Help me help you:
Potential roles of health economics and health technology assessment to support your research

KT Canada National Seminar Series

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19 October 2023

Disclaimer

- These views are my view and not the view of the people or places with whom I work

Session Objectives

- How can these methods help?
- What questions we can help answer?
- HTA in action

What is Economics?

- **Objective** and **Constraints**
- Objective
  - Maximize patients treated, quality of care, etc.
- Constraints
  - Limited time, people, space, machines, etc.
- **Allocation** of **scarce resources**

Wonderling et al. Introduction to Health Economics, 2005.

Scarcity and Tradeoff

Why Do HTA?

Routine mammograms do not save lives: The research is clear

Published: October 2, 2017 12.09am BST

A recent Canadian trial reports breast cancer over-diagnosis rates of up to 55 per cent, from routine screening mammograms. (Shutterstock)

Objective To compare breast cancer incidence and mortality up to 25 years in women aged 40-59 who did or did not undergo mammography screening.

Design Follow-up of randomised screening trial by centre coordinators, the study's central office, and linkage to cancer registries and vital statistics databases.

Setting 15 screening centres in six Canadian provinces,1980-85 (Nova Scotia, Quebec, Ontario, Manitoba, Alberta, and British Columbia).

Participants 89 835 women, aged 40-59, randomly assigned to mammography (five annual mammography screens) or control (no mammography).

Interventions Women aged 40-49 in the mammography arm and all women aged 50-59 in both arms received annual physical breast examinations. Women aged 40-49 in the control arm received a single examination followed by usual care in the community.

Main outcome measure Deaths from breast cancer.

Conclusion Annual mammography in women aged 40-59 does not reduce mortality from breast cancer beyond that of physical examination or usual care when adjuvant therapy for breast cancer is freely available. Overall, 22% (106/484) of screen detected invasive breast cancers were over-diagnosed, representing one over-diagnosed breast cancer for every 424 women who received mammography screening in the trial.

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Research

Twenty five year follow-up for breast cancer incidence and mortality of the Canadian National Breast Screening Study: randomised screening trial

BMJ 2014 ; 348 doi: https://doi.org/10.1136/bmj.g366 (Published 11 February 2014)
Cite this as: *BMJ* 2014;348:g366

Article | Related content | Metrics | Responses | Peer review

Anthony B Miller, professor emeritus [1], Claus Wall, data manager [1], Cornelia J Baines, professor emerita [1], Ping Sun, statistician [2], Teresa To, senior scientist [3], Steven A Narod, professor [1 2]

- **Earlier is not** necessarily **better** than late
- **More is not** necessarily **better** than less
- **"Do" is not** necessarily **better** than "Don't"
- More advance and higher cost of health technology is not better than traditional and lower cost technology

The same is true for medical tests and treatments

https://www.choosingwisely.org/resources/updates-from-the-field/avoiding-antibiotics-overuse/

Why Do HTA?

- Health care resources = scarce
- Therefore, choices must be made

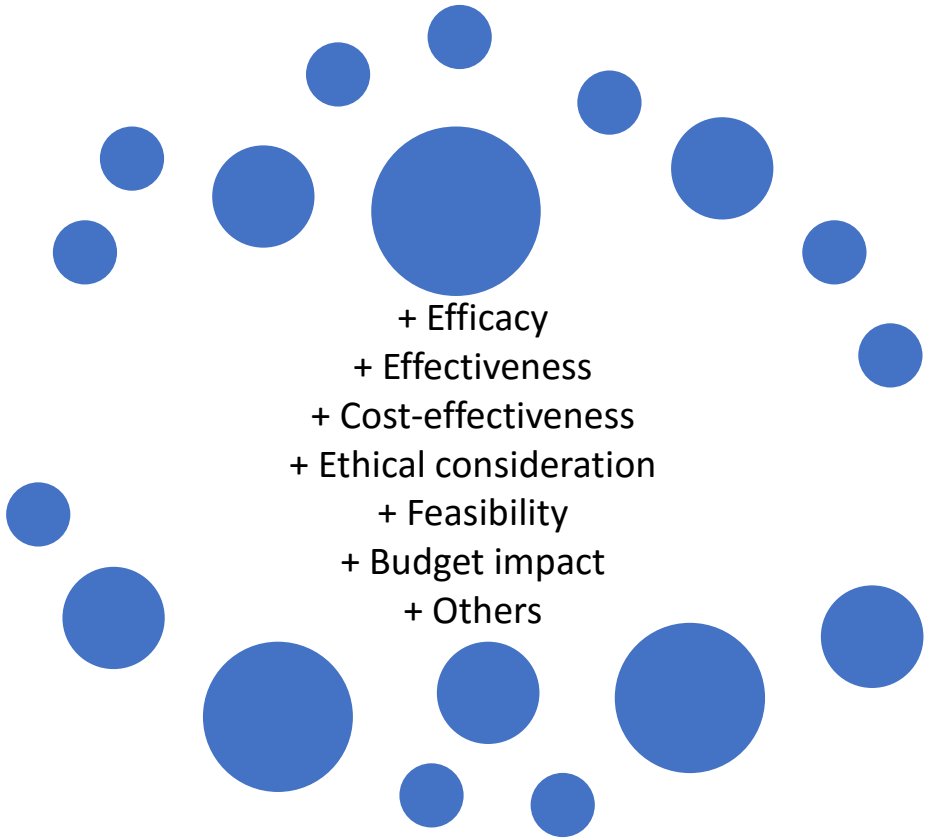
- **More is not** necessarily **better** than less
- **Earlier is not** necessarily **better** than late
- **“Do” is not** necessarily **better** than “Don’t”
- More advance and higher cost of health technology is not better than traditional and lower cost technology

HTA

https://www.idsihealth.org/blog/idsis-health-technology-assessment-toolkit-surpasses-100-downloads/, Drummond et al., 2015; Tantivess, Teerawattananon, & Mills, 2009; Teerawattananon et al., 2003

