

Al-Mustaqbal University College
Department of Pharmacy
5th Stage
Pharmacoeconomics
Lecture: 2



ASSESSMENT OF COSTS

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IDENTIFYING COSTS

- It is important to take into account **all the costs** associated with an **intervention, not just the market prices.**
- Calculation of true economic cost is **difficult**, but it is **essential** to make sure that cost information reflects **true economic cost** as closely as possible.
- This is **not** usually **straightforward** in healthcare **because** normal markets and pricing mechanisms are not necessarily operating.

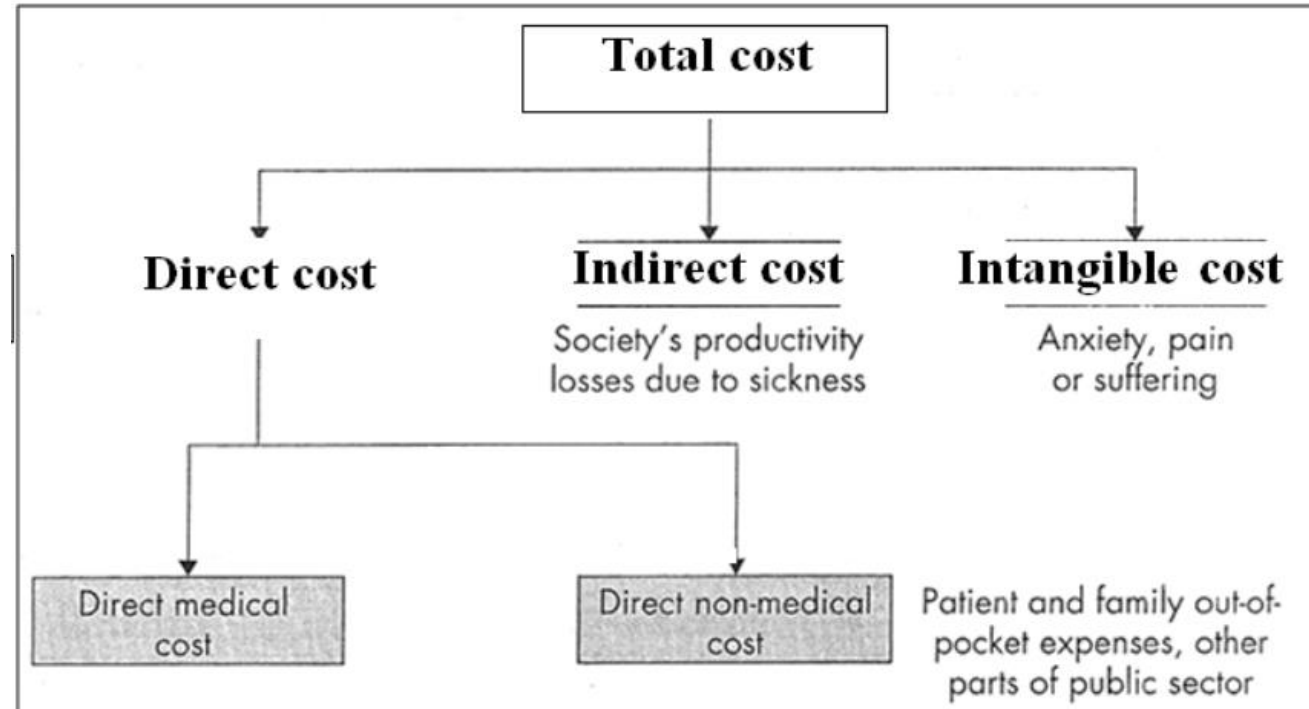


IDENTIFYING COSTS

- For example, prescribing the **highly effective** antipsychotic drug **clozapine** for a person with **schizophrenia** does **not** just incur the costs of **buying the drug**.
- Clozapine can have serious **side effects**, so regular blood **monitoring** tests have to be carried out in all patients.
- Therefore, these monitoring costs must be taken into account when the **economic implications** of using clozapine are being assessed.
- A very small number of patients go on to experience serious side effects that require **hospitalization** and **treatment**, and these costs must also be identified and measured.

TYPES OF COSTS

- Economic studies use a **range of costs**.
- It is important to be able to **distinguish** between the different types of costs that are used.
- Costs are usually divided into **direct, indirect, and intangible**.



