



Designing Economic Evaluation Alongside Clinical Studies
Health Economics Short course

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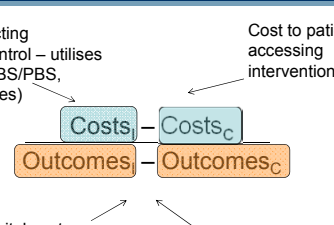

Module 3 – Collecting relevant health system and patient cost data

Centre for Health Policy
 Melbourne School of Population and Global Health


Economic versus financial costs

- Construction of costs in economics different to finance or accounting; more interested in 'resources consumed'
- Interested in a broad economic cost not just a budget, recorded cost or a single payer
- **Opportunity cost:** value of best alternative forgone (e.g. adding 2 mins to GP consultation)
- **Value of time:** for example the time spent by a carer accompanying patient to appointments has a value
- **Future costs** are also important, not just those immediately seen (e.g. future costs of disease)


Cost-effectiveness: where do costs fit in?



Cost of conducting intervention/control – utilises prices (e.g. MBS/PBS, professional fees)

Cost to patients of accessing intervention

MBS/PBS/hospital costs associated with outcomes e.g. cost of having a stroke

Patient costs associated with their outcomes e.g. time off work

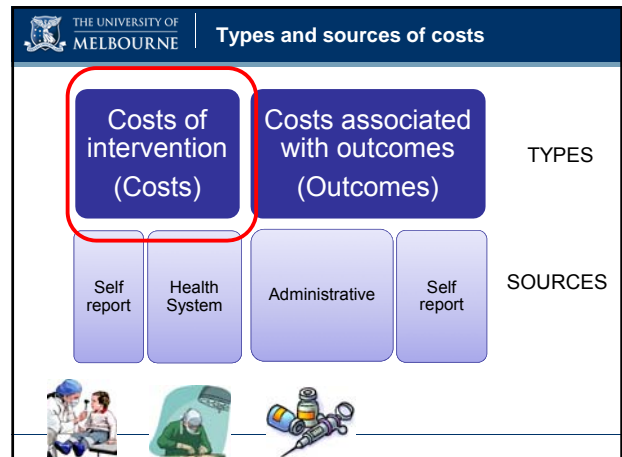

Economic evaluation perspective



Societal
 Government
 Health system
 Hospital

THE UNIVERSITY OF MELBOURNE | **Real world**

- Economic evaluation takes a **pragmatic** approach
- Application to the **real world**
- Informing actual **decisions** regarding implementation and priority setting
- **Costs to all**, relative to perspective taken



THE UNIVERSITY OF MELBOURNE | **Intervention Costs**

- Who does what to whom? Think ‘resources required’
- Study protocol provide utilisation patterns
 - e.g. pharmaceutical dose, imaging, pathology tests, surgical procedures, equipment
 - e.g. medical professionals, number and length of consults received
- Per protocol versus as implemented
- Study protocol versus population scale up

THE UNIVERSITY OF MELBOURNE | **Unit prices attach to utilisation**

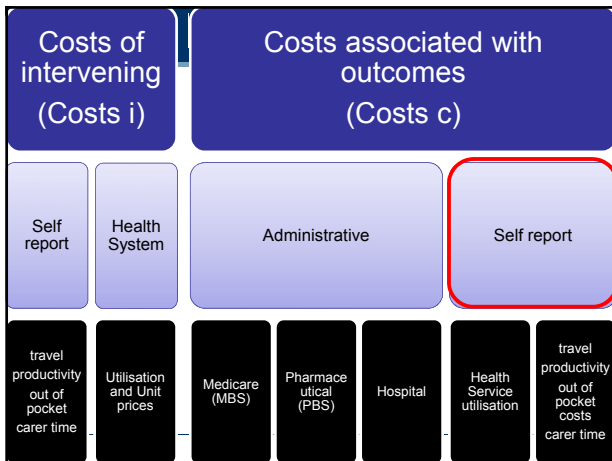
- Professional groups’ recommended fees
- Medical Benefits Schedule
 - e.g. pathology tests and consultations
- Pharmaceutical Benefits Schedule
- National hospital cost weight
 - Procedure or type of admission
- Private sector costs
 - e.g. equipment