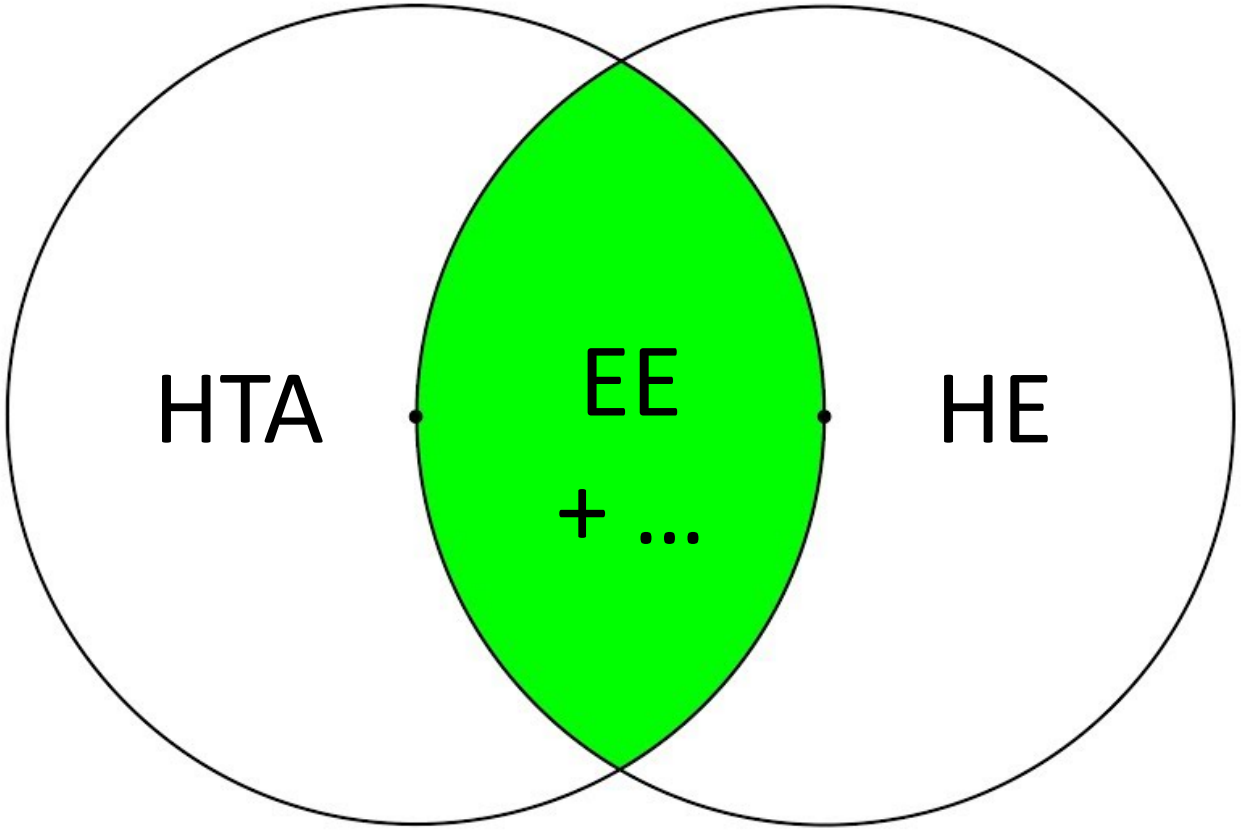
Why does this matter to me?

- If you have an idea(s) to help our healthcare system
- If you want to show the value-for-money of your interventions
- If you have to make decisions in our healthcare system

