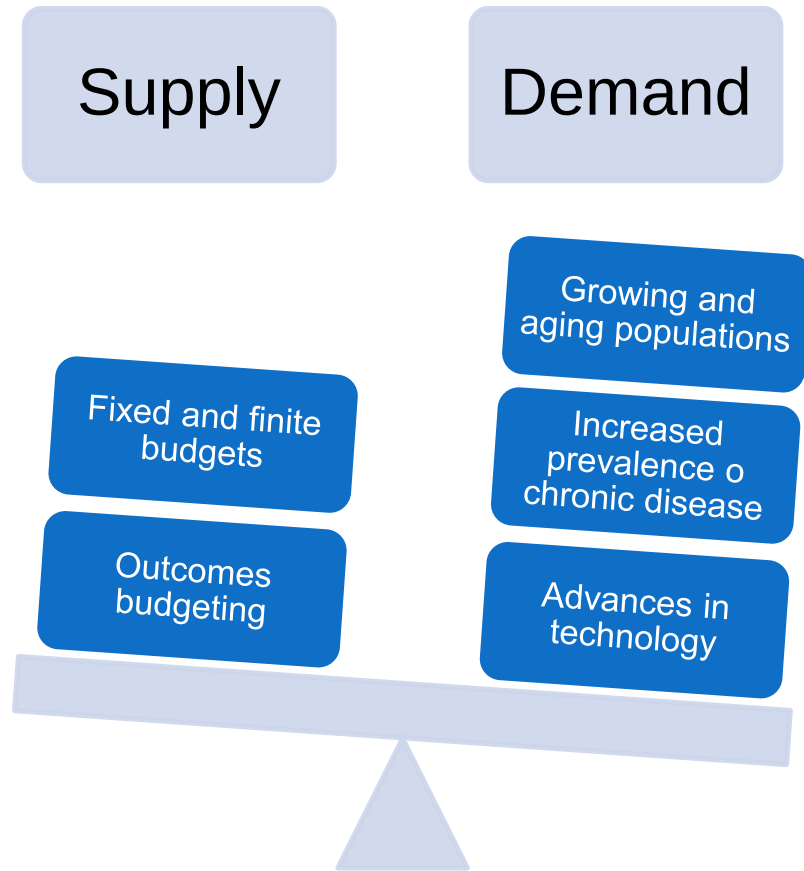


How to plan for conducting an economic evaluation and how to be an informed commissioner of economic evaluations



Common economic analysis tools, the different questions they address and associated data requirements

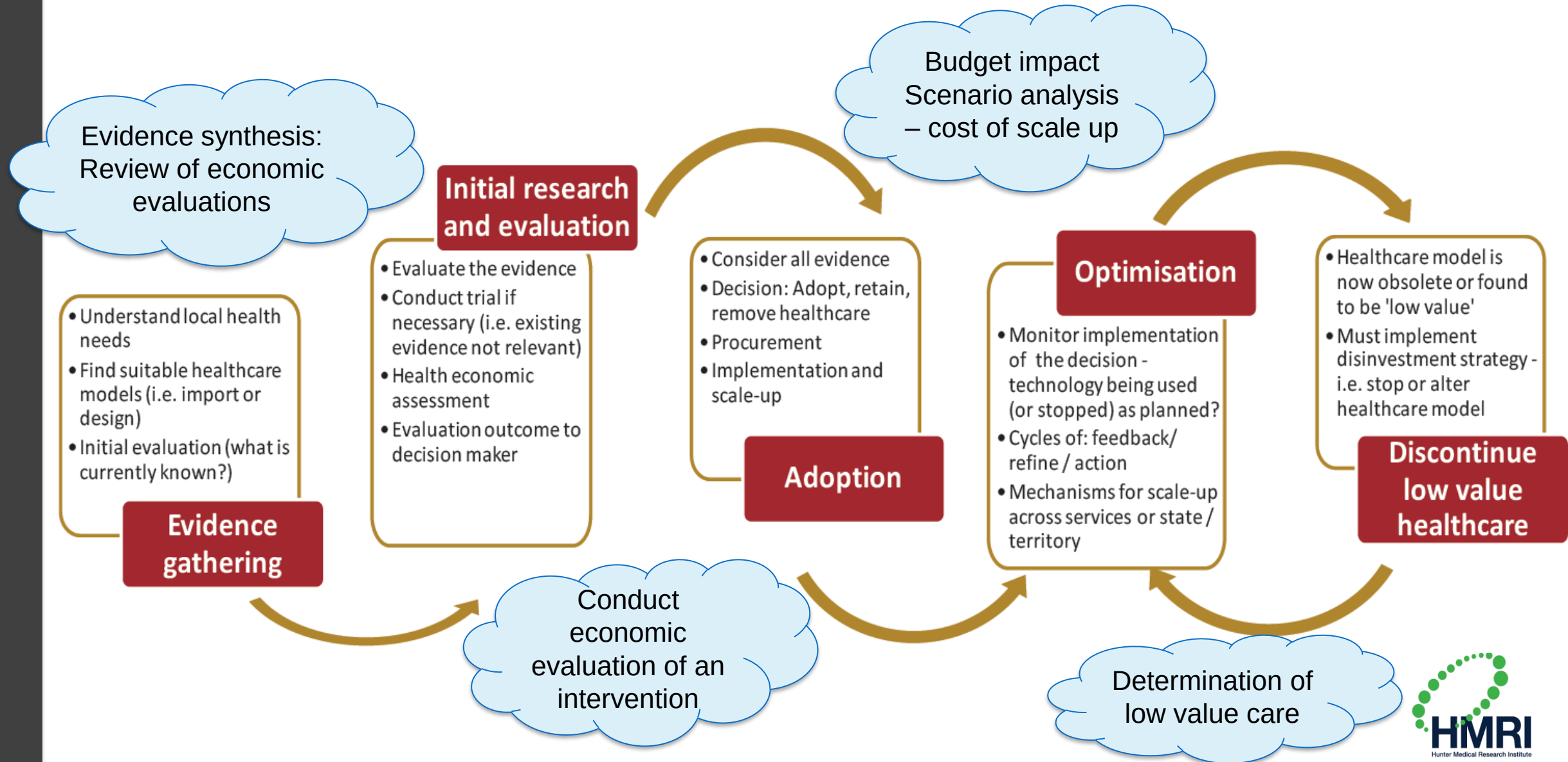
Why conduct an economic evaluation?



Healthcare decision makers need to know:

- Does the healthcare work?
- **Is it good value?**
- **Is it affordable?**

Different ways economic evaluation can be informative



Do you need an economic evaluation and how to plan for conducting an economic evaluation

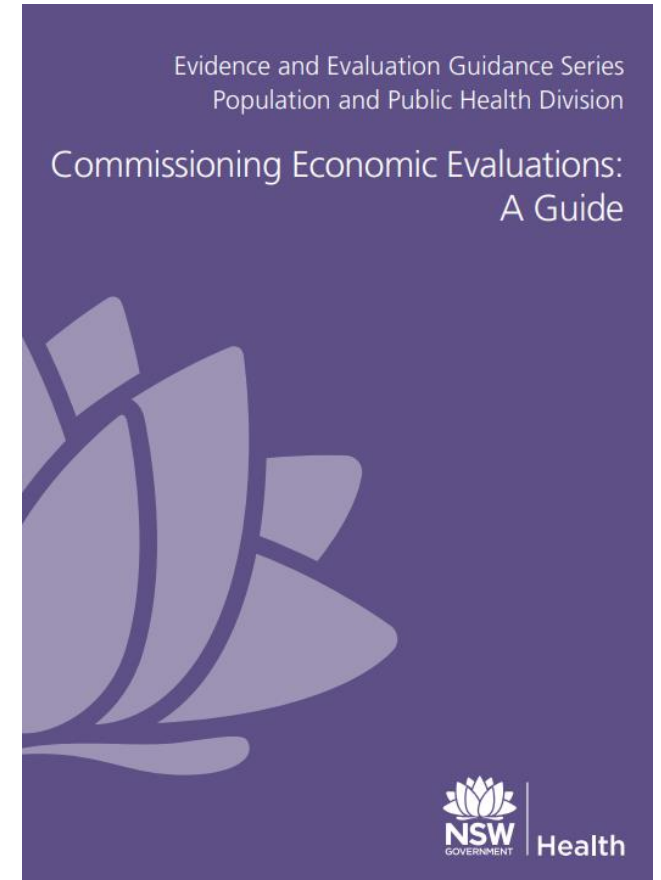
How to plan for conducting an economic evaluation

1. Think about the economic question you need to answer

- What are the end user or decision maker needs?
 - Just cost / affordability?
 - Value?
 - Return on investment?