THE UNIVERSITY OF MELBOURNE | **Patient costs associated with intervention**

- Usually **self-report** via patient survey
 - Travel to participate in intervention
 - Carer time to participate in intervention
 - Out-of-pocket costs associated with receiving the intervention (e.g. follow up referrals with gap payments)
 - **Real world** application
 - If a study saves the government money but shifts burden to patients/carers, this is important to know

THE UNIVERSITY OF MELBOURNE | **Considerations with costing intervention**

- **Scale up:** Generally we are more interested in cost of intervention as it would be rolled out at scale (variable costs), rather than specific, one-off start up costs (fixed costs)
- **Research costs:** we do not include costs associated with research e.g. obtaining ethics, research surveys, analysing data etc.
- **Study specific costs:** study-specific costs that do not relate to how intervention would be rolled out in practice are not included. Works both ways e.g. if pharmaceutical is provided free for study but would be paid for in real world we would build in a cost



THE UNIVERSITY OF MELBOURNE | Patient diaries

① Medicines and health care products and equipment: purchased today

What was the item you purchased?	Was it a prescription?	What was it for?	How much did you pay?
<i>Example: Coversyl</i>	Yes	High blood pressure	\$3.20
...
...
...
...

② Health and community services: used today

What type of service was it?	Where did it take place?	Who provided the service ?	How much did you pay?
<i>Example: Meals on wheels</i>	<i>My home</i>	<i>Council</i>	\$2.50
...
...
...

THE UNIVERSITY OF MELBOURNE | Example: Patient cost questions

How far you have to travel to attend medical appointments or hospital visits over the last 3 months.

Please indicate the distance you travel to your usual hospital each way _____ kms

Please estimate the distance you travel to your usual doctors (GP) each way _____ kms

Please tell us how your illness affects your ability to undertake your normal duties whether that be paid or unpaid work. Please indicate how many days you have taken off in the last 3 months below?

Reason for taking day off	Days off usual <u>unpaid</u> work?	Days off <u>paid</u> work?
Because you have been too unwell		
To attend medical appointments or hospital		

THE UNIVERSITY OF MELBOURNE | GP recall

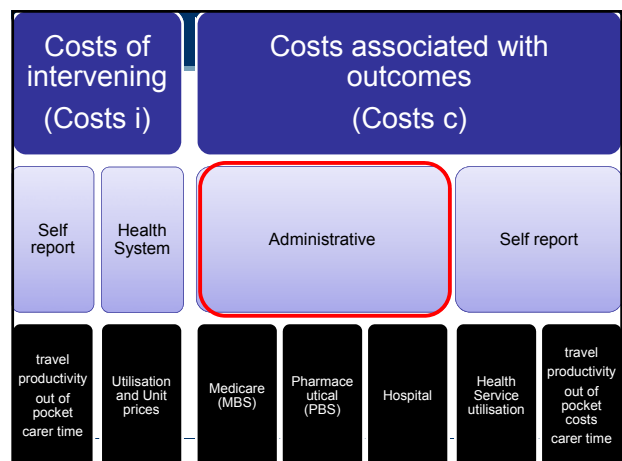
OVER THE LAST 2 WEEKS: Please tell us about your visits to the doctor (general practitioner).

Have you consulted a doctor (general practitioner GP) in the last 2 weeks? Please circle	Yes	No
If yes, please write how many visits you have made (e.g. 1,2,3 etc.)		

THE UNIVERSITY OF MELBOURNE | Types of patient costs associated with outcomes

- Travel to health care
- Time taken off work or usual duties for future appointments
- Time taken off work or usual duties to care for another
- Reduction or dropping work
- Out of pocket expenses for medication, health care, in home help, equipment, other services

Prioritise!