DIRECT MEDICAL COSTS

- Direct medical costs are the most **obvious** costs to measure.
- These are the medically **related inputs** used **directly** to provide the treatment.
- It includes the **costs** associated with the **pharmaceuticals, diagnostic tests, physician visits, pharmacist visits, emergency department visits, and hospitalizations.**
- **Example:** during chemotherapy treatment, direct medical costs may include the chemotherapy products themselves, other medications are given to reduce side effects of the chemotherapy, intravenous supplies, laboratory tests, clinic costs, and physician visits.

DIRECT MEDICAL COSTS

Direct medical costs examples:

- ✓ Medications
- ✓ Medication monitoring
- ✓ Medication Administration
- ✓ Patient counseling and consultations
- ✓ Diagnostic tests
- ✓ Hospitalizations
- ✓ Ambulance services
- ✓ Nursing services

DIRECT NONMEDICAL COSTS

- Direct nonmedical costs are costs to **patients** and their **families** that are **directly** associated with treatment but are **not medical** in nature.
- These include the cost of **traveling** to and from the physician's office, **clinic**, or the **hospital**; **child care services** for the children of a patient; and **food** and **lodging** required for the patients and their families during *out-of-town* treatment.
- Using the **example of chemotherapy** treatment, patients may have increased travel costs related to traveling to the clinic or hospital.
- They may also have to hire a babysitter for the time they are undergoing treatment.

INDIRECT COSTS

- Indirect costs are incurred by the **reduced productivity** of a patient and their family, resulting from illness, death, or treatment.
- They may include **time off work** or; **time spent** going to healthcare providers; **time spent** caring for the patient by relatives; **time has forgone** from leisure.
- **Only** the following indirect costs can be calculated reliably from data:
 - A. Time off work due to sick leave
 - B. Early retirement
 - C. Reduced productivity at work

INDIRECT COSTS

- The **significance** of indirect costs **depends** upon the particular illness and treatments involved.
- **Diseases** such as asthma, migraine, and depression affect working age groups, **whereas** other diseases, such as Alzheimer's, do not.
- Indirect costs are **difficult to measure** so they are **not often** included in economic studies.
- However, it is likely that **most interventions** will affect indirect costs, so they should always be considered, if not measured.

INTANGIBLE COSTS

- Intangible costs are **difficult or impossible** to measure, **but** they still occur and it is of **value** to identify them.
- They can include anxiety, pain, or suffering from an illness or treatment.

INCREMENTAL COSTS AND MARGINAL COSTS

- The terms **incremental** cost and **marginal** cost are often used in **economic evaluations**.
- **Incremental cost:**
 - It is the difference in overall costs between the two alternatives.
- **Marginal cost:**
 - It is the cost of carrying out one more intervention, or expanding a program or service (e.g. increasing the length of stay in the hospital by one day).

OPPORTUNITY COSTS

- Represent the **economic benefit** forgone when using one therapy **instead** of the next best alternative therapy.
- Therefore, if a **resource** has been used to **purchase** a program or treatment alternative, then the opportunity to use it for another purpose is lost.
- In other words, opportunity cost is the **value of the alternative that was forgone**.
- Imagine we have a **choice of two** effective treatments, A and B, **but only enough** money for **one** of them.
- If treatment **A is funded** rather than treatment B, the opportunity cost benefit of funding A is in not choosing B.

OPPORTUNITY COSTS

- Consider, for **example**, **two** possible interventions: a cancer screening program (intervention **A**) and a smoking cessation program (intervention **B**).
- If **only one** of these interventions can be **funded** then the **opportunity cost of funding A** can be thought of as the **number of life years** that would have been gained is more than through the smoking cessation program.

AVERAGE COST

- Average cost is calculated by **dividing** the **total costs** for the intervention by the **total quantity** of treatment units provided, such as the number of patients receiving a course of antibiotics.

HOW ARE COSTS VALUED?

- The **two ways** of collecting costs are either '**top down**' or '**bottom up**' (also called **microcosting**).
- **Top-down** studies use the **total budget** to produce **average costs per patient**.
- This method is the **quicker** one but assumes that all patients have the same diagnosis, severity of illness, and treatment.
- **Bottom-up** studies measure resource use by **individual patients** and so are able to detect treatment differences between patients.
- This method produces much **better** quality costs but can be **time-consuming and expensive**.

WHEN TO STOP COLLECTING COSTS

- It is important to **carry on** collecting information about resource use **until** it is clear that no more events are likely to occur related to the original intervention.
- **These events** may be further interventions, such as treatment, or they can be side effects of the intervention, and consequences of failed treatment.
- The study must **carry on** collecting cost information **until** all these events have stopped.
- This may be a **month**, a **year**, or **longer**, depending on the type of intervention or illness being treated.
- The **time** when **costs are no longer collected** should **coincide** with when **outcomes** are also **no longer going** to be collected and is called the **time horizon**.
- Often, trials do **not continue** with such a **long-term** follow-up period because of **expense**, and a **shorter time horizon** will be employed.