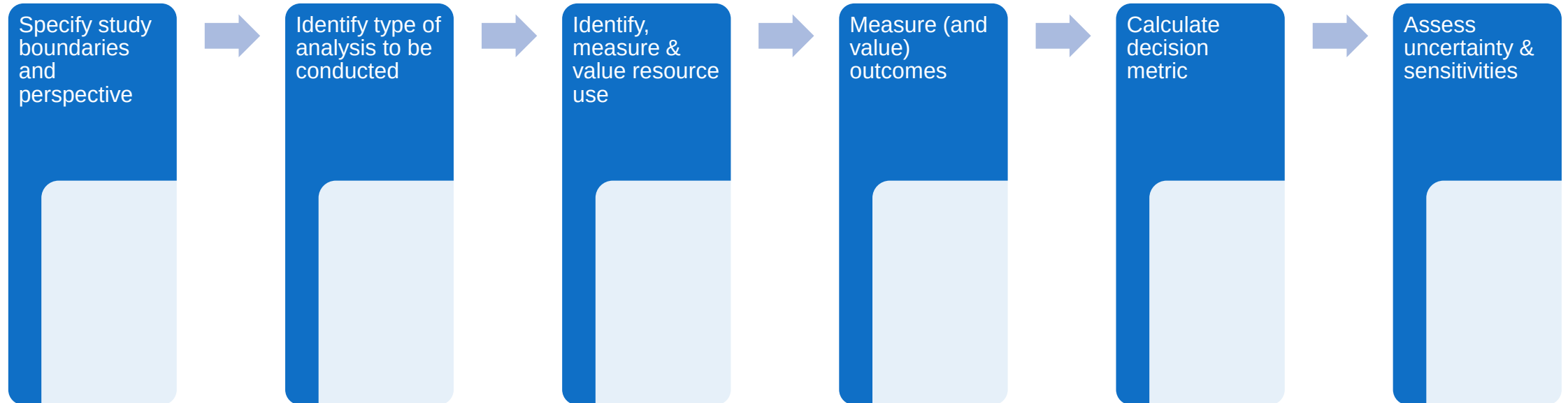
2. Obtain technical input early

- Contact Health Research Economics @ HMRI or another health economist in your network
- Trial-based economic evaluations have data requirements that must be factored into the trial design & planning



<https://www.health.nsw.gov.au/research/Publications/commissioning-economic-evaluations.pdf>

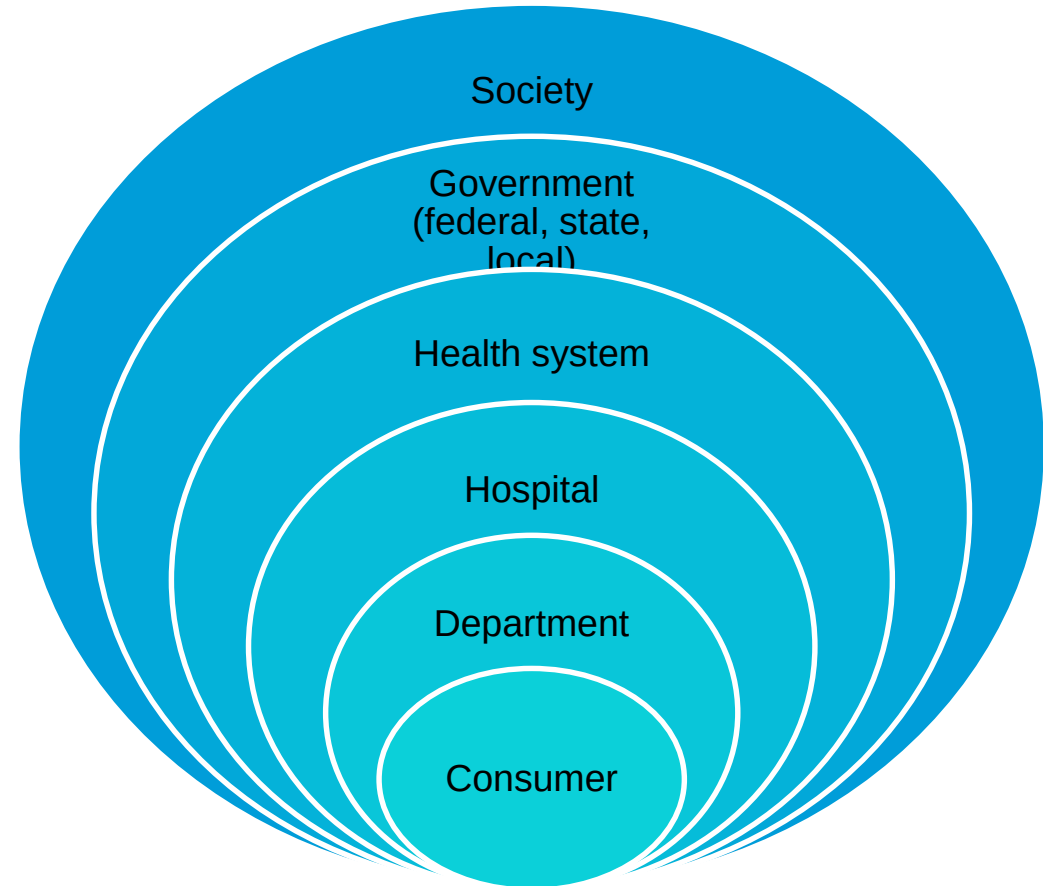
Economic evaluation steps



Economic evaluation steps

Specify study boundaries and perspective

- **Perspective**
 - Whose resources? (who bears the cost)
 - For whose benefit?
- **Time horizon**
- **Choice of comparator(s)**



Economic evaluation steps

Identify type of analysis to be conducted

Is the comparison of two or more alternatives?

Are both costs and outcomes of alternatives assessed?

	NO		YES
NO	Examines outcomes only	Examines costs only	Partial evaluation ☐ Cost-outcome description
	Partial evaluation ☐ Outcome description	Partial evaluation ☐ Cost of illness study	
YES	Partial evaluation ☐ Outcome description	Partial evaluation ☐ Outcome description	Full economic evaluation ☐ Cost-consequence analysis ☐ Cost-minimisation analysis ☐ Cost-effectiveness analysis / cost utility analysis ☐ Cost-benefit analysis

Common types of economic evaluation methods

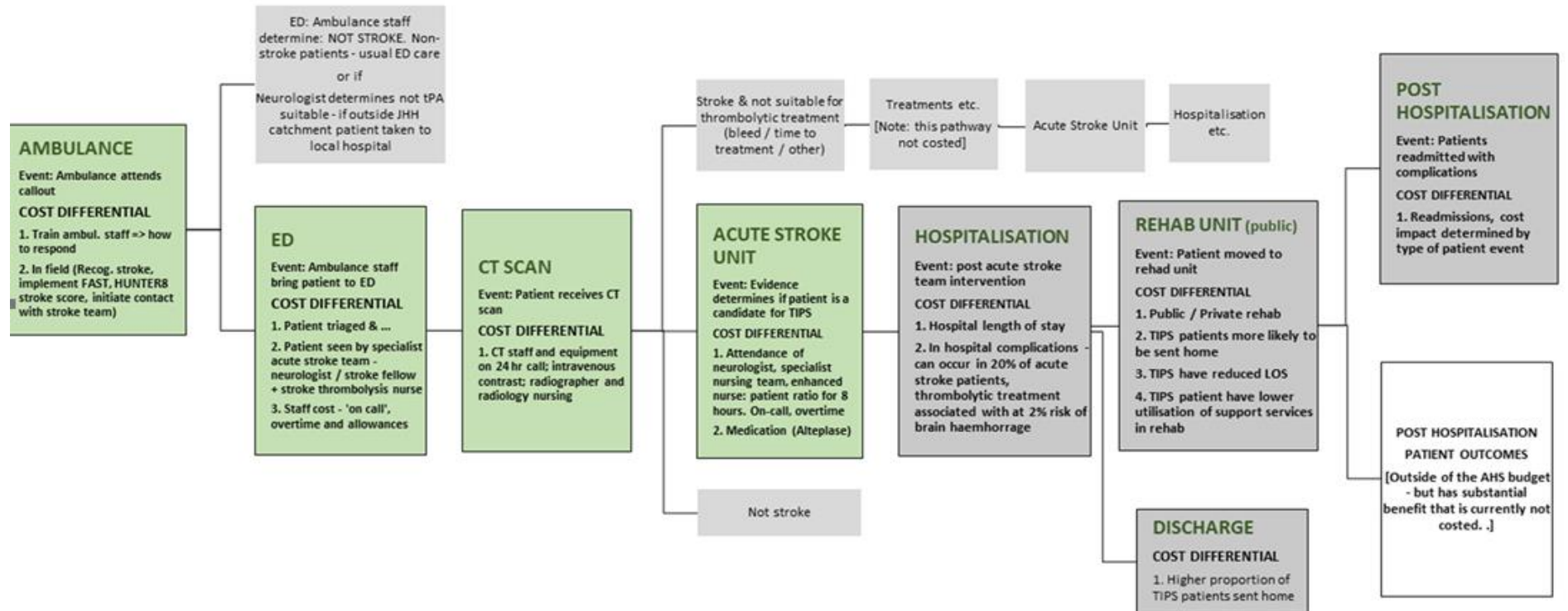
Method of analysis	Cost measurement	Outcome measurement
Cost-consequence analysis (CCA)	\$	Multi-dimensional listing of all outcomes
Cost-minimisation analysis (CMA)	\$	Equivalence demonstrated or assumed in comparative groups
Cost-effectiveness analysis (CEA)	\$	Single 'natural' unit of outcome
Cost utility analysis (CUA)	\$	Life years adjusted for quality of life (QALYS)
Cost-benefit analysis (CBA)	\$	\$

