



MONASH University
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How health economic data can be used to facilitate health care decision making

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Content

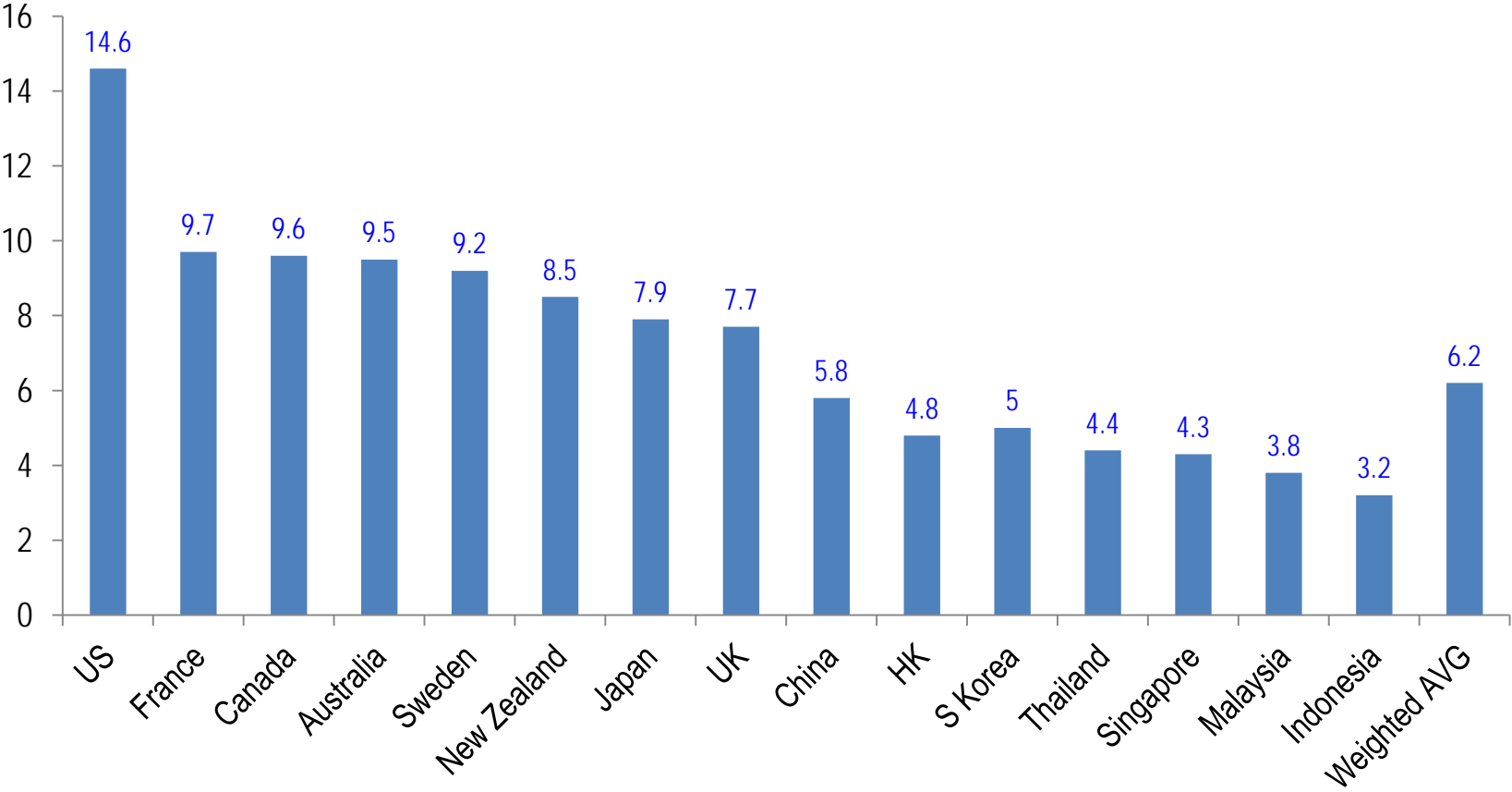
- Background of health economics
- Paradigm shift in drug evaluation since mid 1990s
- “Value” of medicine
- Health Technology Assessment (HTA)
- Example study
- Summary