Think about your study

Questions to ask

- What outcomes are most important to patients? Which outcomes have greatest cost implications?
- Are outcomes likely to occur within the study period or within what timeframe?
- Which dataset will best capture outcomes of interest? (eg Medicare, hospital)
- Is the value of obtaining cost data worth it relative to effort and cost to extract?
- Prioritise!

Types of data needed: Health care usage

- Primary care/Medicare data:
 - GP visits, some allied health
 - Specialist consultations
 - Diagnostic tests
 - Pathology
- Pharmaceutical use
 - Dose and quantity
- Hospital episodes
 - Type: private/public
 - Inpatient, emergency, outpatient
 - AR-DRG cost weights



On MBS/PBS outcomes cost data collection

- **Think** about data collection early, have a **reason** and **plan** for how you will use data
- Include **budget** to cover data charge (\$5,000 to \$10,000)
- Become familiar with the process:
 - Consented study form (include consent form and ethics approval)
 - Likely to go through Department of Health Ethics
 - Patients individually need to consent, build into process
 - Need to present finalised consent forms in order to get data
 - Think about relevant data capture time point, can have 4 years and 6 months of data total, and you pay for each data capture
 - Justify and prioritise variables of interest

MBS/PBS data

- **MBS records** contain :
 - Item number (defines type of service), Date of service, Total cost charge, Patient out of pocket costs, Hospital flag for services provided in a private hospital, Postcode of provider, Postcode of enrollee
- **PBS records** contain:
 - Item number (Type of drug & dose), Type of patient (Ordinary/ Concessional/ Safety-net, Cost to the patient, Benefit paid, Date of supply, Postcode of Pharmacist

MBS data example

A	B	C	D	E	F	G	H	I	J
AHWP	Date service	Medicare	Item description	Provider charge	Schedule fee	Benefit paid	Patient OOP	Hospital	Item category
1	8/03/2014	66531	Glycosylated Haemoglobin	22.45	16.9	12.7	9.75	H	P2 Chemical
3	19/03/2014	23	LEVEL 'W' Consultation	35.6	35.6	35.6	0		A1 General Practitioner
4	22/03/2014	72814	Waiver complexity level 3, 1, 1	73.90	66.90	73.90	0		P5 Tissue Pathology
5	21/03/2014	79926	Initiation of a patient episode	7.60	6.20	7.05	0		P10 Patient Episode Inc
6	21/06/2014	105	Subsequent Specialist Atter	80	42.3	35.9	44.1		A3 Specialist

(data made up)

- There is a new line of data every time a new item number is billed

PBS data example

A	B	C	D	E	F	G	H	I	J
AHWP	Supply	PBS item	Item description	Patient category	Patient OOP	Net benefit	Form category	ATC code	
1	20-Apr-14 09302N	GLUCLAZIDE	60MG TABLET MC Concessional - Ordinary		0	9.05	REPEAT	A 10 B 8 09	
3	2 30-Aug-14 0907C	PERINDOPRIL	3MG TABLET AR General Safety-net		0	4.40	ORIGINAL	C 09 A 04	
4	3 16-May-14 08214H	ATORVASTATIN	20MG TABLET General Ordinary		37.7	44.43	REPEAT	C 10 A 05	
5	4 16-Mar-14 08189B	ACARBOSE	100MG TABLET-5 Concessional - Ordinary		0	77.53	REPEAT	A 10 B F 01	
6	4 28-May-14 08607B	METFORMIN	1G TABLET HCL-Concessional - Ordinary		0	9.87	REPEAT	A 10 B A 02	

(data made up)

- There is a new line of data every time a script is filled, including repeats

Understanding limitations of data

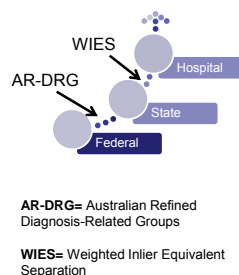
- Public, private (different methodology/scope for hospital costs)
- Medications below co-payment (only available since April 2012) <http://www.pbs.gov.au/info/statistics/under-co-payment/ucp-data-report>
- Missing from observation

