# PHARMACOECONOMICS

Type of pharmacoeconomics evaluations

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# LEARNING OUTCOMES

**By the end of this lecture you will be able to:**

- Understand what contribute to a full economic evaluation
- Define cost-minimisation analysis
- Define cost-effectiveness analysis
- Understand cost effectiveness plane
- Learn how to estimate cost-effectiveness ratio and incremental cost-effectiveness ratio

# REFERENCES

- Drummond MF, Sculpher MJ, Torrance GW. Methods for the economic evaluation of health care programs: Oxford university press, 2005.

- Briggs AH, Claxton K, Sculpher MJ. *Decision modelling for health economic evaluation*: Oxford University Press, USA, 2006.

- ISPOR book of terms. Health care cost, quality, and outcomes. ISPOR, 2003.

# PHARMACOECONOMIC EVALUATION TYPES

**Imagine a scenario !!!**

- You are a hospital manger and you are considering to  hire a clinical pharmacist..

**What might be the most urging questions?**

# QUESTIONS TO CONSIDER

- Can it work?
  - **i.e. Evidence of efficacy**
- Does it actually work ?

  **i.e. evidence of effectiveness**
- Is it **better** than usual care (i.e. without the presence of clinical pharmacy) ?

  **i.e. more output, but how is output to be measured ?**
- Can we afford to pay for it ?

  **i.e. How much will it cost/ save ?**
- Does it represent an efficient use of resources?

  **Is it worth transferring resources from another health care area to pay for?**

# HOW WE CAN ANSWER THESE QUESTIONS

- Health economic evaluations help us to Answer theses question and aid in decision making
- Health economic evaluations are tools to make comparison
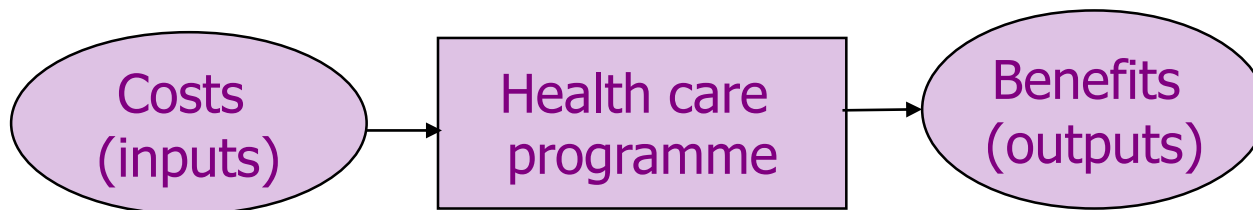- They are used to ensure that society get a good return on its investment in public health
- i.e.

Economic evaluation methods provide a systematic way to **identify, measure, value, and compare the costs and consequences** of various programs, policies, or interventions.

# REMEMBER !!

- The overall goal of PE evaluations is to identify, measure, value and compare the costs and consequences of the alternatives being considered

  > **i.e. to achieve the most efficient use of resources**

- It is not about determining the cheapest health care alternatives, but determining those alternatives that provide the **best health care outcome per Dinar spent.**

# REMEMBER FROM THE PREVIOUS LECTURES

- Economic evaluations are tools that health economists use to assess the cost-effectiveness of health care interventions.

- An economic evaluation is about comparing the cost and outcome of alternative treatments

- They consist of two components:
  - inputs (costs)
  - outputs (benefits)

| Costs (inputs) | → | Health care programme | → | Benefits (outputs) |

**Resources**

| | | **Outcomes** |
|---|---|---|
| Building | Surgery | Effectiveness |
| Staff | Medication | QoL |
| Drug | Counselling | Utility |
| | | WTP |

# DEFINITION

- **Economic evaluation:** A comparative analysis of alternatives in term of costs and consequences

- Economic evaluations can be described as either partial or full.
  - **Full economic evaluation**: must be a comparison of two or more alternatives and both the costs and consequences of the alternatives must be examined
  - **Partial economic evaluation:** Consider costs and/or consequences, but which either do not involve a comparison between alternative interventions or do not relate costs to benefits.