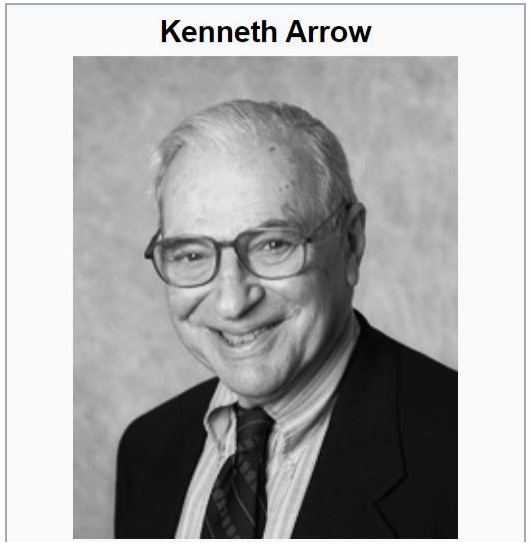


Decisions

HTA → Evidence Package


HTA
EE
+ ...
HE

Health Economics



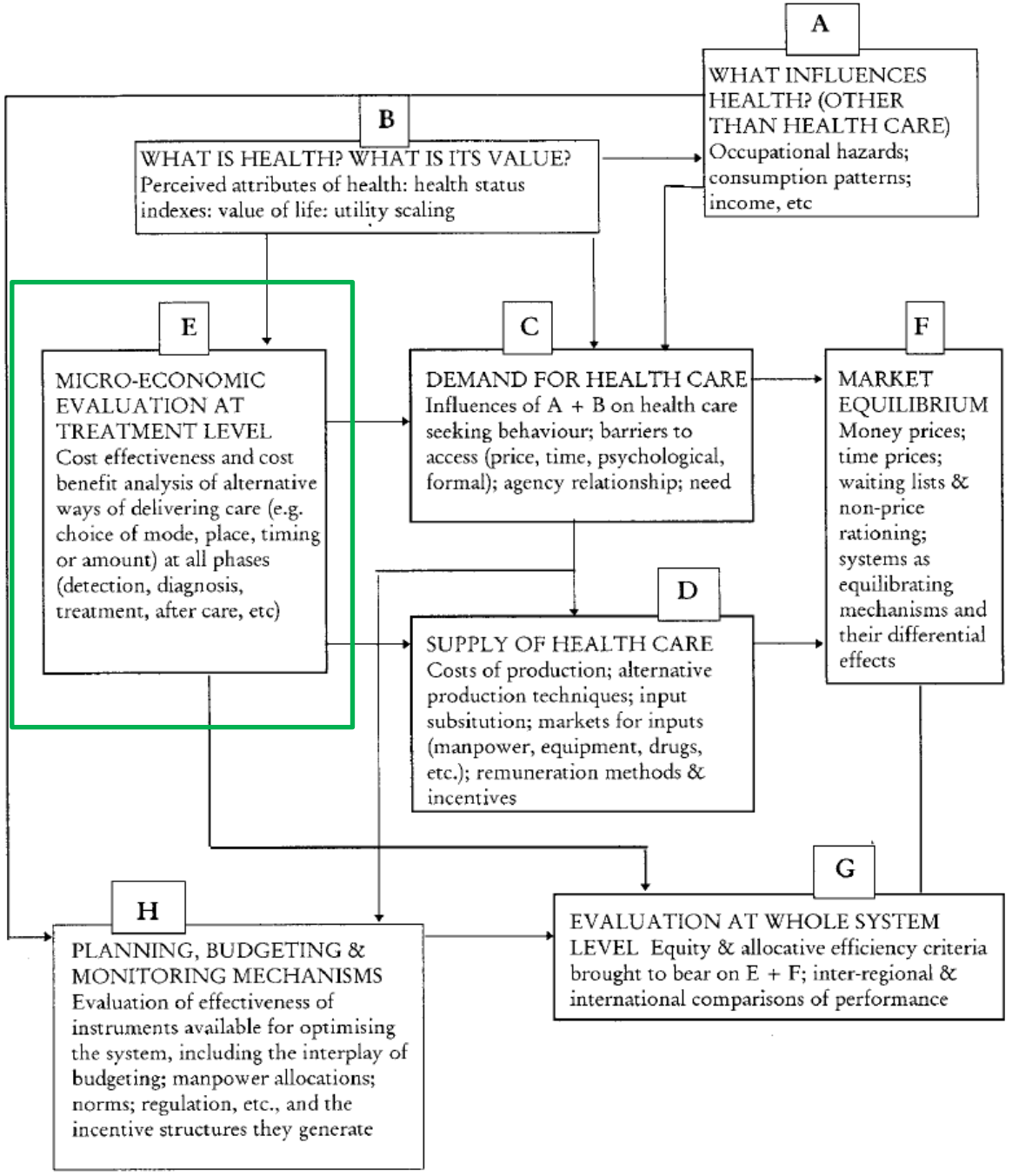


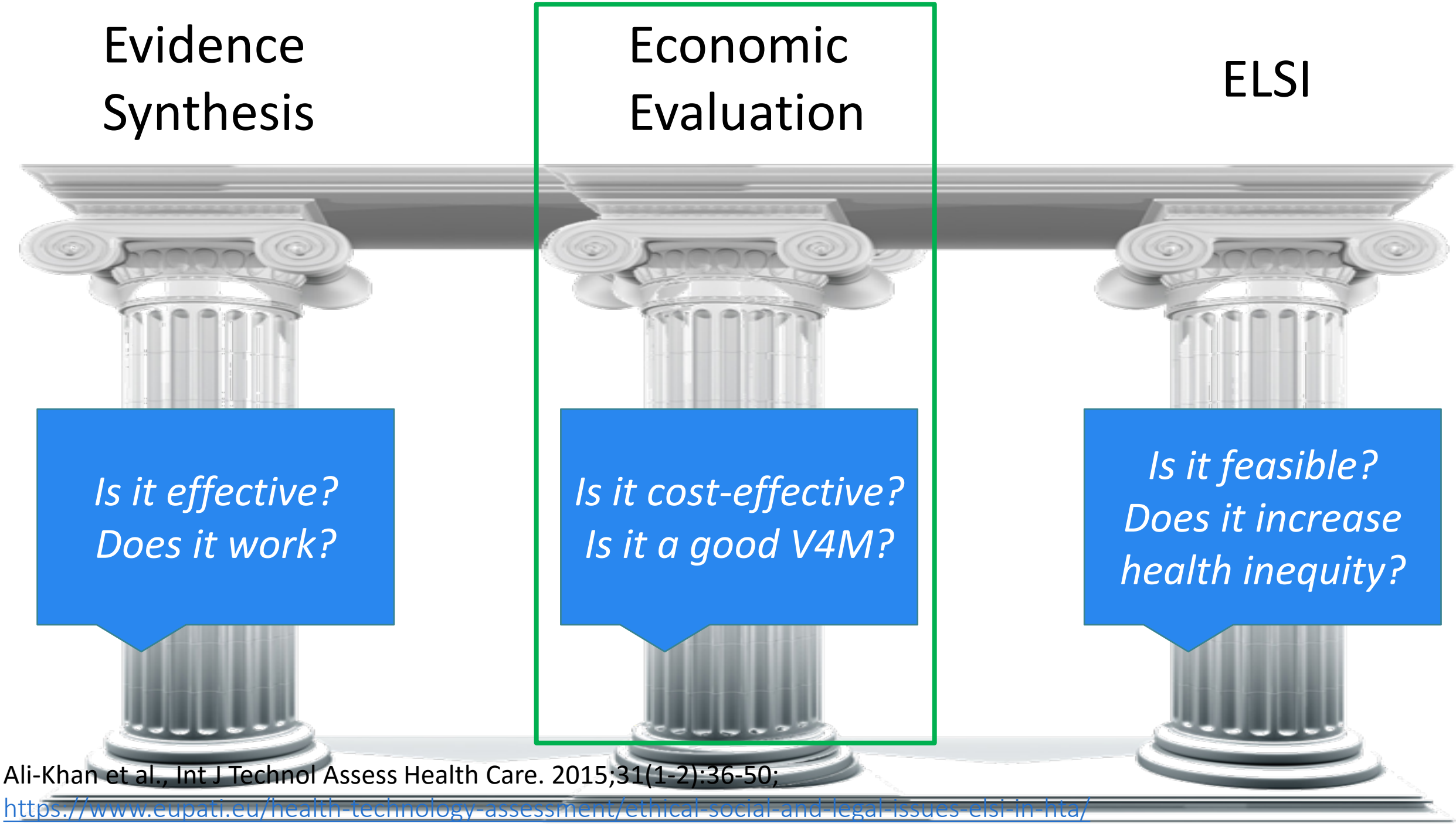
Figure 1. Health economics: structure of discipline

Maynard and Kavanos. Health Economics 2000

Health Technology Assessment (HTA)