Hospital data

- Hospital records are normally generated on discharge for billing purposes and normally contain:
 - Primary/principle diagnosis AR-DRG (main reason the patient is in hospital)
 - Secondary/other diagnoses (can be many fields – other things that happened while in hospital)
 - Date of admission/date of discharge

Costing hospital data

- Australia has moved to activity-based hospital costing – this involves classifying all hospital episodes according to a Diagnosis-Related Group (AR-DRG)
- Each DRG is meant to contain patients with similar resource use – hospitals then get a payment based on the “cost weight” for that group
- Two levels of payment: from federal to state and then from state to hospital



DRG national weights

- Under the new national costing framework there are some broad **adjustments to funding** made:
 - Regional (+17%) and Remote (+15%) and very remote (+21%) Adjustment
 - ICU Adjustment (see formula)
 - Indigenous Adjustment (+17%)
 - Paediatric Adjustment (+196%)
 - Specialist Psychiatric Age Adjustment (see formula)
- (<https://www.ihpa.gov.au/what-we-do/pricing-framework>)

DRG national weights

- In Australia AR-DRGs in **public and private hospitals** reflect different types of costs:
 - Public hospitals- covers ALL costs
 - Private – only accommodation/general running costs as cost of ‘Medical Services’ is covered by Medicare
- Latest version found at: <https://www.ihpa.gov.au/what-we-do/nhcdc>

Example: public and private weights

- Diagnosis of malignant neoplasm ear
- AR-DRG J10Z
- Public costing (Round 16)
 - Average cost = public hospital weight 0.73 x \$4,500 = **\$3,285**
- Private costing (Round 16)
 - Average cost= private hospital weight 0.5885 x \$4,500= \$2,648
 - Plus MBS items for admission with hospital flag from MBS Data
 - MBS Item 45665 plastic surgery \$495, 73924 initiation of patient episode \$18, 72832 histology \$117, 20100 initiation of anaesthesia \$282, 17610 pre-anaesthesia consult \$68= **\$980**
 - Total private cost = \$2,648 + \$980 = **\$3,628**

Combining costing data over time

- Cost weights can **change over time** to reflect changes in resource use:
 - Round 12 (2007-8) “**A05Z Heart Transplant**” had a cost weight of 27.83 implying a cost of \$108,741
 - Round 15 (2010-11) the same DRG cost \$127,173
- Which should we use in an analysis? Depends on the research question:
 1. Historical analysis should use historic cost weights after adjusting for inflation (to bring all costs into a common year)
 2. Estimating future costs – use the most recent DRG as it's most likely to reflect future resource use
 3. Potential to use WIES if interested in a finer level of cost than is permitted by a DRG

Cost data across locations

- Multi-centre studies
- Multi-national studies
- Options
 - Treat each country separately for costs using local units and currency
 - Base on main country and then use currency conversion to translate across settings
- Trade off between statistical power and relevance to local setting



Example: Process for obtaining hospital data

- Usually need to provide ethics approval
- Usually need study and investigators within hospital
- Provide AR-DRGs or UR numbers and time frame to “Decision Support Unit” at hospital
- Indicate data fields of interest (start with minimum data for VAED and VEMD for ideas) and provide justification and details
- Receive spreadsheet, usually in excel
- Hospitals have different processes
- Usually provide 5-10 years of data

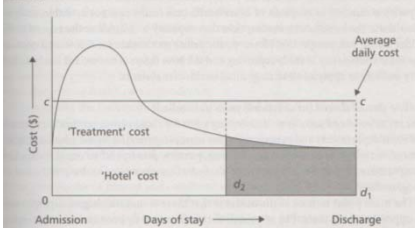
Types of hospital data held

- AR-DRG and WIES (Victoria)
- Length of stay
- Patient demographics
- Type of presentation/admission
 - Inpatient
 - ICU
 - Emergency
 - Outpatient
- Revenue received from admission (WIES)
- Cost to hospital associated with admission (sometimes)
- Breakdown on buckets of cost (e.g. nursing, medical, allied health, imaging, pathology, pharmacy, ICU, prostheses, hotel, equipment)

Average versus Marginal Cost

Box 4.5 Estimating the cost savings associated with reductions in hospital in-patient stay

Hospital cost can be considered to consist of two elements: the hotel cost, which is broadly constant over the length of stay, and the treatment cost, which may peak just after admission but then tail off in the later days of the stay (see the figure below).



