Types of Pharmacoeconomic Analysis

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Objectives

Describe the four types of pharmacoeconomic analysis:

- cost-minimization analysis (CMA),
- cost-benefit analysis (CBA),
- cost-effectiveness analysis (CEA), and
- cost-utility analysis (CUA).

Describe the advantages and disadvantages of the different types of pharmacoeconomic analyses.
Pharmacoeconomic Analysis

- A complete Pharmacoeconomic evaluation has 2 major components costs and outcomes of the compared alternatives.
- The cost component is always measured in monetary unit, while outcome component can be measured in various ways such as life years saved, case treated and utility terms.
Pharmacoeconomic Analysis

There are four main types of pharmacoeconomic evaluations:

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

- For a CMA, costs are measured in monetary, and outcomes are assumed to be equivalent.

- For eg, comparing cost of two drugs. All the outcomes (e.g., efficacy, incidence of adverse drug interactions) are expected to be equal, but the costs are not.

- Some researchers contend that a CMA is not a true pharmacoeconomic study, because costs are measured, but outcomes are not.
Others say that the strength of a CMA depends on the evidence that the outcomes are the same. This evidence can be based on previous studies, publications, FDA data, or expert opinion.

The advantage of this type of study is that it is relatively simple compared to the other types of analyses because outcomes need not be measured.

The disadvantage of this type of analysis is that it can only be used when outcomes are assumed to be identical.
A hospital needs to decide if it should add a new intravenous antibiotic to the formulary, which is therapeutically equivalent to the current antibiotic used in the institution and has the same side effect profile.

The advantage of the new antibiotic is that it only has to be administered once per day versus three times a day for the comparison antibiotic.

Because the outcomes are expected to be nearly identical, and the objective is to assess the costs to the hospital (e.g., the hospital perspective), only direct medical costs need to be estimated and compared.
Cost-Minimization Analysis-example

- The direct medical costs include the daily costs of each medication, the pharmacy personnel time used in the preparation of each dose, and the nursing personnel time used in the administration of each dose.

- Even if the cost of the new medication is a little higher than the cost of the current antibiotic, the lower cost of preparing and administering the new drug (once a day vs. three times per day) may offset this difference.

- Direct nonmedical, indirect, and intangible costs are not expected to differ between these two alternatives and they need not be included if the perspective is that of the hospital, so these costs are not included in the comparison.
Cost-Benefit Analysis (CBA)

- A CBA measures both inputs and outcomes in monetary terms. One advantage to using a CBA is that alternatives with different outcomes can be compared, because each outcome is converted to the same unit (dollars).

- For example, the costs (inputs) of providing a pharmacokinetic service versus a diabetes clinic can be compared with the cost savings (outcomes) associated with each service, even though different types of outcomes are expected for each alternative.

- Many CBAs are performed to determine how institutions can best spend their resources to produce monetary benefits.
Comparing costs and benefits (outcomes in monetary terms) is accomplished by two methods.

One method divides the estimated benefits by the estimated costs to produce a benefit-to-cost ratio. If this ratio is more than 1.0, the choice is cost beneficial.

The other method is to subtract the costs from the benefits to produce a net benefit calculation. If this difference is positive, the choice is cost beneficial.
More complex use of CBA consists of measuring clinical outcomes (e.g., avoidance of death, reduction of blood pressure, and reduction of pain) and placing a dollar value on these clinical outcomes.

This use of the method still offers the advantage that alternatives with different types of outcomes can be assessed, but a disadvantage is that it is difficult to put a monetary value on pain, suffering, and human life.

There are two common methods that economists use to estimate a value for these types of consequences, the human capital (HC) approach and the willingness-to-pay (WTP) approach.
The human capital approach assumes that the values of health benefits are equal to the economic productivity that they permit. The cost of disease is the cost of the lost productivity due to the disease.

There are disadvantages in using HC. People's earnings may not reflect their true value to society, and this method lacks a solid literature of research to back this notion.

The willingness-to-pay method estimates the value of health benefits by estimating how much people would pay to reduce their chance of an adverse health outcome.
An independent pharmacy owner is considering the provision of a new clinical pharmacy service. The objective of the analysis is to estimate the costs and monetary benefits of two possible services over the next 3 years.

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Cost-Effective Analysis (CEA)

- This is the most common type of analysis. A CEA measures costs in monetary and outcomes in natural health units such as cures, lives saved, or vital signs.

- An advantage of using a CEA is that health units are common outcomes practitioners can readily understand and these outcomes do not need to be converted to monetary values.

- On the other hand, the alternatives used in the comparison must have outcomes that are measured in the same units, such as lives saved with each of two treatments. If more than one natural unit outcome is important when conducting the comparison, a cost-effectiveness ratio should be calculated for each type of outcome.
In order to determine if a therapy or service is cost-effective, both the costs and effectiveness must be considered. Think of comparing a new drug with the current standard treatment.

If the new treatment is (1) both more effective and less costly, (2) more effective at the same price, or (3) has the same effectiveness at a lower price, the new therapy is considered cost-effective.

On the other hand, if the new drug is (1) less effective and more costly, (2) has the same effectiveness but costs more, or (3) has lower effectiveness for the same costs, then the new product is not cost-effective.
Cost-Utility Analysis (CUA)

- A CUA takes patient preferences, also referred to as utilities, into account when measuring health consequences. The most common unit used in conducting CUAs is QALYs (Quality Adjusted Life Year[s]).

- A QALY is a health-utility measure combining quality and quantity of life, as determined by some valuations process. The advantage of using this method is that different types of health outcomes can be compared using one common unit (QALYs) without placing a monetary value on these health outcomes (like CBA).

- The disadvantage of this method is that it is difficult to determine an accurate QALY value. This is a relatively new type of outcome measure and is not understood or embraced by all providers and decision-makers. Therefore, this method is not commonly seen.
One reason researchers are working to establish methods for measuring QALYs is the belief that 1 year of life (a natural unit outcome that can be used in CEAs) in one health state should not be given the same weight as 1 year of life in another health state.

For example, if two treatments both add 10 years of life, but one provides an added 10 years of being in a healthy state and the other adds 10 years of being in a disabled health state, the outcomes of the two treatments should not be considered equal.
Summary

**Cost of Illness**
- Provides baseline to compare treatment options by estimating the cost of a disease on a defined population.

**Cost minimisation**
- Appropriate when alternative therapies have identical outcomes, but differ in costs.

**Cost-effectiveness**
- Appropriate when alternative therapies differ in clinical effectiveness but can be examined from the same dimension of health outcome.

**Cost-utility**
- Appropriate when alternative therapies may be examined using multiple dimensions of health outcome, such as morbidity and mortality.

**Cost-benefit**
- Requires the benefits of therapy to be described in monetary units and is not usually the technique of choice.

*Figure 2 Techniques used in economic analyses*
THANK YOU