- A **multidisciplinary** process that uses explicit methods to determine the value of a health technology at different points in its lifecycle
- Purpose = to **inform** decision-making in order to promote an equitable, efficient, and high-quality health system

O'Rourke, B., Oortwijn, W., & Schuller, T. (2020). The new definition of health technology assessment: A milestone in international collaboration. *International journal of technology assessment in health care*, *36*(3), 187-190; https://www.cambridge.org/core/journals/international-journal-of-technology-assessment-in-health-care/article/new-definition-of-health-technology-assessment-a-milestone-in-international-collaboration/8A3BA65D279F3FDAA83ADB3D08CF8C17; https://www.valueinhealthjournal.com/article/S1098-3015(20)32060-X/fulltext

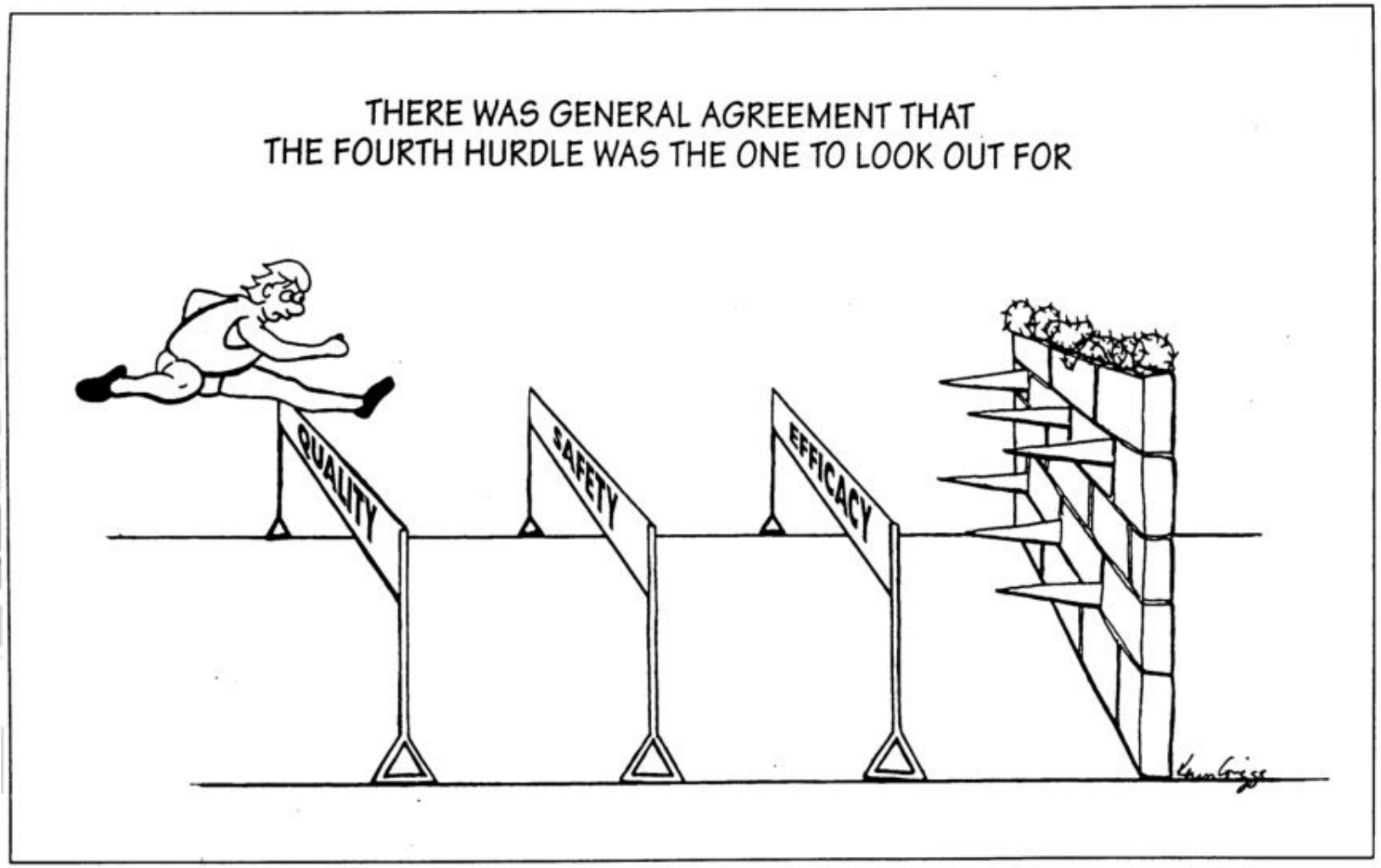


Ali-Khan et al., Int J Technol Assess Health Care. 2015;31(1-2):36-50;
https://www.eupati.eu/health-technology-assessment/ethical-social-and-legal-issues-elsi-in-hta/