Introduction and background of health economics

Terminology

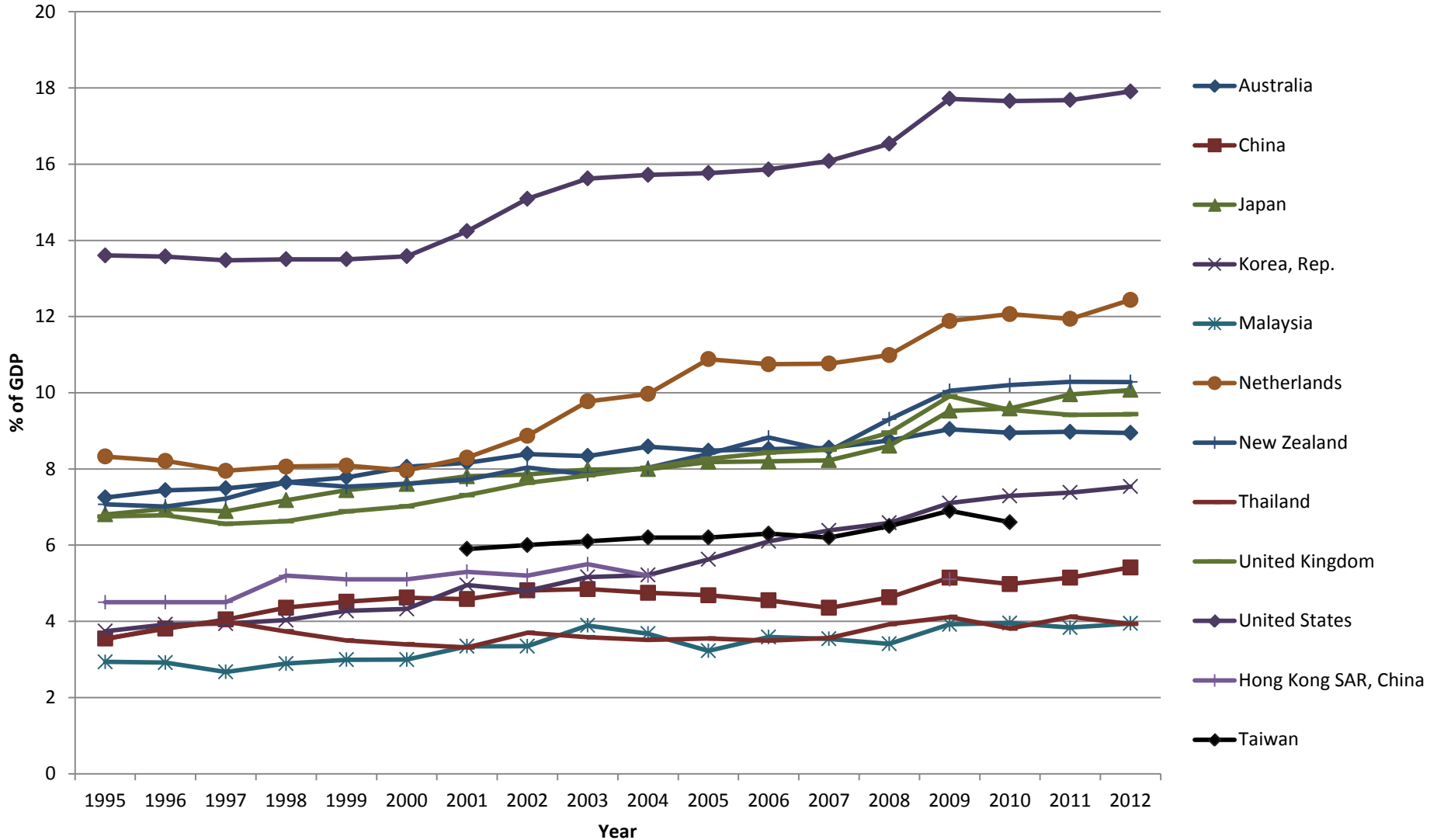
- **Health Economics** – A discipline that analyses the economic aspects of health and health care and that usually focuses on the costs (inputs) and the consequences (outcomes) of health care interventions using methods and theories from economics and medicine
- **Health Technology Assessment (HTA)** – A form of policy research that examines short- and long-term consequences of the application of a health care technology i.e. it includes total budget impact analysis, setting of priorities and cost-effectiveness as assessed by health economic evaluation