Other economic analyses

Method of analysis	Description
Budget impact analysis	Translation of the economic costs into financial terms, by budget holder
Business cases	Provides justification for undertaking a project or program by evaluating the benefit, cost and risk of alternative options and provides a rationale for the preferred option

Economic evaluation steps

Identify, measure & value resource use



Economic evaluation steps

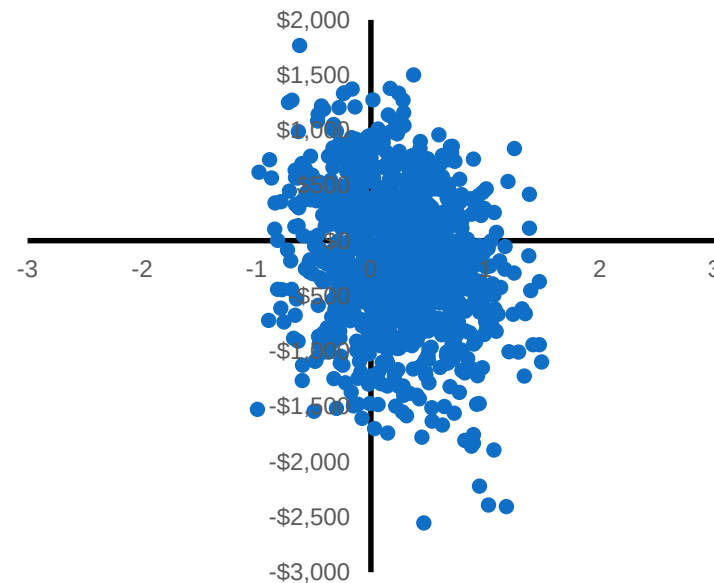
Measure (and value) outcomes

- Outcomes are typically measured via a trial
- Specific outcomes used in cost utility analyses are QALYS
 - Life years gained +
 - Quality of life measured using a multi-attribute utility instrument
- CEA and CCAs use outcomes left in natural units
- CBAs require ALL outcomes to be monetised

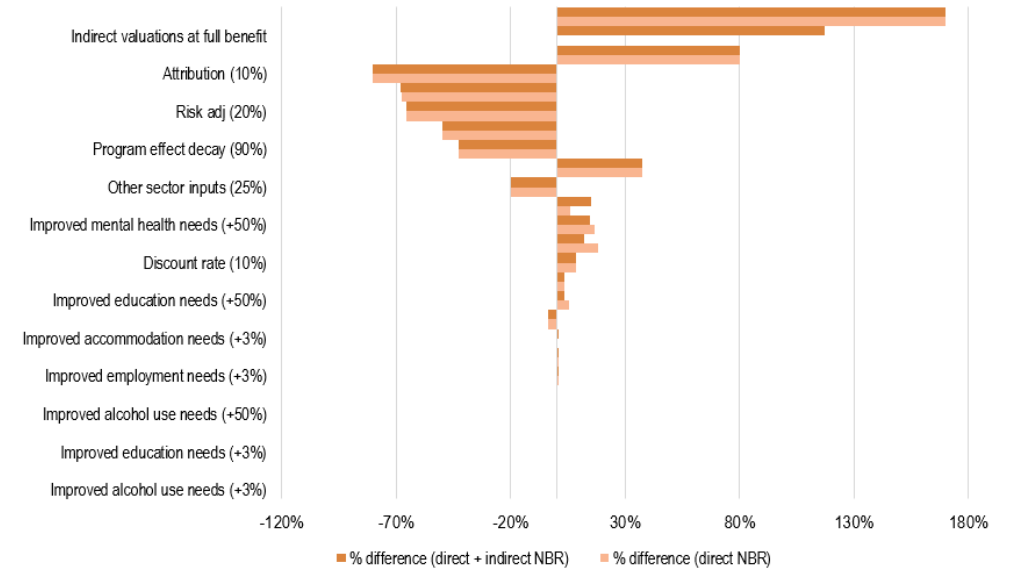
Economic evaluation steps

Assess
uncertainty &
sensitivities

Example uncertainty analysis (CEA, CUA)

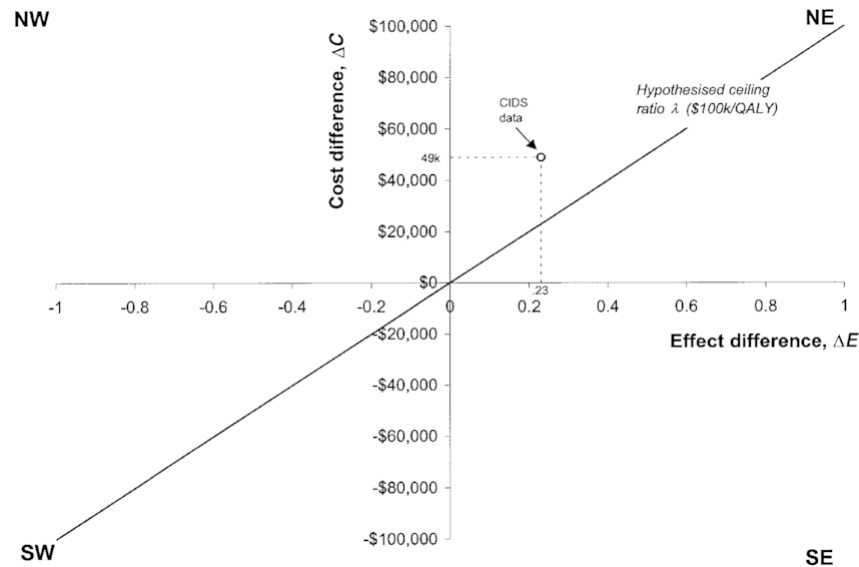


Example sensitivity analysis (ALL)



Interpreting the results of economic evaluations

- Cost effectiveness plane



- Budget impact statements

- The intervention may be efficient/equitable but can we afford it?
- BIS convert the results of economic evaluations (opportunity costs) into financial results disaggregated by different budget holders

A note on reporting (publications)

- Refer to the CHEERS Checklist (24 items)

Husereau D, Drummond M, Petrou S, et al. Consolidated health economic evaluation reporting standards (CHEERS)—Explanation and elaboration: A report of the ISPOR health economic evaluations publication guidelines good reporting practices task force. Value Health 2013;16:231-50.

<https://www.equator-network.org/wp-content/uploads/2013/04/Revised-CHEERS-Checklist-Oct13.pdf>

Items to include when reporting economic evaluations of health interventions

***Also serves as a useful guide in the planning phase

Section/item	Item No	Recommendation	Reported on page No/line No
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as “cost-effectiveness analysis”, and describe the interventions compared.	_____
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	_____
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study. Present the study question and its relevance for health policy or practice decisions.	_____
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	_____
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	_____
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	_____
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	_____
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	_____
Discount rate	9	Report the choice of discount rate(s) used for costs and	_____

Useful resources

CHEERS economic evaluation reporting guidelines <https://pubmed.ncbi.nlm.nih.gov/23529982/>

NSW health Guide to commissioning economic evaluations

<https://www.health.nsw.gov.au/research/Publications/commissioning-economic-evaluations.pdf>

The Sax Institute's Translational Research Framework

<https://www.saxinstitute.org.au/wp-content/uploads/Translational-Research-Framework.pdf>

NSW Treasury Policy and Guidelines Paper NSW Government Guidelines for Economic Appraisal (TPP17-03)

NSW Treasury Policy and Guidelines Paper NSW Government Guidelines for Business Cases (TPP18-06)

NSW Treasury Outcome Budgeting overview

<https://www.treasury.nsw.gov.au/four-pillars/outcome-budgeting/outcome-budgeting>

NSW Treasury Policy and Guidelines Paper NSW Government Outcomes Budgeting (TPP18-09)

How to contact Health Research Economics at HMRI

Phone: 02 4042 0114

Email: penny.reeves@hmri.org.au

Web: <https://hmri.org.au/research-project-support/health-research-economists>

CASE STUDY 1: *Economic analysis of the Fracture Liaison Service*



Doctor Gabor Major

Director of Rheumatology in the Bone and Joint Institute of the Royal Newcastle Centre, John Hunter Hospital and Conjoint Senior Lecturer, School of Medicine and Public Health, Faculty of Health and Medicine



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Benefits and Costs of running a FLS in Australia

Gabor Major
Fiona Niddrie





10.1% of 60 years + **will** fracture

- Female - 43% (M 27%) over 50 years
- Female - 56% (M 29%) over 60 years
- 1 person hospitalised every 8.1 minutes

Post # NOF

- 20% - 25% die within 12 months
- 85% cannot walk unassisted at 6/12
- 25% require full time nursing home care

(Osteoporosis Australia 2007; Nguyen T et al, 2004)



- In 2007 health system expenditure on osteoporosis was estimated to exceed \$1.5 billion

(comparable to coronary artery disease, diabetes, depression, stroke, asthma)

- Total cost of osteoporosis in Australia, including lost productivity costs and direct health costs is \$7 billion.