The Fourth Hurdle

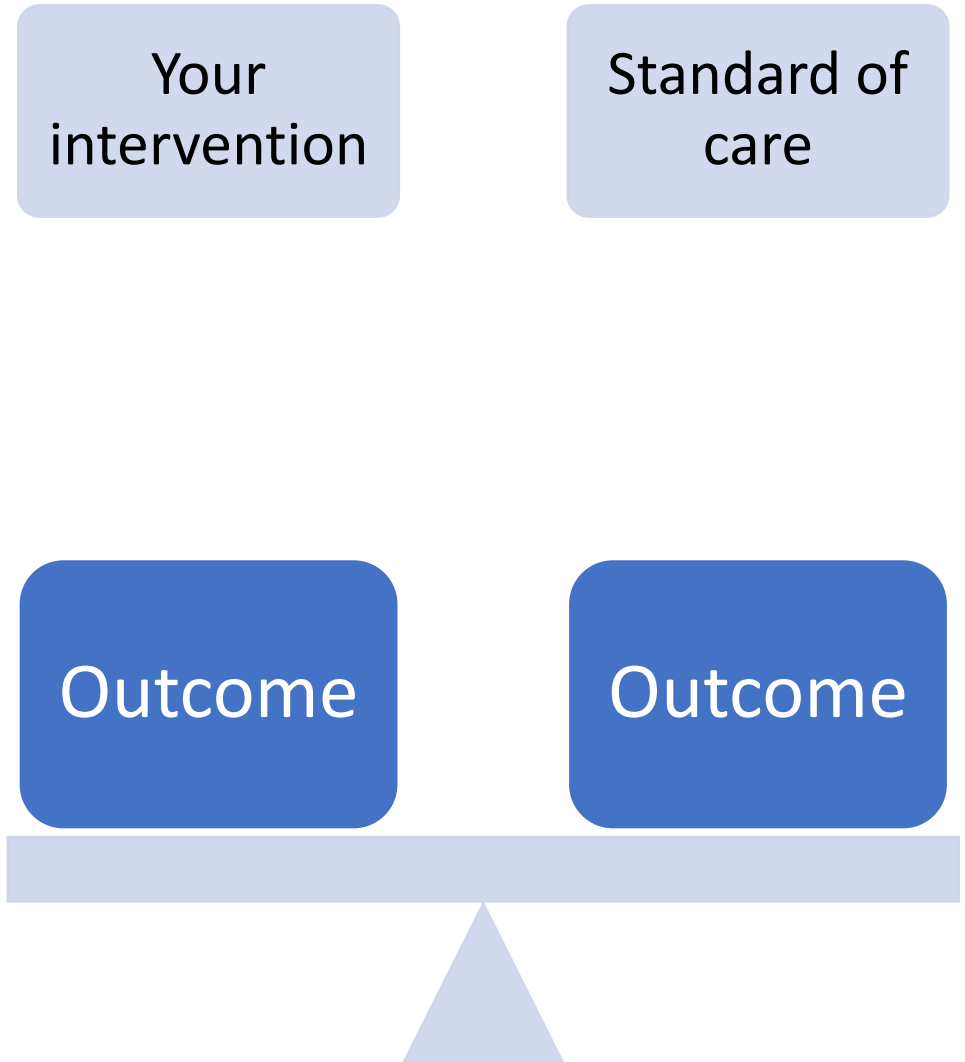
With proposed intervention, things to check

1. **Quality**: Does it have good quality?
2. **Safety**: Is it safe?
3. **Efficacy/effectiveness** (does it work?)
4. **Cost-effectiveness**
5. **Budget impact**
6. **Other criteria…**



Source: www.ohri.ca

Preparing Your Evidence Package



Does Your Intervention Work?

Yetley, E. A.,... & Wells, G. A. (2017). *The American journal of clinical nutrition*, *105*(1), 249S-285S.

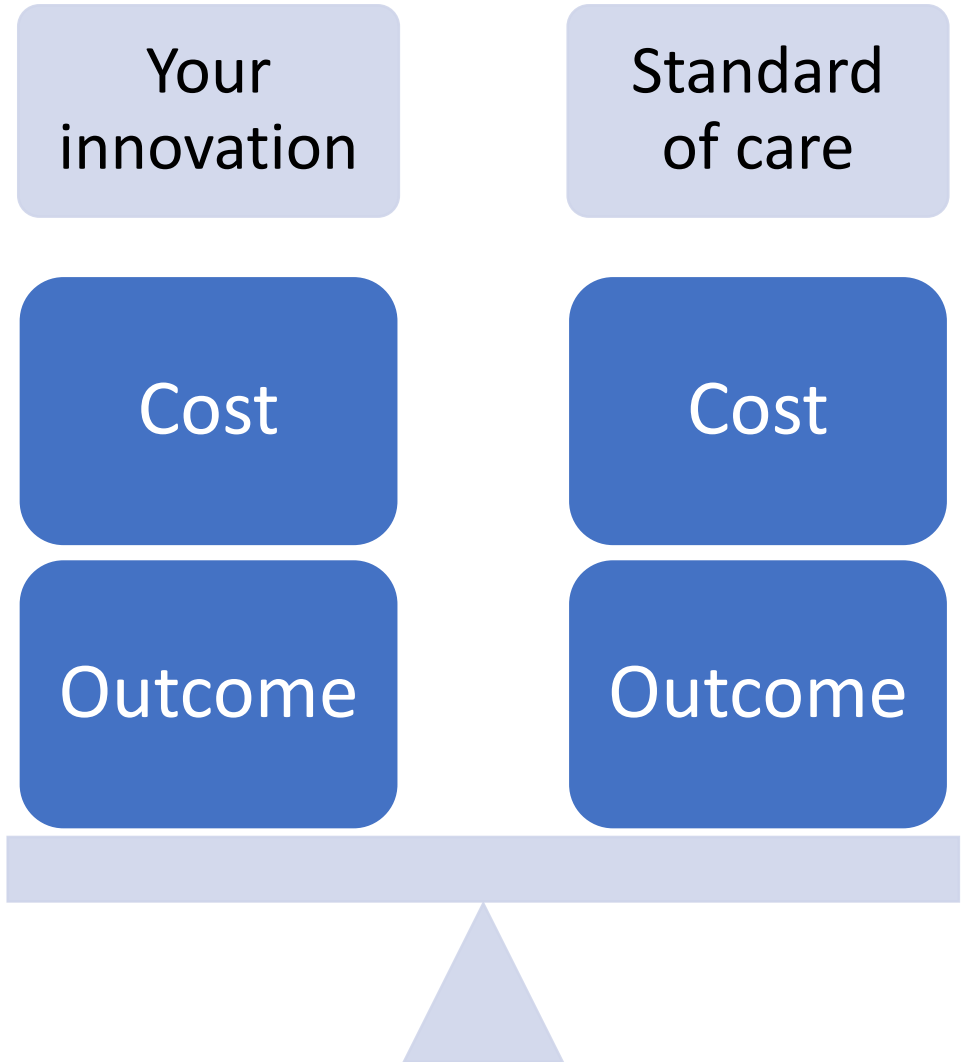
More than one piece of a puzzle

Does it work?

Is it cost-effective?