Health expenditure as percent of GDP per capita of some western and Asian countries (2010)*



Source: * www.nationmaster.com

Total Health Care Expenditures as Percentage of GDP



Source: World Bank 2014

Major contributing reasons to increased health care expenditures

1. Cost inflation on new health technologies
2. Aging population
3. Increased expectation form public
4. Changing epidemiology from traditional acute diseases to more chronic health problems
5. Under development of preventive care, over reliance on secondary care

Rational use of health care resources

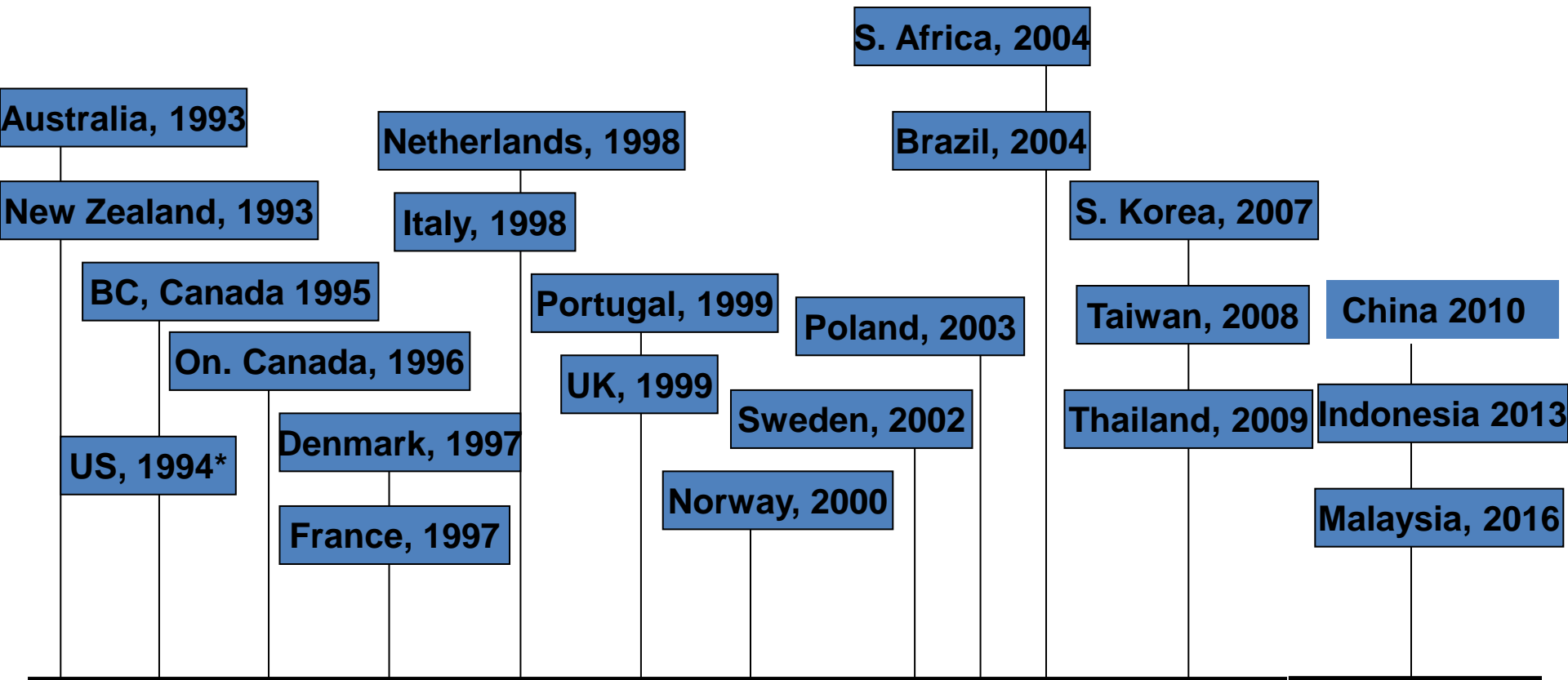
Statistical findings show that "patients in the highest-spending regions of the country receive 60 percent more health services than those in the lowest-spending regions, yet this additional care is not associated with improved outcomes."