ACI Musculoskeletal Network – NSW Model of Care for Osteoporotic Refracture Prevention 2011



- Globally – a major gap in detection and management of osteoporosis
- 75% Osteoporosis undiagnosed & untreated
- 50% - 60% of fracture cascade is preventable

Giangregorio L et al,2006; Nguyen T et al 2004)



The John Hunter Experience



- JHH: number of fracture patients /year,
>50 years old - 1500
- patients > 50 yrs with MTF - 1100



2007 - Osteoporosis re-fracture prevention service established,

Based on Fracture Liaison Service (FLS) model of care

Components: identification,
assessment,
education,
intervention,

Program Goals



- Identify patients over the age of 50 with minimal trauma fractures
- Investigate and treat them in order to reduce further fractures
- Follow up patients to ensure compliance





- A fracture prevention service reduces further fractures two years after incident minimal trauma fracture *Van Der Kallen et al 2014 Int J Rheum Dis 17;195-203*
- Evidence of effectiveness of a fracture liaison service to reduce the re-fracture rate *Nakayama et al 2016 Osteoporosis Int 27:873-879*

2015 Evaluation – Inter-hospital comparison study



	JHH	Comparator hospital
Health service	Hunter New England	South West Sydney
Local gov. areas	25	7
composition	Rural metropolitan	Rural metropolitan
Population	873,741	880,000
Major trauma centre for area	yes	yes
University affiliation	University of Newcastle	University of NSW

Nakayama et al Osteoporosis Int 2016 27:873-79

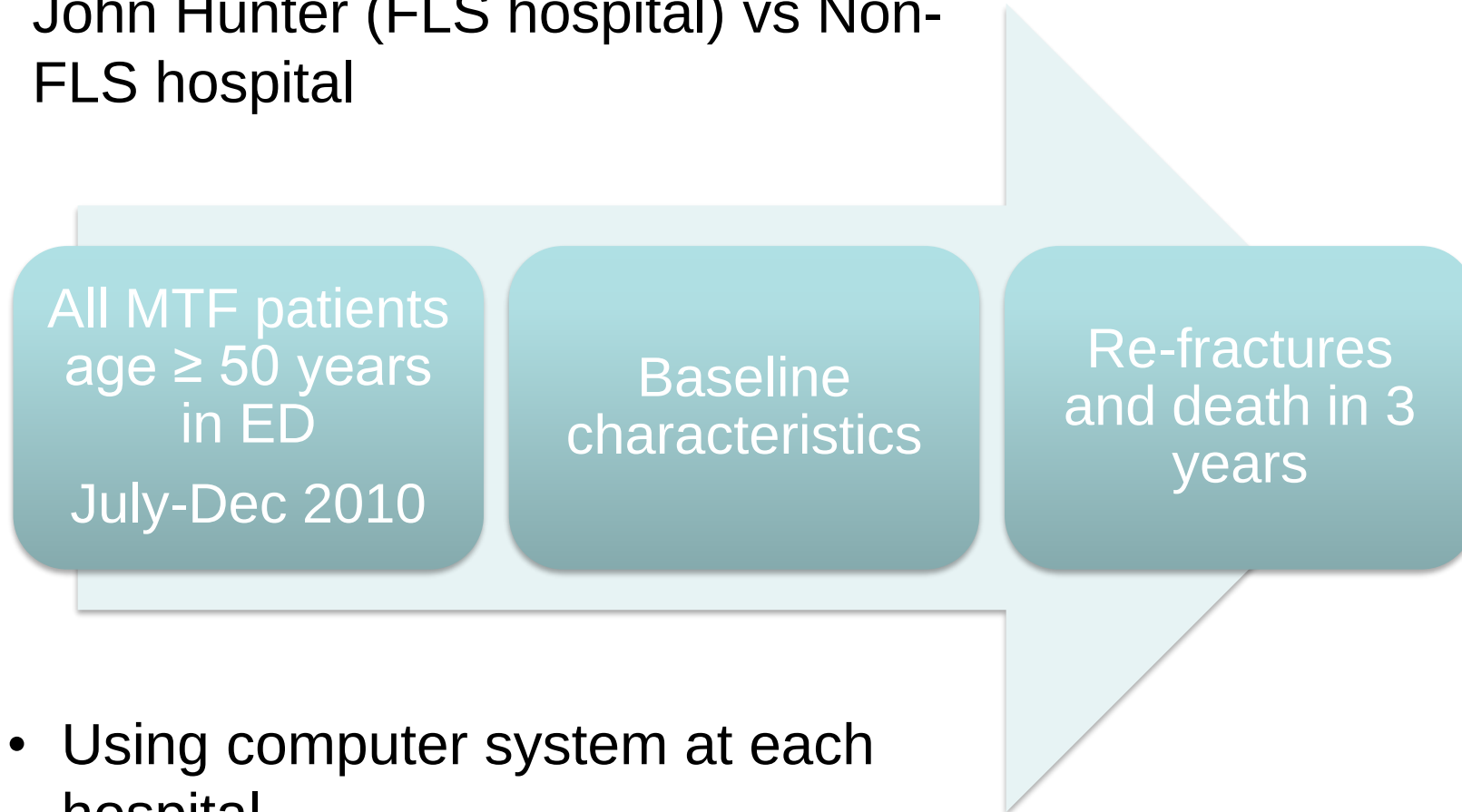


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Methods

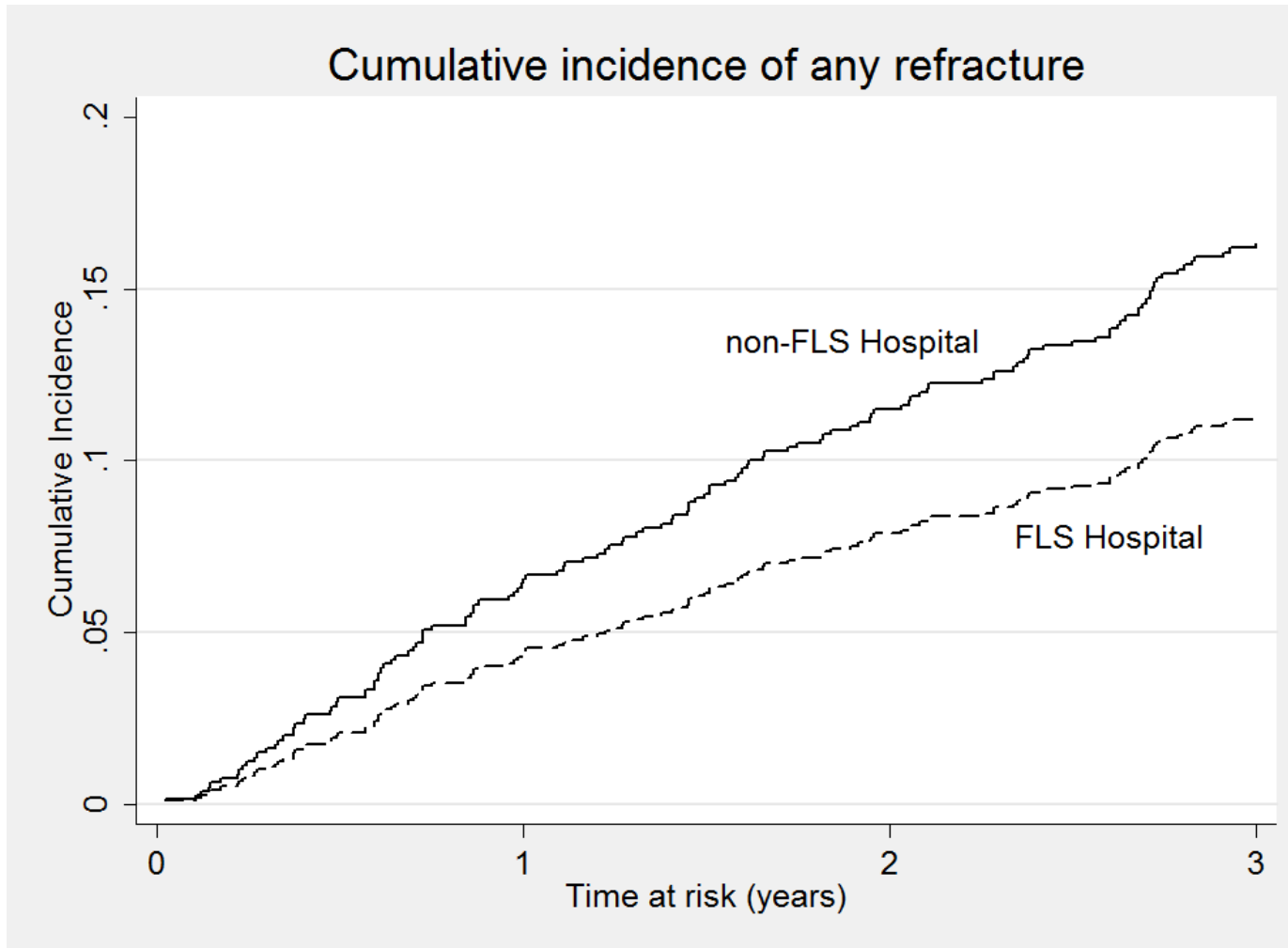


- John Hunter (FLS hospital) vs Non-FLS hospital



- Using computer system at each hospital
- Deaths confirmed with NSW Death registry