Severens, JL. Quality Improvement Research. 2003

Preparing Your Evidence Package



Context Matters → Your Question(s) Set the Context

Example questions of interest	Type of analysis
Compared to usual care, is this new intervention cost-effective?	• Cost-benefit analysis • Cost-effectiveness analysis • Cost-utility analysis
How much does the intervention cost?	• Cost description
How will the program affect the overall budget?	• Budget impact analysis
What is an economic impact of a disease or health condition?	• Economic analysis

Implementation of Stock Epinephrine Program in Malls and Food Service Establishments:

To stock or not to stock?

Waserman, S., Avilla, E., Harada, L., Allen, M., Isaranuwatchai, W., Perdrizet, J., & Kastner, M. (2018). *The Journal of Allergy and Clinical Immunology: In Practice*. 7(2), 678-680.

How much each year?

Note: Cou ople)
1 Canadian

A. 5 million

B. 50 millio

C. 500 mill

D. 5 billion

E. >5 billio

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LIVE EVENT 2 mins ago WATCH LIVE: Fountains of lava continue to gush from Hawaii's Kilauea volcan

MONEY September 2, 2016 12:06 pm Updated: September 2, 2016 12:11 pm

Anxiety and depression cost the Canadian economy almost $50 billion a year

By Nicole Mortillaro

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HEPATOLOGY
Official Journal of the American Association for the Study of Liver Diseases

Health Care Costs Associated With Hepatocellular Carcinoma: A Population-Based Study

Hla-Hla Thein,[1,2] Wanrudee Isaranuwatchai,[3] Michael A. Campitelli,[1] Jordan J. Feld,[4] Eric Yoshida,[5] Morris Sherman,[6] Jeffrey S. Hoch,[7,8,9,10] Stuart Peacock,[9] Murray D. Krahn,[11,12] and Craig C. Earle[2,10]

Although the burden of hepatocellular carcinoma (HCC) is an escalating public health problem, it has not been rigorously estimated within a Canadian context. We conducted a population-based study using Ontario Cancer Registry linked administrative data. The mean net costs of care due to HCC were estimated using a phase of care approach and generalized estimating equations. Using an incidence approach, the mean net costs of care were applied to survival probabilities of HCC patients to estimate 5-year net costs of care and extrapolated to the Canadian population of newly diagnosed HCC patients in 2009. During 2002-2008, 2,341 HCC cases were identified in Ontario. The mean (95% confidence interval [CI]) net costs of HCC care per 30 patient-days (2010 US dollars) were $3,204 ($2,863-$3,545) in the initial phase, $2,055 ($1,734-$2,375) in the continuing care phase, and $7,776 ($5,889-$9,663) in the terminal phase. The mean (95% CI) 5-year net cost of care was $77,509 ($60,410-$94,607) and the 5-year aggregate net cost of care was $106 million ($83-$130 million) (undiscounted). The net costs of patients receiving liver transplantation only and those undergoing surgical resection only were highest in the terminal phase. The net cost of patients receiving radiofrequency ablation as the only treatment was relatively low in the initial phase, and there were no significant differences in the continuing and terminal phases. *Conclusion:* Our findings suggest that costs attributable to HCC are significant in Canada and expected to increase. Our findings of phase-specific cost estimates by resource categories and type of treatment provide information for future cost-effectiveness analysis of potential innovative interventions, resource allocation, and health care budgeting, and public health policy to improve the health of the population. (HEPATOLOGY 2013;58:1375-1384)

HCC incidence and mortality in many countries over

Editorial

Could the human papillomavirus vaccination be cost-effective in males for the prevention of oropharyngeal cancer?

Expert Rev. Pharmacoecon. Outcomes Res. 14(6), 763–765 (2014)

Wanrudee Isaranuwatchai

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Could the human papillomavirus (HPV) vaccination be cost–effective in males for the prevention of oropharyngeal squamous cell cancer (OPC)? It could be under certain conditions. Research on HPV vaccine has focused mainly on females. However, within the next decade, it is predicted that OPC will surpass cervical cancer as the most common HPV-related cancer, and it is postulated that HPV vaccination may alter the incidence of OPC. The purpose of this editorial is to comment on the potential cost–effectiveness of HPV vaccination in males for OPC prevention by addressing three elements payers often consider when making a decision to fund an intervention and to provide an overview of recent findings regarding the cost–effectiveness of HPV vaccine in males.

Watch out for the newcomer

Within the next decade, it is predicted that oropharyngeal squamous cell cancer (OPC) will surpass cervical cancer as the most common human papillomavirus (HPV)-related cancer [1]. Up to 80% of OPC may be attributable to HPV in developed countries and the incidence of HPV-related diseases such as OPC is increasing (3.6/100,000) [1–4]. OPC, a type of head and neck cancer, is a disease in which cancerous cells grow in the tissue at the base of the tongue, between oral HPV infection and OPC has been established, raising the question of possible benefit for HPV vaccination for the prevention of this disease. Most research on HPV vaccine has focused on females [9], and HPV vaccination in females has been recommended and supported widely as a cost–effective public health program (e.g., 2006 in the US [4] and 2007 in Canada [10]). A confirmed benefit of HPV vaccine for the prevention of HPV-related OPC could lend further weight to the incorporation of HPV vaccination into cancer prevention

Isaranuwatchai *et al. BMC Geriatrics* (2017) 17:199
DOI 10.1186/s12877-017-0599-9

BMC Geriatrics

RESEARCH ARTICLE Open Access

Cost-effectiveness analysis of a multifactorial fall prevention intervention in older home care clients at risk for falling

Wanrudee Isaranuwatchai[1,2*], Johnna Perdrizet[1], Maureen Markle-Reid[3] and Jeffrey S. Hoch[1,2,4]

Journal of Educational Evaluation for Health Professions

J Educ Eval Health Prof 2016; 13: 44 • https://doi.org/10.3352/jeehp.2016.13.44 Open Access
eISSN: 1975-5937

Research article

A cost-effectiveness analysis of self-debriefing versus instructor debriefing for simulated crises in perioperative medicine in Canada

Adv in Health Sci Educ (2014) 19:219–232
DOI 10.1007/s10459-013-9464-6

pital,
anada;

Comparing the cost-effectiveness of simulation modalities: a case study of peripheral intravenous catheterization training

Wanrudee Isaranuwatchai · Ryan Brydges · Heather Carnahan · David Backstein · Adam Dubrowski