(Fisher et al 2003)

Health Expenditure / Health Indicator

Country	Health expenditure as % of GDP, 2009	Government health expenditure as % of all health expenditure, 2009	Age adjusted mortality rate-non communicable (100,000)	Age adjusted mortality rate-communicable (100,000)	Life expectancy at birth, 2009 (years)
US	16.2	48.6	418	34	79
Canada	10.9	68.7	346	23	81
Brazil	9.5	45.7	534	97	73
UK	9.4	83.7	401	36	80
Japan	8.3	80.0	273	40	83
Australia	8.0	70.1	330	18	82
Korea	6.5	54.1	355	29	80
Russia	5.4	64.4	797	71	68
Malaysia	4.8	44.8	526	185	73
China	4.6	50.3	604	58	74
Thailand	4.3	75.8	675	153	70
India	4.2	32.5	685	363	65
Singapore	3.9	41.5	313	66	82

Formal use of HE data around the world



Common Criteria in Assessing New Pharmacological Agents

Traditional Criteria in Assessing a New Drug

- Safety
- Efficacy
- Quality
- Unit cost

True VALUE of a drug is not assessed !

Cost vs Value

Cost

- Fixed
- Easy to count
- visible

Value

- Uncertainties exist
- Difficult to estimate
- Difficult to demonstrate
- Humanistic consideration included
- Examples: long term cost-effectiveness, quality-of-life, overall effect on the society, impact on the management guideline etc