TIMING ADJUSTMENTS FOR COSTS

TIMING ADJUSTMENTS: FOR COSTS

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graph TD; A[TIMING ADJUSTMENTS: FOR COSTS] --- B[1. Bringing Past Costs to the Present: Standardization of Costs]; A --- C[2. Bringing Future Costs (Benefits) to the Present: Discounting];
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1. Bringing Past Costs to the Present: Standardization of Costs

2. Bringing Future Costs (Benefits) to the Present: Discounting

BRINGING PAST COSTS TO THE PRESENT: STANDARDIZATION OF COSTS

- When costs are estimated from information collected for **more than 1 year before** the study, **adjustment** of costs is needed; this is also referred to as **standardization of costs**.
- If **retrospective** data are used to assess resources used over a number of years back, these costs should be **adjusted**.
- If you **compared costs** for patients who received **treatment** in **2000** with patients who received **treatment** in **2005**, the comparison of resources used would **not be a fair comparison** because treatment costs tend to **go up each year**, so patients who received the **same treatment** in **2000** would have **lower costs** than those who received the treatment in **2005**.
- **Adjustment** of the 2000 costs to the amount they would have cost in 2005 is **needed before a direct (fair) comparison** can be made between these groups.

BRINGING PAST COSTS TO THE PRESENT: STANDARDIZATION OF COSTS

- **For example**, if the **objective** of the study is to **estimate the difference** in the costs of **chemotherapy** regimens, information on the past use of these two treatments might be collected from a review of medical records.
- If the **retrospective** review of these medical records dates back for more than 1 year, it may be necessary to standardize the cost of both medications by calculating the number of units (doses) used per case and multiplying this number by the current unit cost for each medication due to frequent use).

BRINGING PAST COSTS TO THE PRESENT: STANDARDIZATION OF COSTS

- Table below illustrates an example of adjustment using this first method to estimate the treatment costs for a mild infection.

TABLE 2.2. EXAMPLE OF STANDARDIZATION: UNITS MULTIPLIED BY COSTS

<i>Medical Resources Used to Treat Mild Infection</i>	<i>Units of Each Resource</i>	<i>Cost per Unit in 2005 US Dollars</i>	<i>Total Cost in 2005 US Dollars</i>
Office visit	Two visits	\$62.00	\$124.00
Laboratory service to culture organism	One laboratory service	\$53.00	\$53.00
Antibiotic medication	28 capsules	\$1.03	\$28.84
TOTAL			\$205.84

BRINGING PAST COSTS TO THE PRESENT: STANDARDIZATION OF COSTS

- Another method used to **standardize past costs** is to **multiply** all of the costs from the year the data were collected by the **medical inflation rate** for that year or also called **Medical Consumer Price Index (CPI) inflation rates** ranged between **4% - 5%** each year since **2000**.

TABLE 2.3. EXAMPLE OF STANDARDIZATION: USING MEDICAL CONSUMER PRICE INDEX (MCPI) INFLATION RATES

<i>Medical Resources Used to Treat Mild Infection</i>	<i>Cost Estimate for Resource</i>	<i>Year of Cost Estimate</i>	<i>Cost Adjusted to 2005 US Dollars</i>
Office visits	\$115.00	2003	\$125.46 ^a
Laboratory service to culture organism	\$50.00	2004	\$52.25 ^b
Antibiotic medication	\$28.84	2005	\$28.84
TOTAL			\$206.55

Medical CPI for 2004 = 4.4 %; Medical CPI for 2005 = 4.5%

^a $\$115 \times 1.044 [1 + \text{MCPI } 2004] \times 1.045 [1 + \text{MCPI for } 2005]$

^b $\$50 \times 1.045 [1 + \text{MCPI for } 2005]$

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- If costs are estimated based on dollars spent or saved in **future years**, another type of modification, called **discounting**, is needed.
- There is a **time value** associated with **money**.
- People (and businesses) **prefer to receive money today** rather than at a later time.
- **Therefore** money received today is **worth** more than the **same amount** of money received **next year**.
- Modifications for this time value are estimated using a **discount rate**.
- From this parameter, the **present value** (PV) of future expenditures and savings can be **calculated**.
- The **discount rate** generally **accepted** for healthcare interventions is between **3% and 6%**.

