Al-Zahrawi University

Pharmacoeconomics

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2nd Semester

5th Grade

Lecture 1

Introduction to Pharmacoeconomics

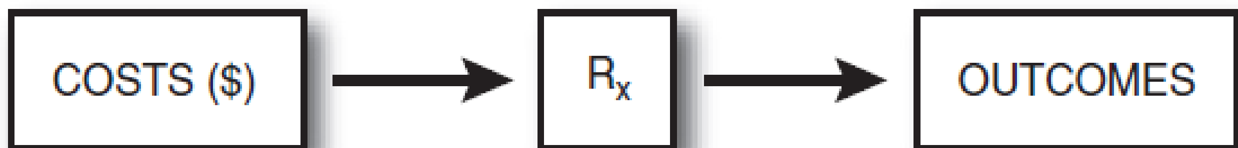
What is Pharmacoeconomics?

- Pharmacoeconomics has been defined as the **description** and **analysis** of the **costs** of **drug therapy** to the **health care system** and society. It **identifies**, **measures**, and **compares** the **costs** and **consequences** of pharmaceutical products and services.

For example

- If we want to use new intervention (**new medication**) in clinical practice. But the new interventions may provide only a **modest advantage** over existing treatment and a **higher cost**. In the case, Pharmacoeconomics attempts to find **whether** the **added benefit** of one intervention is **worth** the **added cost** of that intervention.

- To show this **graphically**, think of **two sides of an equation**.



Basic pharmacoeconomic equation. Pharmacoeconomic studies compare the costs (*left box*) associated with providing a pharmacy product or service (represented as Rx) to the outcome of the product or service.

A - The **left-hand side** of the equation represents the **inputs (costs)** used to obtain and use the pharmaceutical product or service.

B - The **right-hand side** of the equation represents the **outcomes** produced by the pharmaceutical product or service.

C - The **center** of the equation, the drug product or service being assessed, is **symbolized by Rx**.

- If just the **left-hand side** of the equation is measured **without regard** to outcomes, it is a **cost analysis** (or a **economic analysis**).

- If just the **right-hand side** of the equation is measured **without regard** to costs, it is a **clinical** study (**not an economic analysis**).

- To be a **true** pharmacoeconomics analysis, **both sides** of the equation must be considered and compared.

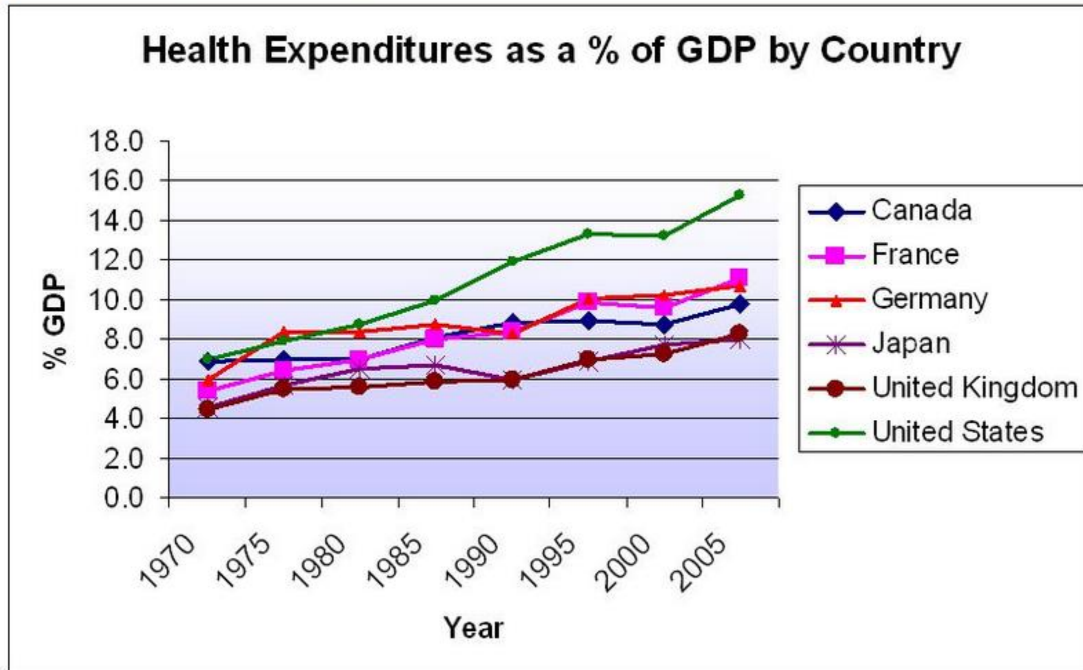
Why is Pharmacoeconomics Important?