| | Question2: Are both costs and consequences of alternatives examined? | | | |
|---|---|---|---|---|
| | NO | | | YES |
| Question1: Is there Comparison of two or more alternatives? | NO | Examines only consequences | Examines only costs | **Partial Evaluation** Cost-outcome description |
| | | **Partial Evaluation** | | |
| | | Outcome description | Cost description | |
| | YES | **Partial Evaluation** | | **Full Economic Evaluation** Cost-effectiveness analysis Cost-utility analysis Cost-benefit analysis |
| | | Efficacy or effectiveness evaluation | Cost analysis | |

# PARTIAL ECONOMIC EVALUATION

- Evaluate the costs or/both outcomes of a single service, interventions or health care program
  - Cost description (Cost of illness)
  - Outcome description
  - Cost-outcome description

- Evaluate cost or outcome for two or more alternatives, services, or programs
  - Cost analysis
  - Effectiveness analysis

# FULL ECONOMIC EVALUATION

- Compare both the costs and outcomes of two or more health programs or treatment

- There are three basic methods of economic evaluation:-
  - cost effectiveness analysis (CEA)
  - cost utility analysis (CUA)
  - cost benefit analysis (CBA)
- They differ in the **type of outcome measure** used.
- cost minimisation analysis (CMA) is a special case in each of the above methods

# COST MINIMISATION ANALYSIS (CMA)

- The analysis of the comparative costs of alternative treatments or health care programmes for which the consequences of the interventions have been shown to be therapeutically equivalent

i.e.

- The outcomes of different interventions are the same
- Choose the intervention that costs the least

- e.g. branded/generic product for the same drug entity and the same dosage form, assuming the products have been shown to be therapeutically equivalent.

# EXAMPLE

- If the dose required to cause a 10mmHg reduction in systolic blood pressure was known for several different medicines.

- Drug A £3 per month

- Drug B £1.50 per month

- Drug C £28.00 per month

The acquisition costs of the medicines could be calculated and the cheapest one selected (CMA)

- Nice in theory
- Simple to implement
- Used when buying the same service from different providers

    e.g. tendering for services

- Not really suitable for new health interventions
  - Outcomes are rarely identical
  - Effects are multi-factorial

# REMEMBER FROM LAST TIME!!

- Example: Comparing laparoscopic cholecystectomy versus open cholecystectomy

  - Different methods to remove the gallbladder
  - Health outcomes for the two techniques were considered equivalent

Is this a CMA?

# COST-EFFECTIVENESS ANALYSIS

- The term "cost effective" is one of the most overused and inappropriately applied. A medicine or service should only be described as cost effective if it has been proven so by economic analysis

- Costs are measured in monetary terms

- **Effectiveness is the outcome of an intervention or service used in this type of economic evaluation and measured in natural units**

- outcome measure common to both alternatives but, may be achieved to different degrees
  (ie there is a difference in effectiveness).

# EFFECTIVENESS

- General (Long-term) outcome measures:
  - cases successfully diagnosed or treated
  - life years saved
  - life years gained

- It is also possible to use clinical indicators (Intermediate outcome measures) : Serve as a proxy for the final outcome measure
  - Percentage reduction in LDL
  - percentage reduction in blood pressure
  - effect on nausea and vomiting frequency

# EFFECTIVENESS

E.g.

- Lipid lowering agents used to decrease LDL-CH (intermediate outcome) to express final outcomes (decrease in MI or an increase in lives saved).

- WHY?

- Humanistic reasons; i.e. Ethical issues

- Easier to demonstrate clinical efficacy

- Faster and thus reduce cost and time required to conduct a clinical trail

# OUTCOMES THAT COULD BE USED FOR A COST-EFFECTIVENESS ANALYSIS

| Service | Measure of outcome |
|---|---|
| Anticoagulant monitoring | Reduction in adverse events (e.g. bleeding) |
| Asthma management service | Improvement in forced expiratory volume |

- CEA  is an appropriate technique to use when the therapeutic outcomes of different interventions can be expressed in common natural units
  - i.e.  Is the extra cost justified by higher efficacy?

# EXAMPLE

- Let us once again consider which medicines should be used to treat hypertension.

  - Drug A causes a 10mmHg drop in blood pressure and costs 120 JDs per year

  OR

  - Drug B causes a 15mmHg drop in blood pressure but costs 180 JDs per year.