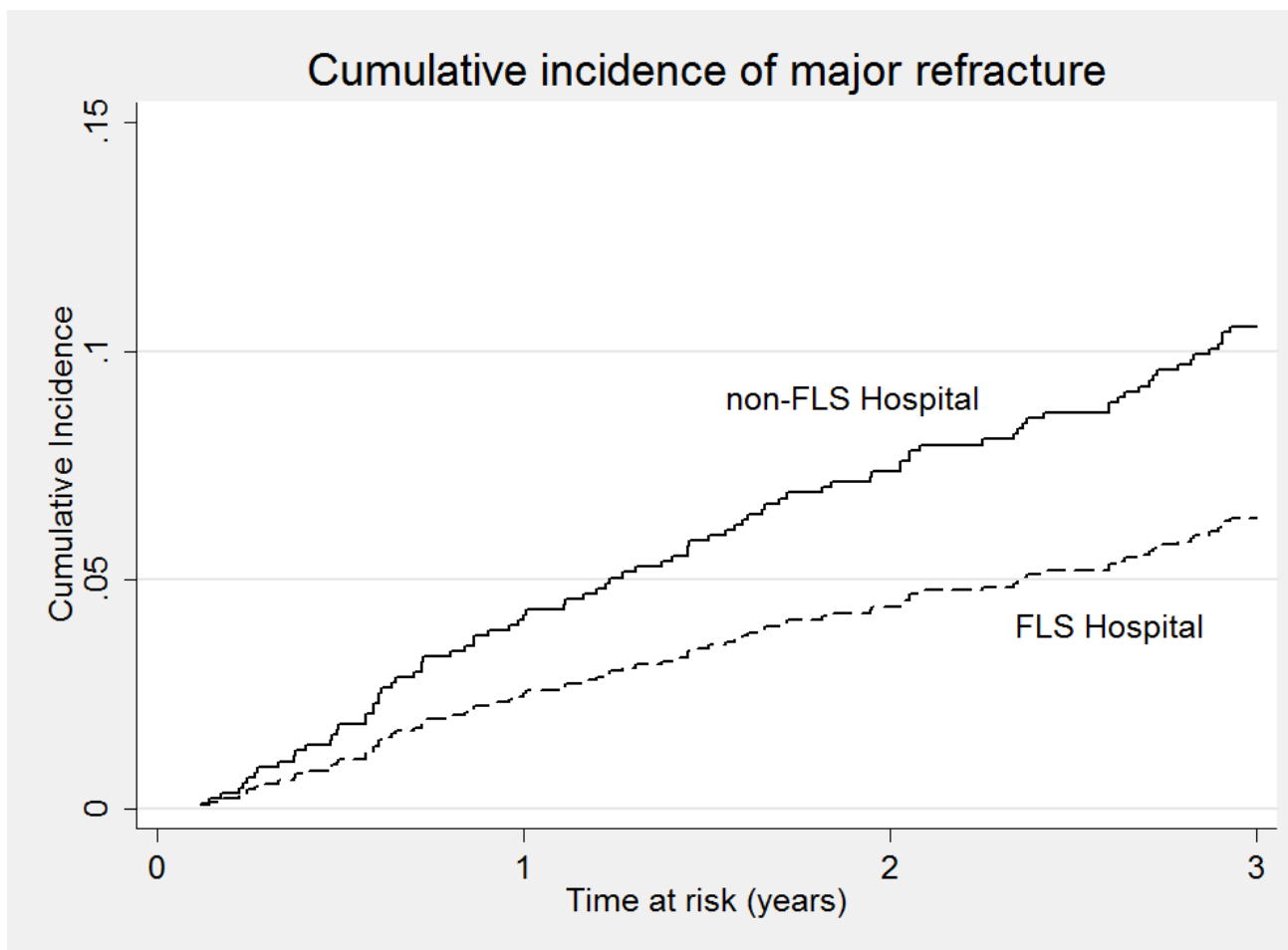
Results – Any re-fracture



Re-fracture rates:

- 16.8% at non-FLS hospital
- 12.2% at FLS hospital

Results – Major re-fracture



Re-fracture rates:

- 10.5% at non-FLS hospital
- 6% at FLS hospital



- John Hunter Hospital FLS had significantly reduced re-fracture rate compared to a similar non-FLS hospital
 - All patients ≥ 50 years with MTF, July – Dec 2010, 3 year follow up
 - ~30% reduced risk of any re-fracture
 - ~40% reduced risk of major re-fracture
 - Absolute risk reduction ~5%, NNT = 20
 - *Nakayama et al Osteoporosis Int 2016 27:873-879*



- Re-fracture reduction comparable to placebo controlled trials of anti-osteoporosis treatments
 - RR 40-60% for vertebral, 20-40% for non-vertebral fracture (Crandall 2014)
- 5% absolute risk reduction, number needed to treat 50, similar to statin therapy
 - NNT 55 to prevent 1 major cardiovascular disease in 5 years (Taylor 2014)



- Strengths
 - Large numbers allowing examination of re-fracture outcomes
 - Intention to treat analysis, inclusion of all patients with MTF
- Limitations
 - Limited data obtainable from hospital computer systems
 - Potential unidentified differences in study groups



What about the costs ?



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- AIMS

To determine the cost running a FLS

To identify the imputed savings (if any) through reduction in refracture rate

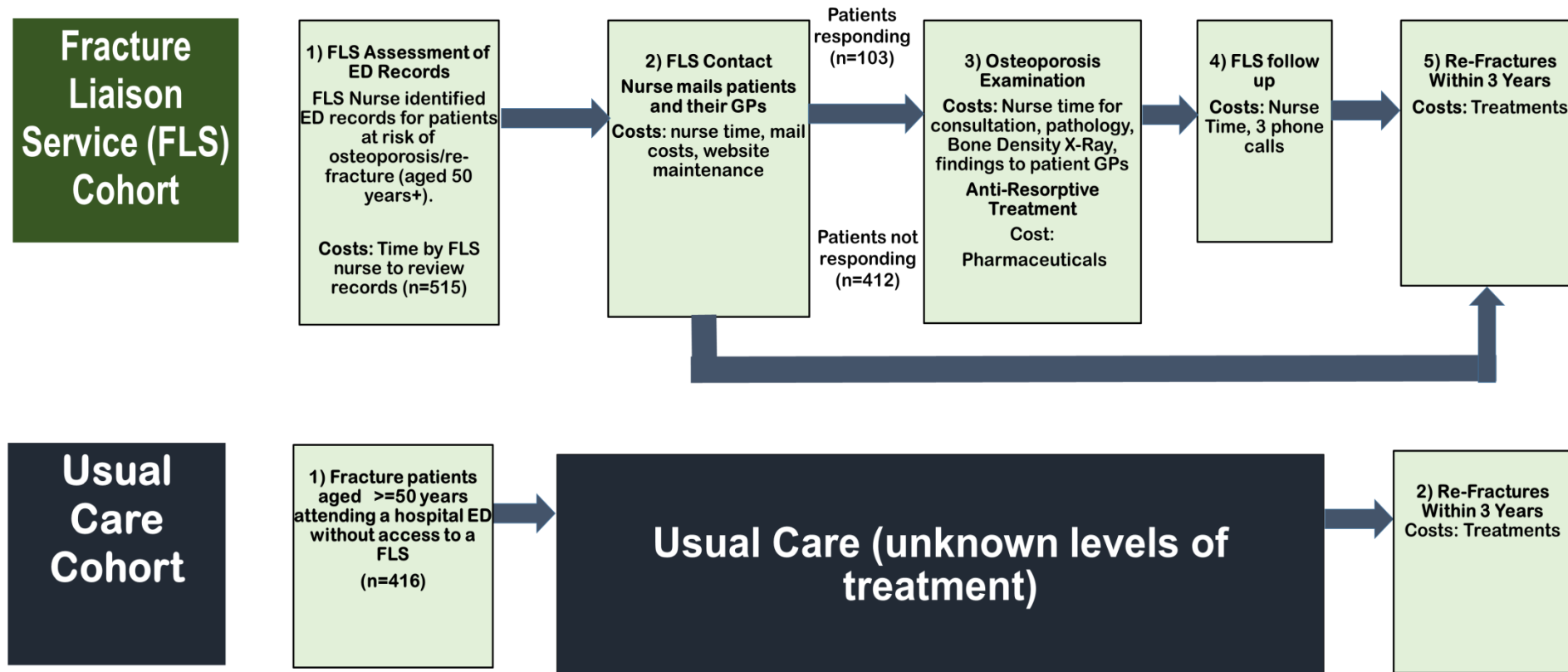
To determine the net cost to the Health Service