- The United States spent about **$3 trillion ($ 3,000,000,000,000)** on **health care**, for an average of about **$10,000 per person**, (**population 300,000,000**) or about **15%** of the **gross domestic product (GDP)**.

- About **10%** of personal costs (about **$1000 per person**) of health care expenditures were for medications.

- Health care costs have been **increasing each year** more than the **average rate of inflation**. This **continued increase** in **costs** has resulted in a need to understand how **limited resources** can be used **more efficiently and effectively**.

Why study Pharmacoeconomics?



What clinicians, payers, patients want?

- **Clinicians** want their patients to receive the **best care and outcomes** available, and **payers** want to **manage rising costs**.

- Patients are seeking more information regarding **humanistic outcomes** of therapy. Patients want to know how their **quality of life** will be affected.

- If a **new branded medication** is approved by the **FDA** that has an advantage over another **marketed medication** that is **less expensive**, the professional can take this into account.

- For example, if the new treatment is **$100 per month ($40 patient** co-pay, and **$60 reimbursement** by health insurance) compared with a similar treatment that is available for **$20 per month ($5 patient** co-pay, and **$15 reimbursement** by health insurance), is the extra **$35 per month** out-of-pocket costs worth it to the patient?

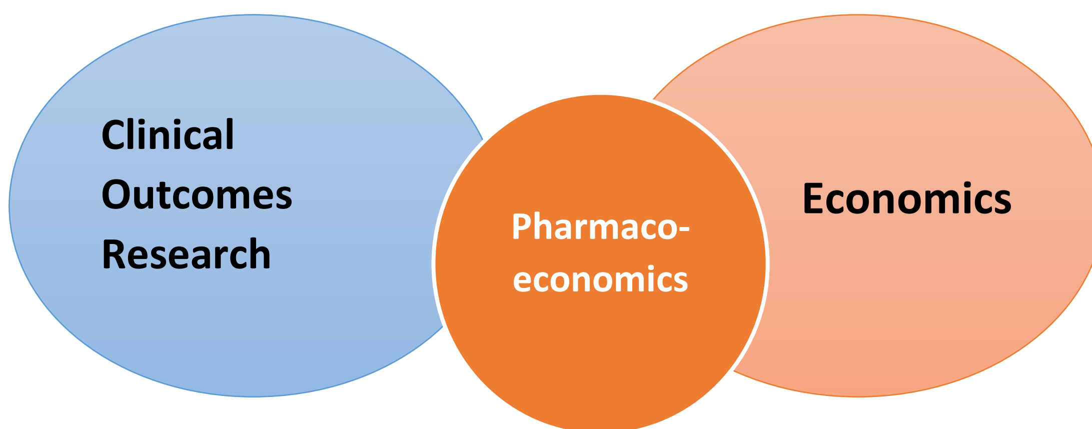
- If the **advantage** is **slight** (e.g., more convenient **once a-day** dosing compared with **twice-a-day** dosing of its competitor), the patient might **not value** the added convenience at **$35 per month**.

- But if the advantage is a **reduction in side effects** (e.g., **no diarrhea** or **no daytime drowsiness**), the added **advantage** may be **worth** the added **cost** for the patient.