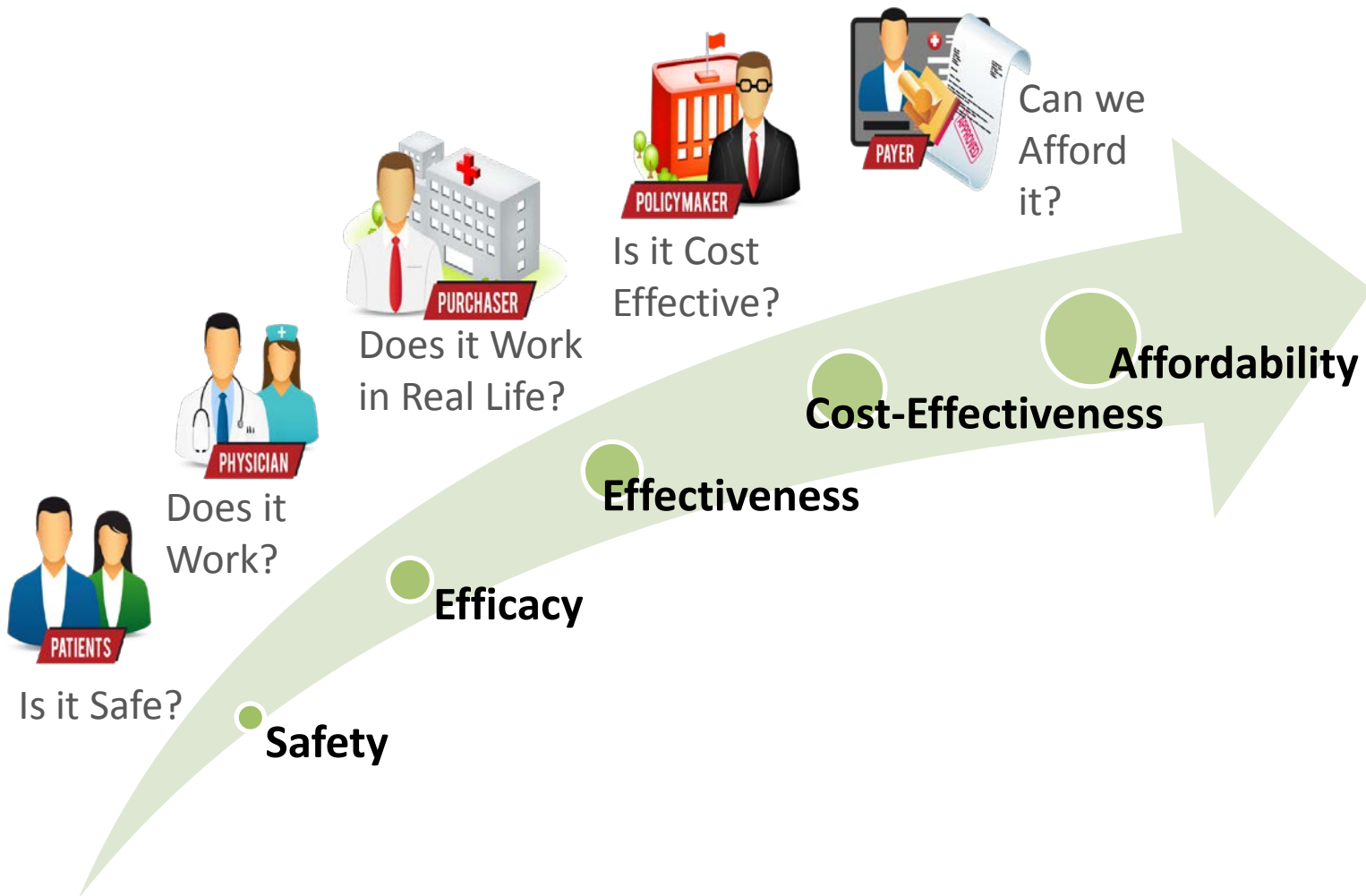
More recent criteria

- Safety
- Efficacy
- quality
- Long term cost-effectiveness (the 4th hurdle, Drummond 2004)
- Post-market re-assessment (the 5th hurdle)

Why is it important to incorporate “value” into assessment?

- To maximize health care benefits from health care spending
- Maximization can be achieved through:
 1. Reallocation of spending
 2. Elimination of no-value-adding services
 3. Better use of capacity
 4. Shortening of turn-around time
 5. Provision of services in appropriate settings
 6. Awarding efficient providers of services
- Overall benefit: Optimization of scarce resources