Cancer Medicine Open Access

ORIGINAL RESEARCH

Cost-effectiveness analysis of potentially curative and combination treatments for hepatocellular carcinoma with person-level data in a Canadian setting

Hla-Hla Thein[1,2], Wanrudee Isaranuwatchai[3,4], Yao Qiao[1], Kenny Wong[1], Gonzalo Sapisochin[5], Kelvin K. W. Chan[6,7,8], Eric M. Yoshida[9] & Craig C. Earle[2,8,10,11]

HEALTH, WEALTH, AND PROFITS

Prevention of non-communicable disease: best buys, wasted buys, and contestable buys

Wanrudee Isaranuwatchai and colleagues highlight the importance of local context in making decisions about implementing interventions for preventing non-communicable diseases

Types of Economic Evaluations

- Cost Benefit Analysis (CBA)
- Cost Utility Analysis (CUA)
- Cost Effectiveness Analysis (CEA)
- Cost Minimization Analysis (CMA)

Drummond et al. Methods for the Economic Evaluation of Health Care Programmes. 2015.
Hoch JS and Dewa CS. *Can J Psychiatry*. 2005. 50(3):159-166.
Briggs, A. H., & O'Brien, B. J. (2001). The death of cost-minimization analysis?. Health economics, 10(2), 179-184.

Which types of EE to use?

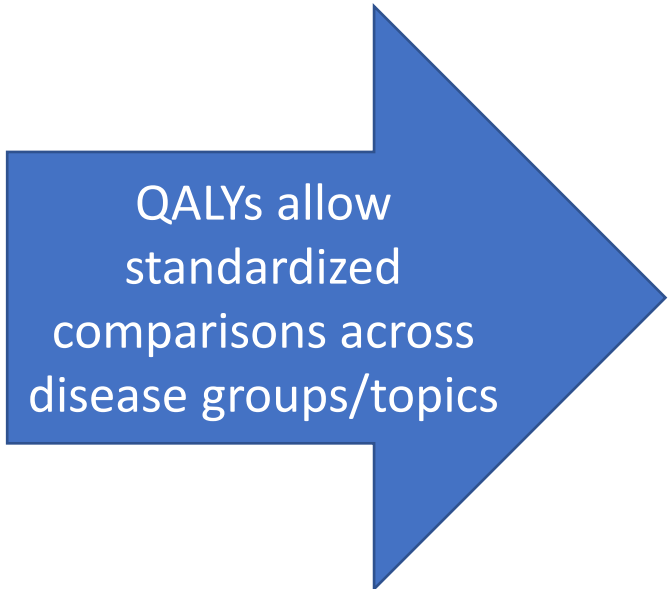
- Need both cost and outcome data
- Depend on outcome

Type of EE	Cost	Outcome
Cost-Benefit Analysis (CBA)	$	$
Cost-Utility Analysis (CUA)	$	QALY
Cost-Effectiveness Analysis (CEA)	$	Natural unit
Cost-Minimization Analysis (CMA)	$	0

Quality-Adjusted Life Year (QALY)

QALY *= LOL * QOL*

How long a person live * his/her quality of life



What Economic Evaluation is About?

- Creating a cost-effectiveness **estimate**

- Characterizing the **uncertainty** of the estimate

Briggs, A. H., & O'Brien, B. J. (2001). *Health economics*, *10*(2), 179-184.

Cost-Effectiveness Estimates

- Incremental Cost-Effectiveness Ratio (**ICER**)
  - EXTRA cost for one EXTRA unit of outcome
  - ΔC / ΔE
  - $\frac{\overline{C_{TX}} - \overline{C_{UC}}}{\overline{E_{TX}} - \overline{E_{UC}}}$

- Incremental Net Benefit (**INB**)
  - EXTRA net benefit of your program compared to usual care
  - λ(ΔE) – (ΔC)

General Rules

- What you want **>** your budget
  - SAY **NO**

☹

ICER **>** CET

Not cost-effective

- What you want **<** your budget
  - SAY **YES** or BUY

☺

ICER **<** CET

Cost-effective

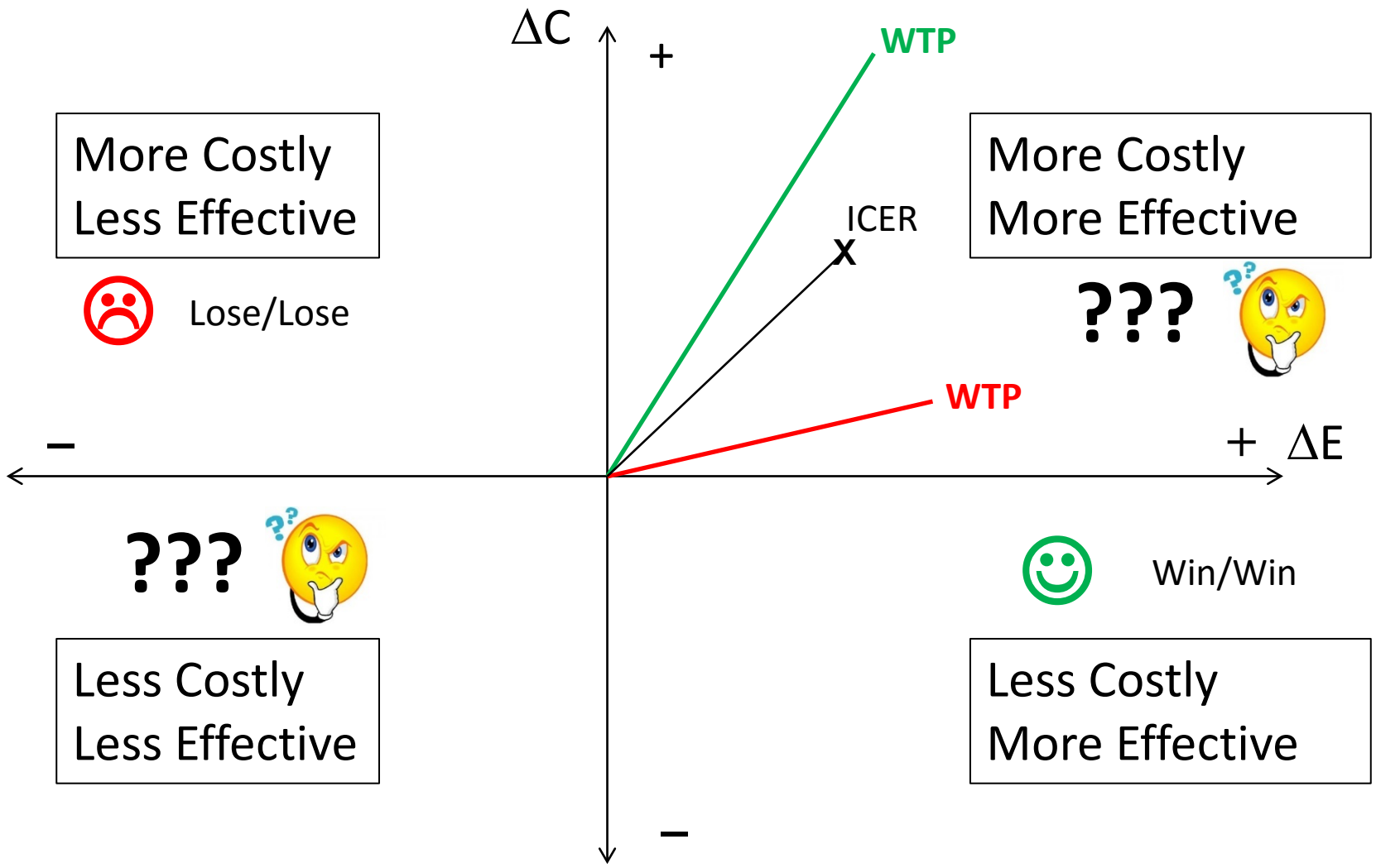
Compared to standard of care, is your health innovation cost-effective?