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- The **discount factor** is equal to:

$$1 / (1 + r)^t$$

- Where:
 - ✓ **r** is the discount rate
 - ✓ **t** is the number of years in the future that the cost or savings occur

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- **For example**, if the **expenses** of cancer treatment for the **next 3 years** are **5,000 \$** for the first year, **3,000 \$** for year 2, and **4,000 \$** for year 3, discounting should be used to determine **total expenses in present value (PV) terms**.
- If one assumes that the expenses occur at the **beginning of each year**, then first-year costs are **not discounted** (see Table 2.4).

TABLE 2.4. EXAMPLE OF DISCOUNTING: COSTS ASSESSED AT BEGINNING OF EACH YEAR*

<i>Year Costs are Incurred</i>	<i>Estimated Costs without Discounting</i>	<i>Calculation</i>	<i>Present Value</i>
Year 1	\$5,000	$\$5,000/1$	\$5,000
Year 2	\$3,000	$\$3,000/1.05$	\$2,857
Year 3	\$4,000	$\$4,000/(1.05)^2$	\$3,628
Total	\$12,000		\$11,485

**Using a 5% discount rate.*

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- It is equally acceptable to assume that **expenses** occur at **the end of the first year** (12 months later) and therefore, they are **discounted** (see Table 2.5).

TABLE 2.5. EXAMPLE OF DISCOUNTING: COSTS ASSESSED AT END OF EACH YEAR*

<i>Year Costs are Incurred</i>	<i>Estimated Costs without Discounting</i>	<i>Calculation</i>	<i>Present Value</i>
Year 1	\$5,000	$\$5,000/1.05$	\$4,762
Year 2	\$3,000	$\$3,000/(1.05)^2$	\$2,721
Year 3	\$4,000	$\$4,000/(1.05)^3$	\$3,455
Total	\$12,000		\$10,938

*Using a 5% discount rate.

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- This example illustrates the impact of discounting the costs of an intervention using information from a theoretical **hip replacement** operation **compared** to drug treatment for a patient with **osteoarthritis**.

<i>Intervention</i>	<i>Costs (£) arising during</i>				
	<i>Year 0</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Hip replacement	5,000				
Painkillers (undiscounted)	1,000	1,000	1,000	1,000	1,000

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

1-What are the total costs for a hip replacement?

- The total cost for the hip replacement operation is £5,000.

2-What are the total costs for drug treatment?

- The total cost for the drug treatment is £5,000.

3-What is the impact of discounting the costs?

- The costs for the **hip replacement** all occur in the **first year (now)**. This means that they should **not be discounted**.
- The costs for **drug treatment** occur over a 5-year period. This means that they must be **adjusted for discounting**.

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- Using the above formula and **discount rate of 3.5%** we can calculate the **discount factor for each year**.

$$D_0 = 1 / (1 + 0.035)^0 = 1$$

$$D_1 = 1 / (1 + 0.035)^1 = 0.9666$$

$$D_2 = 1 / (1 + 0.035)^2 = 0.9334$$

$$D_3 = 1 / (1 + 0.035)^3 = 0.9002$$

$$D_4 = 1 / (1 + 0.035)^4 = 0.8711$$

BRINGING FUTURE COSTS (BENEFITS) TO THE PRESENT: DISCOUNTING

- The discounted costs are calculated by multiplying the discount factor by the costs for each year.

Intervention	Costs (£) arising during					Total
	Year 0	Year 1	Year 2	Year 3	Year 4	
Hip replacement	5,000					5,000
Painkillers (discounted)	1,000	1,000 x 0.966 = 966	1,000 x 0.934 = 934	1,000 x 0.902 = 902	1,000 x 0.871 = 871	4,673

- This **example shows** that when **discounting** is taken into account, **drug treatment** over 5 years period is **cheaper** than **hip replacement**.
- Therefore, future costs have to be **discounted** in any economic evaluation.
- Studies will generally discount costs if the intervention lasts more than 1 year.

COST OF ILLNESS

- The cost of illness (COI) is the **personal cost of acute or chronic disease**.
- The cost to the patient may be **economic, social, or psychological.....etc.**
- It **differs** from healthcare costs, meaning the **societal cost** of providing services related to the delivery of healthcare, rather than the **personal impact** on individuals.
- 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 D.M in Iraq versus costs of D.M in Jordan).
- The **point** of treating a patient with a disease is to **reduce the costs of illness**.



**THANK YOU FOR
YOUR ATTENTION**