Steps to establish “value” of a medicine



WHEN do we need health economic analysis

Outcomes

Worse

Better

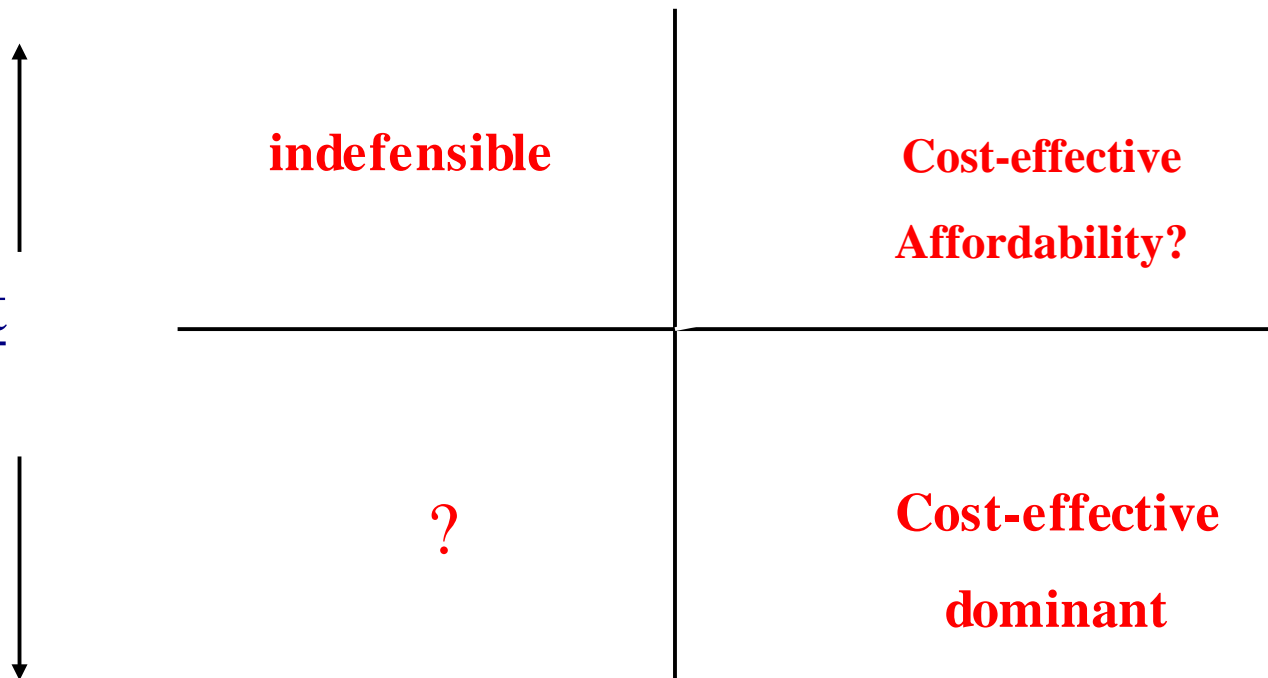
Cost

indefensible

Cost-effective
Affordability?

?

Cost-effective
dominant



“Cost Effective”

- Cost effective \neq cost savings
- Cost effective \neq effective

Instead,

- Cost effective = cost savings with equal or better health outcomes
- Cost effective = having an additional benefit worth the additional cost

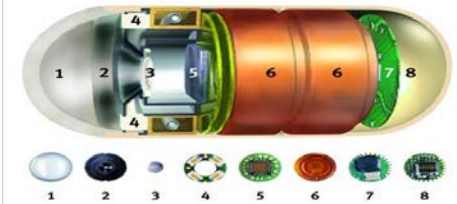
“Cost Effectiveness” : evidence-based, the outcomes are worth their cost compared with competing alternatives

Tool for establishing the VALUE of a medicine

**Health Technology Assessment
(HTA)**

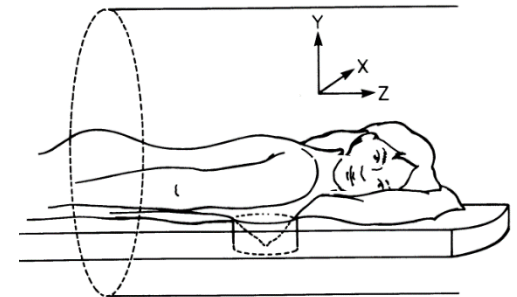
The Horizon of New Health Technologies

- Diagnostics: Virtual colonoscopy
- Devices: Computerized knee
- Procedures: Breast MRI
- Drugs: Biologics
- Services: Counseling



INSIDE THE M2A™ CAPSULE

1. Optical dome
2. Lens holder
3. Lens
4. Illuminating LEDs (Light Emitting Diode)
5. CMOS (Complementary Metal Oxide Semiconductor) imager
6. Battery
7. ASIC (Application Specific Integrated Circuit) transmitter
8. Antenna



What is Health Technology Assessment?

“A multidisciplinary field of policy analysis to study the medical, social, ethical, and economic implications of development, diffusion, and use of health technology”

(INAHTA, 2008)

Multidisciplinary: clinicians, health economists, epidemiologists, organizational researchers, social scientists, and other healthcare professionals

Policy analysis: analyzing different ways of implementing alternatives to review the consequences of different options. It addresses medical, societal, patient, and economic implications

Why Establish HTA Systems

- Inform formulary, coverage and reimbursement decisions
- Better allocation of scarce resources
- More effective distribution of funds across the health care system
- Support innovation by identifying & rewarding high-value products
- Provide information to providers & patients and physicians to allow optimal treatment decisions

Potential contributions of HTA to policy making

- **Identifying health technologies** that bring the greatest benefit to patients
- Ensuring **early access**, allowing **choice** among health technologies of value
- Need **credible/scientific information** about costs and consequences of health technologies
- **Evidence-based** decision making i.e. rationing of decisions
- **Consistency** in decision making
- Assistance in **long term health care budgeting**
- Increase in **transparency and accountability** in decision making
- Enhancement of **drug pricing negotiation** process based on solid local data

What is assessed in a HTA?