- ICER = Extra cost for 1 unit of effect
- Cost-effective: ICER < CE threshold
- ΔC / ΔE < Willingness-to-pay (CET)

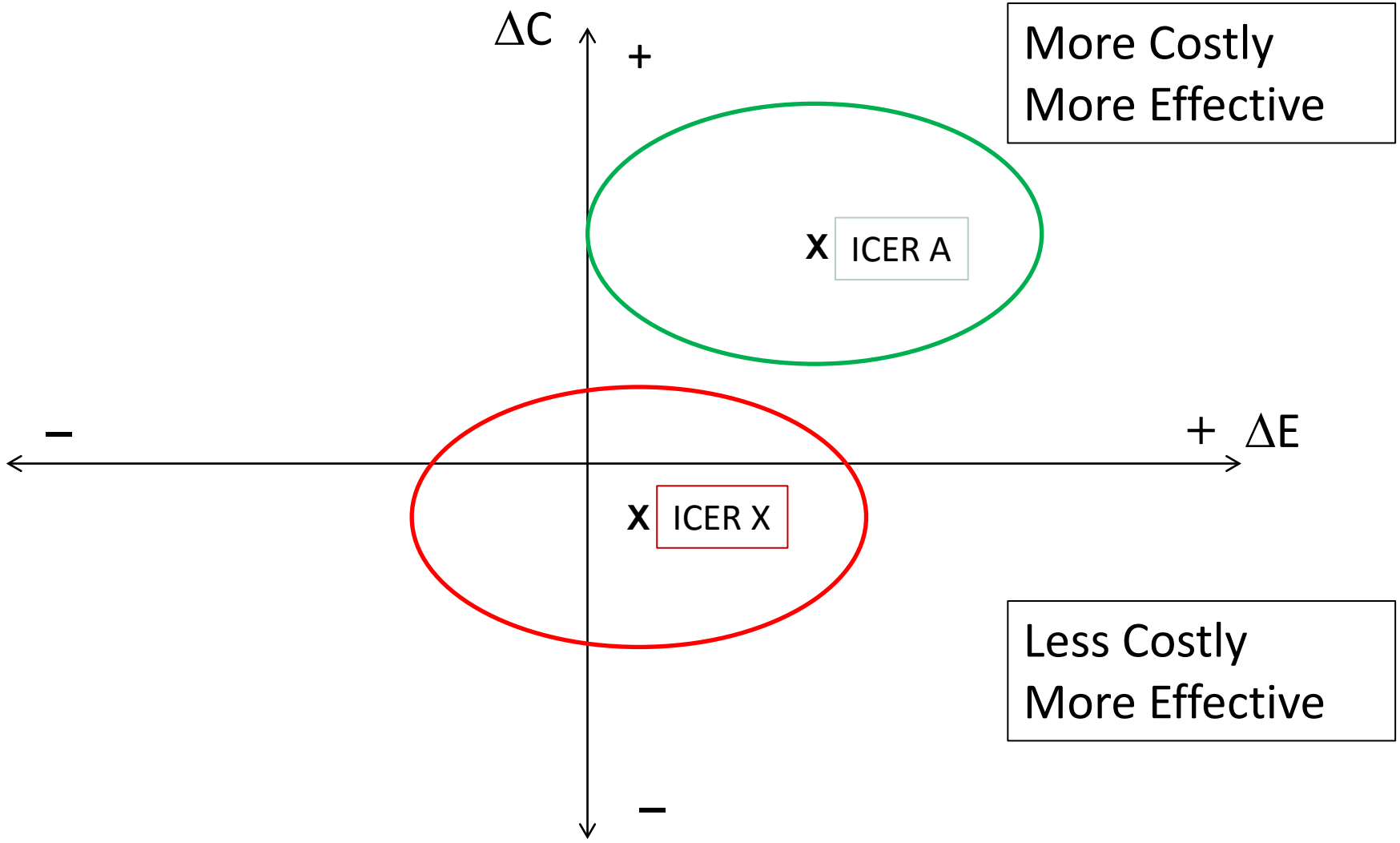
EVIDENCE

CONTEXT

Cost-Effectiveness Plane



ICER and Uncertainty



Summary

- Why do HTA?
  - Health care resources = limited
  - You can spend each baht once
- Your question sets the context
- Multidisciplinary process
- Goal of HTA
  - To inform decision- and policy-making process

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