- Lower relative costs toward end of admission
- Change in length of stay is the difference between d_1 and d_2
- Overestimated if using average rather than marginal costs

Source: Drummond et al. Methods for the Economic Evaluation of Health Care Programs, 2005 p67

What hospital data looks like

1	A	B	C	D	E	F	G	
1	UR number	DOB	Surname	Admit. Date	Sep. Date	DRG Code	DRG Long Name	Inlier WAU (Weis)
2	1			28/06/2013	28/06/2013	F15Z	Trans-Vascular Percutaneous Cardiac Intervention	2.85
3	1			7/10/2013	11/10/2013	A49Z	ECMO	42.05
4	2			15/02/2012	16/02/2012	F14C	Vascular Procs Except Major Reconstruction W/O	1.57
5	2			23/07/2012	27/07/2012	F07C	Other Cardiothoracic/Vascular Procedures W CPB I	5.87
6	3			14/04/2014	25/04/2014	F07B	Other Cardiothoracic/Vascular Procedures W CPB I	7.78
7	4			19/10/2011	19/10/2011	F42C	Circulatory Disorders W/O AMI W Invasive Cardiac I	0.80
8								

(data is made up)

- New line of data for each admission
- Also typically will include ICD-10 codes for principal diagnoses and procedure, plus many secondary codes
- You can determine costs based on DRG (apply national weights) or WIES (apply state funding formula)

Hospital AR-DRG cost weight data

NATIONAL HOSPITAL COST DATA COLLECTION
 COST WEIGHTS FOR AR-DRG VERSION 6.0x, Round 14 (2009-10)
 Public Sector - Estimated


DRG	DRG Description	Cost Weight	Standard Error	Number of Seps	Number of Days	ALOS (Days)	Average Total	per DRG (\$)
A01Z	LIVER TRANSPLANT	32.35	0.28	197	6,741	34.27	145,565	126,244 19,321
A03Z	LUNG OR HEART/LUNG TRANSPLANT	25.84	1.05	118	3,769	32.02	116,292	99,159 17,134
A05Z	HEART TRANSPLANT	29.88	0.25	70	2,857	40.87	134,479	112,403 22,075

Each unit of cost weight is approximately \$4,500

Source:
[http://www.health.gov.au/internet/main/publishing.nsf/Content/0D98746E071E30DDCA257BF001CBF04/\\$File/R14CWNatEst_v6x.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/0D98746E071E30DDCA257BF001CBF04/$File/R14CWNatEst_v6x.pdf)

Example costing using national weights

- Patient admitted for AR-DRG
 - A05Z Heart Transplant (Round 16)
 - Cost **\$187,536** (public weight 38.97)



- If patient is indigenous loading 17%
 $\$187,563 \times (1+0.17) = \$219,417$
- If patient is a child loading 196% etc.
 $\$187,563 \times (1+1.96) = \$555,186$

Example of WIES formula for Victoria

- If states passed on the average payment for a DRG to all their hospitals some would be disadvantaged
 - For more complex populations or needs or where care is more expensive
- WIES formula redistributes average funds received
<http://health.vic.gov.au/abf/history.htm>

National versus state weights

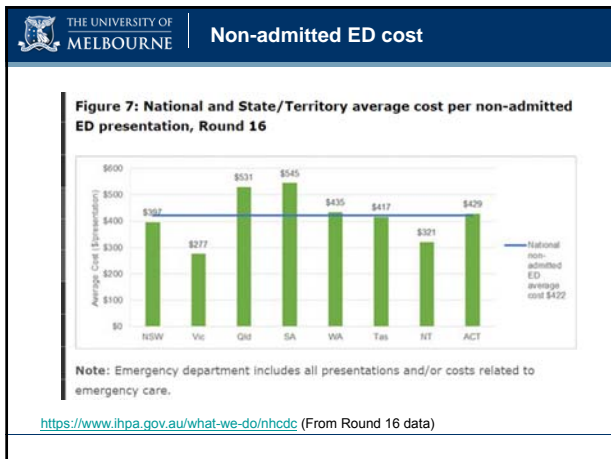
- National weights provide average cost for each AR-DRG; therefore, the data is standardised, and simple to obtain and apply
- State formulas differ by state but will provide a finer level of costing than just an average per AR-DRG; this can be more complex to obtain and apply