Technical properties	<ul style="list-style-type: none">• Performance characteristics maintenance, ease of use, etc.
Safety	<ul style="list-style-type: none">• Adverse events in a given situation
Efficacy	<ul style="list-style-type: none">• Can it work?
Effectiveness	<ul style="list-style-type: none">• Does it work?
Economic impact	<ul style="list-style-type: none">• Economic evaluations, budget impact analysis
Organizational /professional	<ul style="list-style-type: none">• Diffusion, utilization, skills, education
Social/ethical/legal	<ul style="list-style-type: none">• Challenge certain legal standards and/or societal norms e.g. stem cells

Tools for Health Economic evaluation

- Cost analysis
- Cost-of-illness analysis (COI)
- Cost-minimization analysis (CMA)
- **Cost-effectiveness analysis (CEA)**
- Cost-benefit analysis (CBA)
- **Cost-utility analysis (CUA)**
- Cost-consequence analysis (CCA)

Interpretation of Data

Cost-effectiveness ratios

- cost-effectiveness ratio (**CER**) of a single agent:
cost/measure of outcome (e.g. \$/mm Hg drop in BP, \$/symptom-free day, \$/QALY)
- Incremental cost-effectiveness ratio (**ICER**)
between 2 comparators:

$$\frac{(\text{cost}^{\text{drug A}} - \text{cost}^{\text{drug B}})}{(\text{outcome}^{\text{drug A}} - \text{outcome}^{\text{drug B}})}$$

Thresholds of ICER

1. Based on QALY or LYG

- USA: US\$50,000-100,000/QALY
- Australia: A\$42,000-76,000/LYG
- NICE: £20,000-30,000/QALY
- Canada: US\$87,800/QALY

2. Based on GDP per capita by WHO 2002 (thus affordability of the country considered)

- **ICER : \$/Disability Adjusted Life Year (DALY)**
 - < GDP : very cost-effective
 - > GDP but < 3 x GDP : cost-effective
 - > 3 x GDP : Not cost-effective

Interpretation of data

- GDP per capita (ppp) of Singapore US82,762 (IMF 2014)

< USD 82,762	Very cost-effective
< USD 248,286 (3 x 82,762)	Cost-effective
> USD 248,286 (3 x 82,762)	Not cost-effective

How do decision makers normally use health economic data

- Major purpose : to determine which drugs should be made available on the formulary of the institution
- General principles for consideration :
 1. products that provide the best patient outcomes at the best possible prices
 2. effectiveness and necessity
- Very often determined by degree of budget impact

The 4 common hurdles in formulary/ reimbursement decisions

- Safety
- Efficacy
- quality
- Cost-effectiveness (the 4th hurdle, Drummond 2004)

ICER is NOT the sole criterion for decision making

Because in reality.....

- Many new pharmaceuticals are considered cost-effective, yet the majority of them are NOT cost saving e.g. new vaccines, biologics
- Formulary approval/reimbursement decisions are NOT made according to the ascending order of the incremental cost-effectiveness ratios (ICER) of new drugs (i.e. the league table)

In reality, listing of pharmaceuticals is

- An inter-play between:
 - safety
 - clinical effectiveness/efficacy
 - quality
 - cost-effectiveness
 - clinical need of patients
 - availability of alternative treatments
 - cost of therapy, hence overall budget impact
 - opportunity cost
 - equity considerations
 - political pressure

Hence

- Criteria used in making decisions unavoidably vary across different jurisdictions