- Determination of Cost of FLS: - observed patient level bottom up – microcosting
- Cost of refracture management – direct cost - sourced from published data (Watt et al -2012 Aus ICUROS study)
- All costs converted and expressed in 2015/16 \$ AUS
- Total costs calculated per patient and reported at a common base of ‘per 1000’ patients

Patient Care Pathways

FLS vs Usual Care



FLS –Component Costs Summary per 1,000 processed patients



Cost Category	\$AUS
Labour (Nursing)	119,666
Office	4,720
Overheads	43,506
Clinic	83,066
Medications (3 year)	92,796
Total	343,754

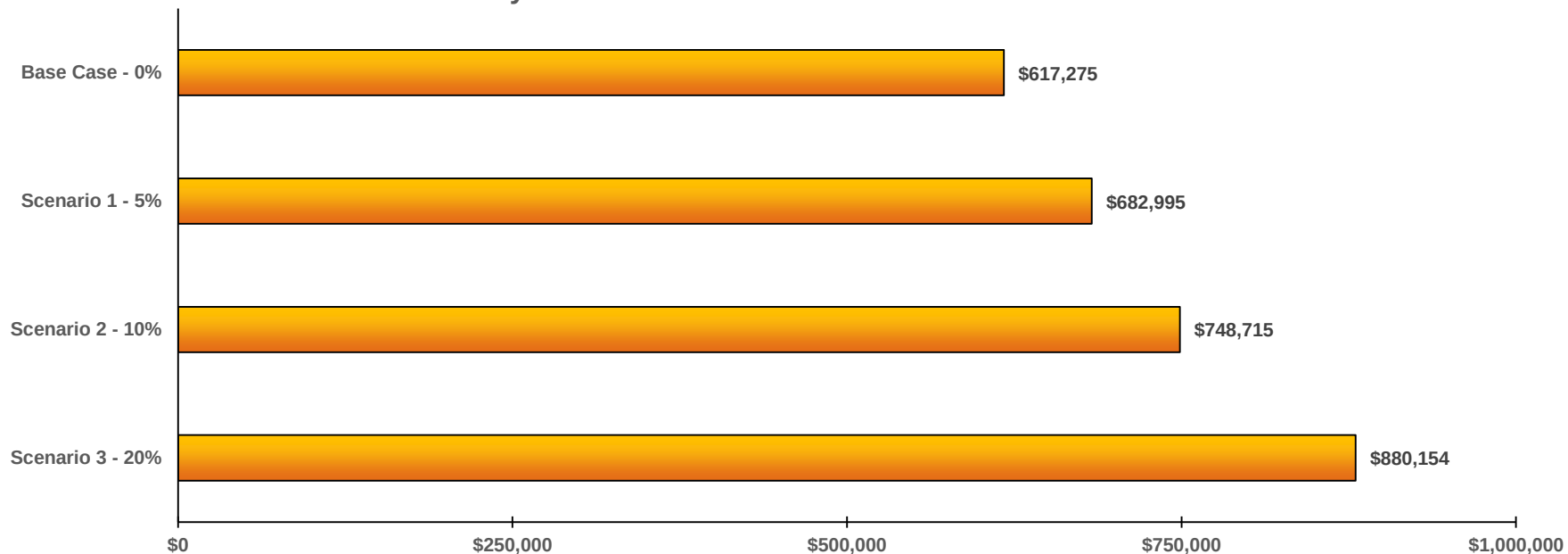
Sensitivity Analysis



FLS vs Usual Care

FLS Net Cost Savings to Health System (per 1,000 Processed Patients over 3 Years)

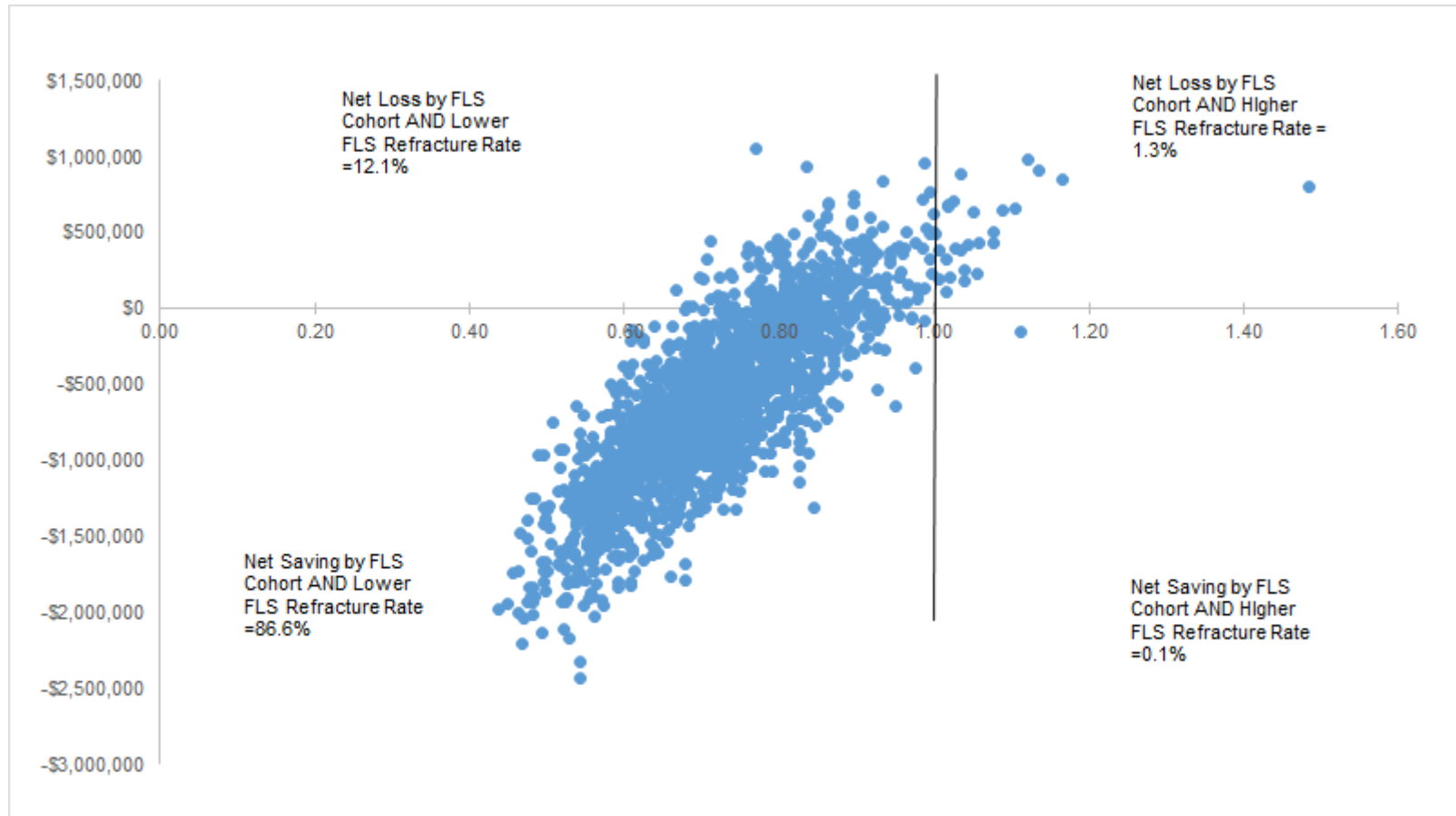
Base Case & Sensitivity Scenarios



Uncertainty Analysis – Monte Carlo simulation

Net total cost of FLS by relative 3yr refracture rate per 1,000 pts

Monte Carlo simulation : 2000 iterations





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Conclusion

A FLS generates a net opportunity cost gain of
617,000-880,000 \$AUS per 1,000 patients





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CASE STUDY 2: *Economic analysis of Screening for Pre-eclampsia*