Emergency data

- 2012 was the start of activity based funding
- Presentations are funded according to “Urgency related groups” - groups of similar cost
<http://docs.health.vic.gov.au/docs/doc/URG-Technical-Specifications-v1-4>
- To cost, you need: whether admitted, departure status (death, left, transferred), triage, ICD-10
- For each URG there is a cost weight

Emergency data

- **Example:**
 - A patient presents to ED with injury, is admitted, triage level 1
 - Weight = 0.3978
 - NEP = \$4,993
 - Cost of presentation = $0.3978 \times \$4,993 = \$1,986$
 - The only adjustment for ED is Indigenous (+4%)
- Other options for costing
 - Hospital level costs, if provided
 - State average cost per ED presentation



Other opportunities for data linkage

- Some states will link your patients (with consent) not just to all hospitals but to other government datasets. Examples include:
 - Education, child protection, justice, births and deaths, maternal health, housing
- The longest linkage in Australia is WA who have been providing this type of patient linkage since 1995
- Perhaps the simplest process is in NSW?

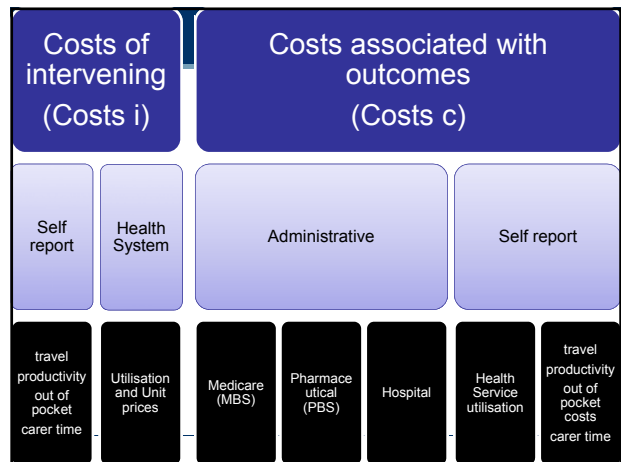
CHRL CENTRE FOR HEALTH RECORD LINKAGE

Data Linkage WESTERN AUSTRALIA

Data linkage Western Australia

Family Connections Births, Deaths & Marriages WA Health Home & Community Care Aged Care Assessment Program WA Notifiable & Infectious Diseases Monitoring of Drugs of Dependence Drug & Alcohol Office State Trauma Registry WA Registry of Developmental Anomalies Health & Wellbeing Surveillance Reproductive Technology Register Geocoding SEIFA & ARIA available for 1996, 2001 & 2006 censuses	Core Datasets Hospital Morbidity Data System (since 1970) Mental Health Information System (since 1966) Emergency Department Data Collection (since 2002) WA Cancer Registry (since 1992) Midwives Notifications (since 1980) Birth Registrations (since 1974) Death Registrations (since 1969) WA Electoral Roll (since 1989)	WA Government Dept of Child Protection Dept of Education Dept of Corrective Services Disability Services Commission Dept of Housing Dept of the Attorney General School Curriculum and Standards Authority Dept of Transport Other Organisations Silver Chain Nursing Association Insurance Commission WA Main Roads WA St John Ambulance IDEA Database Breastscreen WA Playgroups WA Raine Study
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<http://www.datainkage-wa.org/>



Cost data conclusions

- It is necessary to understand what type of cost data will be of greatest priority to your research
- There are many options available
- Selection, analysis and interpretation of some of this cost data requires a level of skill
- Cost data can add significant value to your research project