Some examples that illustrate this

Situation 1

- A new drug is only marginally effective (or potentially so), and thus not particularly cost-effective
- BUT the disease is severe i.e. high clinical need
- There are no alternative treatments available
- Decision makers : difficult not to approve or at least include it under the safety net
- e.g. β -interferon for multiple sclerosis
- Underlying reason : “Rule of rescue” which supersedes other criteria

Situation 2

- A drug is proven to be cost-effective
- But would involve a large resource commitment for patient groups that have relatively low priority
- Thus, high opportunity cost/loss may result due to the large budget impact
- e.g. sildenafil not reimbursed in most countries even though with favourable cost-effectiveness data
- In most jurisdictions, reimbursement is only restricted to a small patient sub-group illustrating a balanced view to help a narrow subgroup of patients while not placing excessive pressure on the health budget

Situation 3

Equity issue

- Budget available : \$200,000

Test 1: cost \$200,000 for the entire population to prevent 1,000 deaths from colon cancer

Test 2 : cost \$400,000 for the entire population to prevent 2,200 deaths

Your choice ?

- Cost-effectiveness *vs* equity
- Evidence suggests that sometimes decision makers are willing to trade efficiency of allocation for a more equal distribution of resources (Schwappach, 2003)

Value-based pricing (VBP) scheme

- Price of a drug is based on the value as demonstrated by technology appraisals
- An accurately estimated instead of a fixed threshold for ICER is therefore required
- In other words, in the presence of an accurate threshold, the reimbursed medicine will at least provide 1 additional QALY/LYG for the cost paid by the payer

Example study

The application of pharmacoeconomic modeling to estimate a value-based price for new cancer drugs

Dranitsaris G, Truter I, Lubbe M, Cottrell W, Spirovski B, Edwards J. *Journal of Evaluation in Clinical Practice* 2010;18:343-351

OBJECTIVES

Using the WHO criteria, PE modeling was used to illustrate the application of value-based price towards bevacizumab, a relatively new drug that provides a 1.4-month survival benefit to patients with metastatic colorectal cancer (mCRC)

METHOD

A decision model was developed to simulate outcomes in mCRC patients receiving chemotherapy \pm bevacizumab. Clinical data were obtained from randomized trials and costs from Canadian cancer centres. Utility estimates were determined by interviewing 24 oncology nurses and pharmacists. A price per dose of bevacizumab was then estimated using a target threshold of \$CAD117,000/QALY gained (3 x GDP 2012).

RESULTS

- Price of bevacizumab at time of study = **\$CAD2,250 per dose**
- ICER = **\$CAD224,000/QALY gained**
- Hence exceeding the Canadian threshold of **\$CAD117,000/QALY gained** (either based on the GDP per capita approach or the national threshold of US\$87,800/QALY)

Discussion

GDP per capita for Canada 2012 = \$CAD39, 000

$\therefore 3 \times \text{GDP} = \$\text{CAD}117,000$

$\therefore \text{ICER} < \$\text{CAD}117,000/\text{QALY}$ gained \rightarrow Cost-effective

- A price of \$CAD830 per dose would be considered cost-effective from the Canadian public health care perspective to increase 1.4 month of survival

Conclusion

The present study estimated that the price of the drug needs to be set at **\$CAD830 per dose** to achieve at least 1 QALY gained and hence can be considered cost-effective if 3 x GDP is used as the threshold

Points to be borne in mind

- Requirement of an accurately estimated threshold esp for drugs that are for end-of-life care or prolongation of life
- ICER originally well within current threshold limits may be raised to the same as threshold to increase profit
- Likely bias against older patients due to their reduced “societal value” – hence contravening to the principle of equity
- Uncertainties after product launch, \therefore post-market reviews is necessary

Summary

- **HTA** is increasingly used for allocation of health care resources worldwide
- Cost-effectiveness is **NOT** the only criterion used
- Many new pharmaceuticals are considered **cost-effective**, yet majority of them require extra budget, hence **proper justification** is required
- **HE** does not always lead to cost savings (i.e. no cost containment), but it will **maximize health benefits from health care spending** and the **“value”** of a drug is guaranteed