Relationship of pharmacoeconomics to other research and ECHO Model

- Pharmacoeconomics **overlaps** with both **economics** & **clinical outcomes research**.

- Pharmacoeconomics is a **type of economic** and **clinical outcomes research**, but **not all outcomes research** is a pharmacoeconomic research. If the research involves **economic** and **clinical** outcome evaluations, it can be termed a pharmacoeconomic study (**overlapped area**)



- The focus of pharmacoeconomic is frequently on the **cost (inputs)** and the **consequences (outcomes)**. It addresses the **clinical, economic, and humanistic** aspect of health care interventions (often diagrammed as the **ECHO Model**).

ECHO Model

(Economic, Clinical, and Humanistic Outcomes)

Types of Pharmacoeconomic Studies

- There are four basic types of pharmacoeconomic studies (cost-minimization analysis (CMA), cost-effectiveness analysis (CEA), cost-utility analysis (CUA), and cost-benefit analysis (CBA). Each method **measures costs in dollars**, but they **differ regarding** how health **outcomes are measured** and compared.

TABLE 1.1. **THE FOUR BASIC TYPES OF PHARMACOECONOMIC ANALYSIS**

Methodology	*Cost Measurement Unit*	*Outcome Measurement Unit*
Cost-minimization analysis (CMA)	Dollars or monetary units	Assumed to be equivalent in comparable groups
Cost-effectiveness analysis (CEA)	Dollars or monetary units	Natural units (life years gained, mm Hg blood pressure, mMol/L blood glucose)
Cost-benefit analysis (CBA)	Dollars or monetary units	Dollars or monetary units
Cost-utility analysis (CUA)	Dollars or monetary units	Quality-adjusted life year (QALY) or other utilities

1 – Cost-Minimization Analysis

Advantages

- CMA has the advantage of being the **simplest** to conduct because the **outcomes** are assumed to be **equivalent**; thus, **only the costs** of the intervention are **compared**.

Disadvantages

- Advantage of the CMA method is also its disadvantage: CMA cannot be used when **outcomes** of interventions are **different**.

- A common example of a CMA is comparing **two generic medications** that are rated as **equivalent** by the **FDA**. If the drugs are **equivalent** to each other (but manufactured and sold by **different companies**), only the **differences** in the **cost** of the medication are used to choose the one that provides the **best value**. Thus, the type of **interventions** that can be evaluated with CMA may be **limited**.

- It would not be appropriate to compare **different classes** of medications using cost-minimization analyses if there are noted **differences** in **outcomes**.

- For example, if a new antibiotic was available that had a **higher rate** of **alleviating inner-ear infections** (but a **higher cost**) than a **currently marketed antibiotic**, it would **not be appropriate** to choose the current antibiotic based solely on the basis that it **cost less than** the new product.

- The **added value** of the new product should be **compared** with its higher cost. This type of studies is **cost analysis**, but **not a full pharmacoeconomic** analysis.

2 – <u>Cost-Effectiveness Analysis</u>

- CEA measures **outcomes** in **natural units** (e.g., mm Hg, cholesterol levels, symptom-free days [SFDs], years of life saved).

Advantages

- The main advantage of this approach is that the **outcomes** are **easier** to quantify when compared with a CUA or a CBA, and clinicians are **familiar** with measuring these types of health **outcomes** because these outcomes are routinely collected in clinical trials and in clinical practice.

Disadvantages

- One disadvantage of CEA is that programs with **different** types of outcomes **cannot** be **compared**. For example, it would **not be possible** to compare the cost-effectiveness of implementing an **anticoagulation clinic** with implementing a **diabetes clinic** because the clinical outcomes measured would be valued in **different units** (e.g., prothrombin time versus blood glucose measures).

- Even if the primary clinical outcome unit is the **same** for the **alternatives**, if there are other major differences (e.g., side effects, impact on other diseases), it is **difficult** to combine the differences into a **single effectiveness measure**.