Doctor Felicity Park, *Obstetrician, John Hunter Hospital*

Prediction and Prevention of Preterm Preeclampsia

Dr Felicity Park
Director Maternal Fetal Medicine
John Hunter Hospital



Prediction and Prevention of Preterm Preeclampsia

- Current model of ANC
- Prediction of prevention of preterm preeclampsia
- Health Economics
 - Activity Based Portal
 - Medicare
 - Cost effectiveness analysis



Case for change

Reversing the Philosophy of Antenatal Care

Current Model ANC

Increase frequency of visit
as pregnancy progresses

Designed to detect disease
when it develops

Preeclampsia

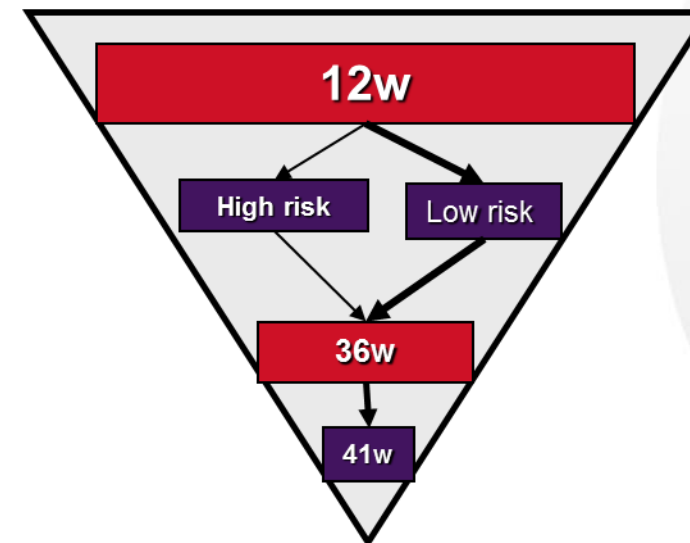
Growth restriction

Preterm birth

Maternal complications

Prepare for delivery
Time delivery

Preventative Approach



12 weeks predictive modeling for:

- Chromosomal abnormality
- Preeclampsia
- Preterm delivery
- Growth restriction
- Major structural abnormalities
- Twin complications



Case for Change Preeclampsia

2-8% of pregnancies

1/3 of the cases are preterm (0.8-1.5%)

6.6 million cases per year worldwide

1 maternal death caused by PET every 12 min

Account for 15% of premature deliveries

John Hunter Hospital 2016

<34 weeks: 44 (1.1%)

<37 weeks: 67 (1.7%)



- Growth restriction
- Perinatal death (4)
(FDIU 3, NND 1)
- Prematurity with
associated complications

- Death (1)
- Eclampsia (seizures)
- Brain Haemorrhage
- Clotting disorders
- Renal failure
- Liver failure



Long term

Women: x2 risk CVD

- Hypertension
- IHD
- Stroke
- Death

Children: x2 increase

- Cerebral Palsy
- Hypertension
- Increased BMI
- Diabetes
- Cardiovascular Dx



Case for change

ASPRE: Prevention of preterm PE



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

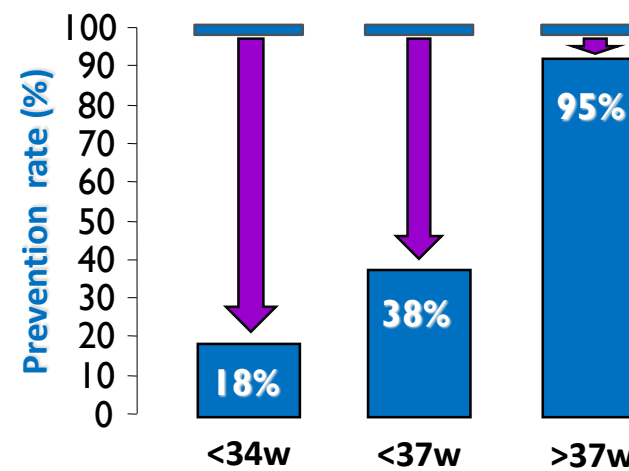
Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

Daniel L. Rolnik, M.D., David Wright, Ph.D., Liona C. Poon, M.D.,
Neil O'Gorman, M.D., Argyro Syngelaki, Ph.D., Catalina de Paco Matallana, M.D.,
Ranjit Akolekar, M.D., Simona Cicero, M.D., Deepa Janga, M.D.,
Mandeep Singh, M.D., Francisca S. Molina, M.D., Nicola Persico, M.D.,
Jacques C. Jani, M.D., Walter Plasencia, M.D., George Papaioannou, M.D.,
Kinneret Tenenbaum-Gavish, M.D., Hamutal Meiri, Ph.D.,
Sveinbjorn Gizurarson, Ph.D., Kate Maclagan, Ph.D.,
and Kypros H. Nicolaides, M.D.

PE <34 w: 1.8% vs 0.4% **82% drop**

PE <37 w: 4.3% vs 1.6% **62% drop**

PE ≥37 w: 7.2% vs 6.6% **5% drop**



July 2017

26,941 women



Antenatal Care – Shifting the focus

First trimester risk Assessment: 11⁺⁰ to 13⁺⁶

Aneuploidy Screening

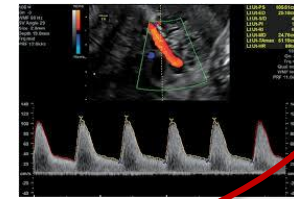
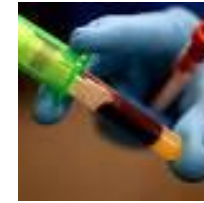


Dating
Early anatomy
Twin complications

POPULATION
HEALTH

Social support

Pre-eclampsia screening



Growth Restriction
Preterm birth

Maternal Medical
Conditions



Allocation of
appropriate
Model of care

Treatment initiation

Cost of Early Preeclampsia <34 weeks Activity Based Management Portal

Women without pre-eclampsia 40 weeks Gestation					
Mother			Neonate		
	Inpatient stay	Length of Stay		Inpatient stay	Length of Stay
Av. Cost	\$4,330.78	3	Av. Cost	\$1,850.23	3
Women with Pre-eclampsia <34 weeks Gestation					
Mother			Neonate		
	Inpatient stay	Length of Stay		Inpatient stay	Length of Stay
Av. Cost	\$13,474.00	10	Av. Cost	\$60,482.00	30

Estimated cost to care for 44 women and neonate without Pre-eclampsia birthing @40 weeks for 2016
\$271,920

Estimated cost to care for the 44 women and neonate with Pre-eclampsia birthing <34 weeks for 2016
\$3,254,064

Bed Days
Estimated bed day for women is
440

Bed Days
Estimated bed day for neonates is
1320

Bed Days Saved from prevention (80%)
Women **245** per year
Neonates **945** per year

Estimated yearly savings from prevention (80%)
\$2.3 M



The Cost Analysis of universal screening for Early Preeclampsia (<34 weeks)

Cost of ePET annually at JHH

\$3.25M



Prevention

Decrease by 80%: **Savings of \$2.3M**

Estimated Yearly Cost Salary

Sonographer:	\$ 245,553 (2.2)
Midwife:	\$114,526 (1.17)
Staff Specialist:	\$265,789 (1)
Admin	\$46,573 (0.63)
Total Salary	\$672,441

Estimated Yearly Income Billings

NT scan	\$59.50 x3800 = \$226 100
Consult	\$72.75 x3800 =\$276 450
Total Billings	\$502,550