  **Can we use cost minimisation?**

  **We cannot use a cost-minimisation analysis in this instance because the outcome achieved is different.**

# COMPARE COST-EFFECTIVENESS?

- In cost-effectiveness analysis, it is important to use the incremental economic analysis, which identify the difference (increment in costs and outcomes) between two health care programs

- Incremental economic analysis enable identifying the dominance of the intervention or the control should be evaluated

- Graphically this can be illustrated by the cost-effectiveness plan
  - The incremental costs a (Y-axis) re plotted against the incremental effects (X-axis)

NW

Cost difference

+

NE

New treatment always rejected, i.e. dominated

Intervention less effective and more costly

?

Intervention more effective and more costly

Effect difference

?

New treatment always accepted, i.e. dominated

Intervention less effective and less costly

Intervention more effective and less costly

SW

-

SE

- A new intervention is said to dominate control being less costly and more effective
  **i.e. located in the southeast quadrant.**

- Vice Versa, a control dominates an intervention if the new intervention is less effective and more costly
  **i.e. it is located in the northwest quadrant**

- In the case of dominance, it is clearly appropriate to implement the least costly and most effective (or dominant) option

- However, far more common is for a new intervention to be more effective and more costly (less common new intervention with less effectiveness and cost)

- A decision should be made in such circumstances whether the additional health benefit is worth the additional cost

**What to do?**

**We need to estimate the incremental cost-effectiveness ratio (ICER)**

# INCREMENTAL COST-EFFECTIVENESS RATIO (ICER):

o ICER: The costs required to achieve one extra unit of outcome

o It is calculated by dividing (ratio) the difference in costs to the difference in effects between the interventions

$$ICER = \frac{\Delta\ Costs(JD)}{\Delta Efficacy} = \frac{Cost\ A-\ Cost\ B}{Effectiveness\ A-\ Effectiveness\ B}$$

o ICER: more accurate and more meaningful since it represents the costs and benefits of each new treatment compared with an existing one.

# AGAIN DRUG B VS. DRUG A

- Drug A costs 10 JDs per month and causes a 10mmHg drop in Blood Pressure
- Drug B costs 25 JDs per month and causes a 12mmHg drop in Blood pressure

**Calculate  ICER?**

Answer

ICER = <u>Cost Drug B (new) – Cost Drug A (old)</u>

   Effectiveness Drug B (new) – Effectiveness Drug A (old)

   = 25 - 10 / 12 mmHg – 10mmHg

Costs an additional 15 JDs for an extra 2 mmHg drop in BP

**ICER is 7.5 JD /1 mmHg drop in BP**

# ANOTHER EXAMPLE

| | Cost/unit (USD)* | No. of units | No. of patients | Total cost (USD) |
|---|---|---|---|---|
| **Medicine A** | | | | |
| Medicine cost | 40 | 12 | 100 | 48,000 |
| Lab cost | 20 | 1 | 100 | 2,000 |
| Adverse event | 50 | 2 | 100 | 10,000 |
| Physician | 25 | 2 | 100 | 5,000 |
| Total | | | | 65,000 |
| **Medicine B** | | | | |
| Medicine cost | 25 | 12 | 100 | 30,000 |
| Lab cost | 20 | 2 | 100 | 4,000 |
| Adverse event | 50 | 3 | 100 | 15,000 |
| Physician | 25 | 3 | 100 | 7,500 |
| **Total** | | | | **56,500** |

- The effectiveness unit  is:  number of patients with ≥ 1% decrease in glycosylated hemoglobin over one year

**Effectiveness**

Medicine A            Medicine **B**

25/100 patients      19/100 patients

What is ICER?

**Comparison between medicines A and B for 100 patients for 1 year**

|  | Medicine A | Medicine B |
|---|---|---|
| **Net costs USD*** | 65,000 | 56,500 |
| **Effectiveness** No. patients with ≥ 1% decrease in glycosylated hemoglobin | 25 | 19 |

**Incremental Cost Effectiveness Ratio** =
(65,000-56,500)/(25-19) = USD1,416.67 per extra patient with ≥ 1% decrease in glycosylated hemoglobin.

# ADVANTAGES AND DISADVANTAGES OF COST-EFFECTIVENESS ANALYSIS

- Adv:
  - An appropriate method when the outcome of intervention or program are measured in the same unit

- Disadv:
  - When comparing alternatives or health care programs with different types of outcomes E.g. MI treatment (Life year gained) versus vaccination for influenza (Reduction in infection rate)
  - When the intervention or program has an impact on quality and quantity of life