- For example, "**first-generation**" antihistamines (e.g., **diphenhydramine**) and "**second-generation**" antihistamines (e.g., **fexofenadine**) are both used to relieve allergy and cold symptoms, but first-generation antihistamines are more likely to cause patients to become **drowsy**. The main clinical unit of measure for both alternatives may be **SFDs (side effects free days)**, or the number of days the patient did not suffer from allergy symptoms. However, this **difference** in the side effect of drowsiness is **not incorporated** into the comparison in a CEA.

- Lastly, CEA may estimate the **extra costs** associated with **each additional unit** of outcome (cure, year of life, SFDs), but who is to say if the added **costs** are **worth** the added **outcomes**? Because **no monetary amount** is placed on the clinical outcomes to indicate the value of these outcomes, it is a **judgment call** by the patient, clinician, or decision maker as to whether the alternative is "**cost-effective**" in their view.

3 – <u>Cost-Utility Analysis</u>

Advantages

- For some CEA comparisons, such as evaluations of chemotherapy agents, the primary clinical unit measure of **effectiveness** is the **number of years of life gained** because of treatment. But just measuring a patient's length of life because of treatment does **not take i**nto account the "quality" or "utility" of those years.

- CUA measures **outcomes** based on years of life that are adjusted by "**utility**" weights, which range from **1.0 for "perfect health" to 0.0 for "dead**". These utility weights incorporate patient or society preferences for specific health states.

Disadvantage

- The main disadvantage of CUA is that there is **no consensus** on how to measure utility weights, and they are more of a "**rough estimate**" than a **precise measure**.

4 – Cost-Benefit Analysis

Advantages

- CBA is unique in that **not only are costs** valued in **monetary terms**, but also the **benefits**. It has **two major** advantages:

- **First**, clinicians and other decision makers can determine whether the **benefits** of a program or intervention **exceed** the **costs** of implementation.

- **Second**, because all inputs and outcomes are converted to **dollars**, it is now possible to compare two alternatives that provide **different types** of outcomes (e.g., the implementation of an **anticoagulation** clinic versus the implementation of **DM** clinic).

Disadvantages

- A disadvantage of the CEA method is that if **one knows** how **much extra** it **costs** to obtain **added outcomes**, it is a **judgment call** as to whether the added cost was **worth** the added benefit.

- The major **disadvantage** of CBA is that it is **difficult** to place a **monetary value** on health outcomes. There are **different methods** used to estimate the value of health outcomes, and similar to the measurement of utilities, **different methods** of measurement may elicit **different estimates**, and these estimates can be **imprecise**.

Other Types of Analyses

Cost-consequence analysis (CCA)

- Other types of analyses that involve the measurement of costs may be seen in the literature. For example, if only a **list of costs** and a **list of outcomes** are presented, with **no direct calculations**, this is termed a **cost-consequence analysis (CCA)**.

Cost-of-illness (COI)

- In a COI study, the researchers attempt to determine the **total economic costs** (including prevention, treatment, losses caused by morbidity and mortality, and so on) of a **particular disease** on society.

- For example, the **total costs** associated with **hypertension** in 2011 in **the USA** were **$46 billion** due to health care services, medications, and missed days of work.

- The costs included in this method are usually summarized into **two categories**:

(1) **Direct costs**, or the costs associated with **providing treatment or prevention** (e.g., medical services)

(2) **Indirect costs**, or the costs attributable to **loss of productivity** of patients with that disease or condition.

- COI studies are **used** to indicate the magnitude of **resources needed** for a specific disease or condition, and they may be used to **compare the economic impact** of one disease versus another (e.g., costs of **schizophrenia** versus costs of **asthma**) or the economic impact of a disease on one country compared with another (e.g., costs of **HIV** in **USA** versus costs of **HIV** in **Iraq**).

- These **estimates** are sometimes used by **pharmaceutical companies** to determine the **market potential** for a **new product**.