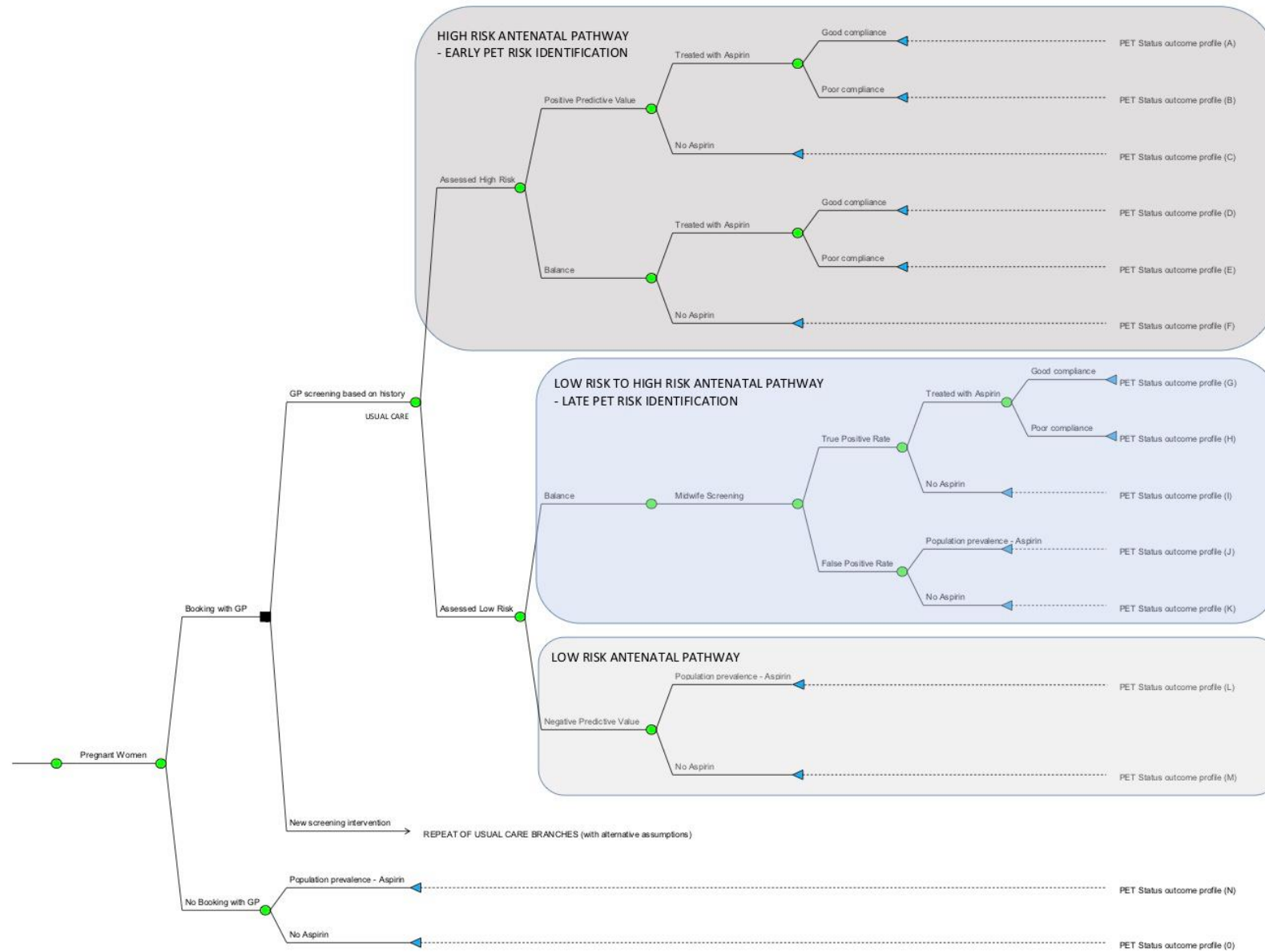
HMRI Health economics team

Formal Cost Effectiveness analysis

- Decision analytic model
- Compare Usual Care to the proposed First trimester intervention
- 6,822 women attending from Jan 2015 – Dec 2016
- Six possible health outcomes
 - No preeclampsia
 - Maternal death
- Results
 - No. of cases PET gained/avoided
 - Incremental increase/decrease in economic costs



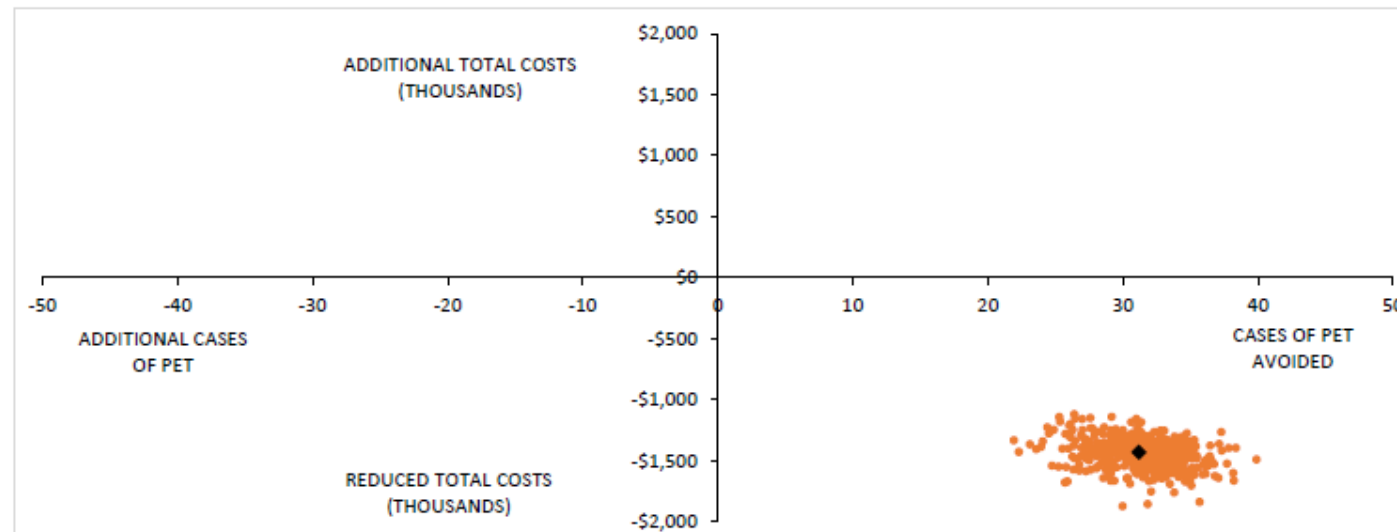
Decision tree and sequence of events (Usual Care versus Intervention)



Results

Intervention produced 31 fewer cases of preeclampsia

Reduced aggregate economic health cost by \$1.43 M



Results of the probabilistic uncertainty analysis on the cost-effectiveness plane, Intervention versus Usual Care, and mean point estimate (black diamond).



Impact on Service Delivery decisions

Commenced full implementation at JHH
(Medicare funding model)

Expansion across

- HNELHD
- NSW
- Australia

Publication in UOG (5.6)
International Clinical Journal

Lessons Learned

Model development

- Clinical relevance
- Evidenced Based
- Adaptable

Scope of Practice

Health Economics fundamental
to sustained practice change



Q&A PANEL



Ms Laura Wall
*Post Doctoral
Research Fellow
Newcastle Business
School, UON*



Doctor Felicity Park
*Obstetrician
John Hunter Hospital*

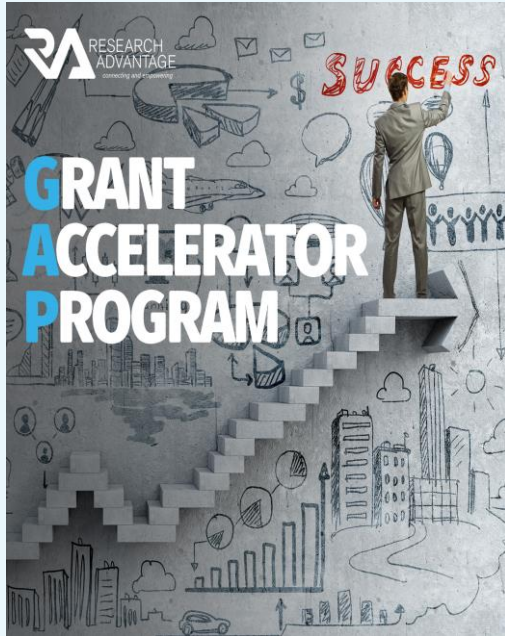


Penny Reeves
*Health Research
Economist
Hunter Medical
Research Institute*



Doctor Gabor Major
*Director of
Rheumatology in the
Bone and Joint
Institute of the Royal
Newcastle Centre*

WHAT'S NEXT?



Tues 15 Sep, 12-1:30PM
**NHMRC Investigator Grants
Lessons Learned**



Wed 16 Sep, 12-1PM
**Preparing for Industry / End-user
meetings**

Tues 13 Oct, 12-1PM
**Common Research Agreements
with Industry**



Mon 7 Sep, 11AM-12:30PM
**How to make Wellness a part of
your everyday**

Thurs 15 Oct, 12:30-1:30PM
Wellness Plan Check-in



Thurs, 12 Nov 12.30 – 2PM
**Consumer Engagement in
Research**

[Register via Discover](#)

Responsible Conduct of Research

This self-paced e-learning module provides a brief overview of the Australian Code for Responsible Conduct of Research and an understanding of your obligations when undertaking research.

Access via Discover

<https://discover.newcastle.edu.au/course/view.php?id=106>

ARE YOU UNDERTAKING RESEARCH?

Make sure you read the *Australian Code for the Responsible Conduct of Research* and know how it applies to you



Scan me

Fairness in the treatment of others



Respect for research participants, the wider community, animals and the environment



Rigour in the development, undertaking and reporting of research



Recognition of the right of Aboriginal and Torres Strait Islander peoples to be engaged in research that affects or is of particular significance to them



Accountability for the development, undertaking and reporting of research



Have you seen conduct that you think breaches The Code?



Scan me

Transparency in declaring interests and reporting research methodology, data and findings



Honesty in the development, undertaking and reporting of research



Promotion of responsible research practices



Australian Government
National Health and Medical Research Council
Australian Research Council



THANK YOU



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