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Muhammad Ashar Malik

*Aga Khan University*, [ashar.malik@aku.edu](mailto:ashar.malik@aku.edu)

Saleem Perwaiz Iqbal

*Aga Khan University*

Farina Abrejo

*Aga Khan University*, [farina.abrejo@aku.edu](mailto:farina.abrejo@aku.edu)

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## Nature, scope and use of economic evaluation of healthcare programmes: with special reference to Pakistan

Muhammad Ashar Malik, Saleem Perwaiz Iqbal, Farina Gul Abrejo

### Abstract

Economic evaluation (EE)/cost effectiveness analysis(CEA) of healthcare programmes is an emerging area, yet the resource base to apprehend EE/CEA is very limited in Pakistan. This paper attempts to fill this gap by providing a basic text in the field of EE with special reference to Pakistan. We used four dimensional criteria (available, relevant, complete and accurate) for reviewing the EE contents in the locally available textbooks and reading material on public health. We find CEA as core competency and skill of medical doctors in undergraduate medical curricula yet we could not find EE contents in the recommended textbooks. We find that economic evaluation entails two rules: both cost and effectiveness should be included in the analysis, and there must be a comparison of at least two drugs or medical intervention. We describe EE/CEA in this article and recommend that EE content should be included in the medical and public health curriculum in Pakistan.

**Keywords:** Economic Evaluation, Cost effectiveness analysis, Healthcare Economics and organization.

### Introduction

Economic Evaluation (EE) is well known method for making clinical decision and health policyaide. In many high income countries EE is a legal requirement for approval of new medicines and medical devices.<sup>1</sup> In low and middle income countries (LMIC) EE is an emerging area. Though EE is a core component of medical and public health curriculum designed by Pakistan Medical and Dental Council (PMDC)<sup>2</sup> and College of Physician and Surgeon (CPSP)<sup>3</sup> yet EE contents are included in the curriculum of only a few academic institutions.<sup>4,5</sup> There are limited locally available resources in this field. Contents of EE covered only in a few books on public health and community medicine and lack complete and accurate information on EE.

This paper attempts to fill the gap in the academic

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Community Health Sciences Department, Aga Khan University, Karachi, Pakistan.

**Correspondence:** Muhammad Ashar Malik. Email: ashar.malik@aku.edu

teaching of cost effectiveness analysis to the students of medical and community medicine. We reviewed locally available resources in the field of EE and identifies gaps in them. We provide here the appropriate definition, scope and types of EE with examples from the published literature in this field from Pakistan and elsewhere.

### Methods

We reviewed the medical curriculum of PMDC and community medicine syllabus of CPSP and locally available textbooks and reading material on EE of the PMDC, CPSP and few leading medical schools in Pakistan. A four dimensional criteria was developed for this review i.e.

1. Is the EE content available?
2. Is the information on EE relevant to the local context?
3. Is the information provided complete for understanding the concepts of EE?
4. Is the available content on EE accurate?

The topic was referred as missing when the word/phrase "economic evaluation or cost analysis, cost effectiveness analysis, cost utility analysis and cost benefit analysis" is not mentioned anywhere in the book. If encountering a topic which is addressing other areas instead of the intended EE/CEA, we defined that as "irrelevant". We defined "incomplete" if information of EE/CEA was not completely present or inadequately covered the topic. If a topic/content on EE/CEA is misleading, we defined that category as "inaccurate."

In order to find appropriate content of EE we reviewed published literature and book material on the subject matter. We reviewed five widely recommended text books by PMDC, CPSP and many leading medical schools in the country for the contents of EE. These include Public Health and Community Medicine,<sup>4</sup> Preventive and Social Medicine,<sup>5</sup> Fundamentals of Preventive Medicine,<sup>6</sup> Foundations of Community Medicine<sup>7</sup> and Text book of Public Health and Community Medicine.<sup>8</sup>

A thorough literature search was carried out to find

published literature on CEA on healthcare intervention in Pakistan. We searched Google Scholar and PubMed using the terms economic evaluation, cost analysis, cost of services, cost effectiveness analysis, cost utility analysis and cost benefit analysis with term Pakistan. We used an open search strategy by applying no restriction on publishing year, types of articles and language of the article in our search strategy.

## Findings

We found that using CEA for clinical decision making as a core competency and skill required from the medical graduates in the medical curriculum of the PMDC.<sup>2</sup> Cost effective analysis and cost benefit analysis of health programmes and intervention was found to be the core component of the syllabus of community medicine under separate section on healthcare financing and economics.<sup>3</sup>

Our review of text books of public health and community medicines revealed that the essential component of economic evaluation was missing holistically from these medical textbooks. For instance, the textbook by Ilyas and Khan et al<sup>4</sup> does not address the topic of economic evaluation at all. Some aspect of "cost" is covered under the topic, "Financial Cost and Cost Aspects of Primary Health Care (PHC)". The textbook by Park<sup>5</sup> considers EE/CEA as quantitative method based on behavioural sciences. The information regarding economic evaluation is somehow mentioned in the text but is either irrelevant (e.g. Input-Output analysis) or inaccurate. Text book by Shaikh (2009)<sup>6</sup> considers the method of "cost-benefit analysis (CBA)" as a "more promising tool" than CEA however in health economics CEA and Cost utility analysis are more common than CBA.<sup>9</sup> The description on CEA in Sheikh<sup>6</sup> was misleading and did not highlight the core components of CEA. Furthermore, none of the books mentioned above depict the concepts of Health Economics and Economic Evaluation in the local context of Pakistan.

Literature search on EE/CEA from Pakistan returned twelve peer reviewed articles. Out of these, three articles covered cost effectiveness analysis,<sup>10-12</sup> five articles provided costing of various services,<sup>13-17</sup> two articles provided the quality of life of the patient of hepatitis B and quality of life of patient with hypertension in Pakistan<sup>18,19</sup> and one article provided expenditure of family planning programme in Pakistan.<sup>20</sup>

We find three books as highly recommended text on EE/CEA globally. These are Methods for the economic evaluation of healthcare programmes,<sup>21</sup> Cost effectiveness of health and medicine<sup>22</sup> and Economic evaluation in healthcare:merging theory with practice.<sup>9</sup>

In addition, we find online resources on cost effectiveness analysis in health care on the web portal of International Society for Pharmacoeconomics and Outcome research (ISPOR).<sup>23</sup> Based on our review of these resources in the following section we provide nature, scope and types of economic evaluation used in healthcare.

## Nature and Scope of Cost Effectiveness Analysis

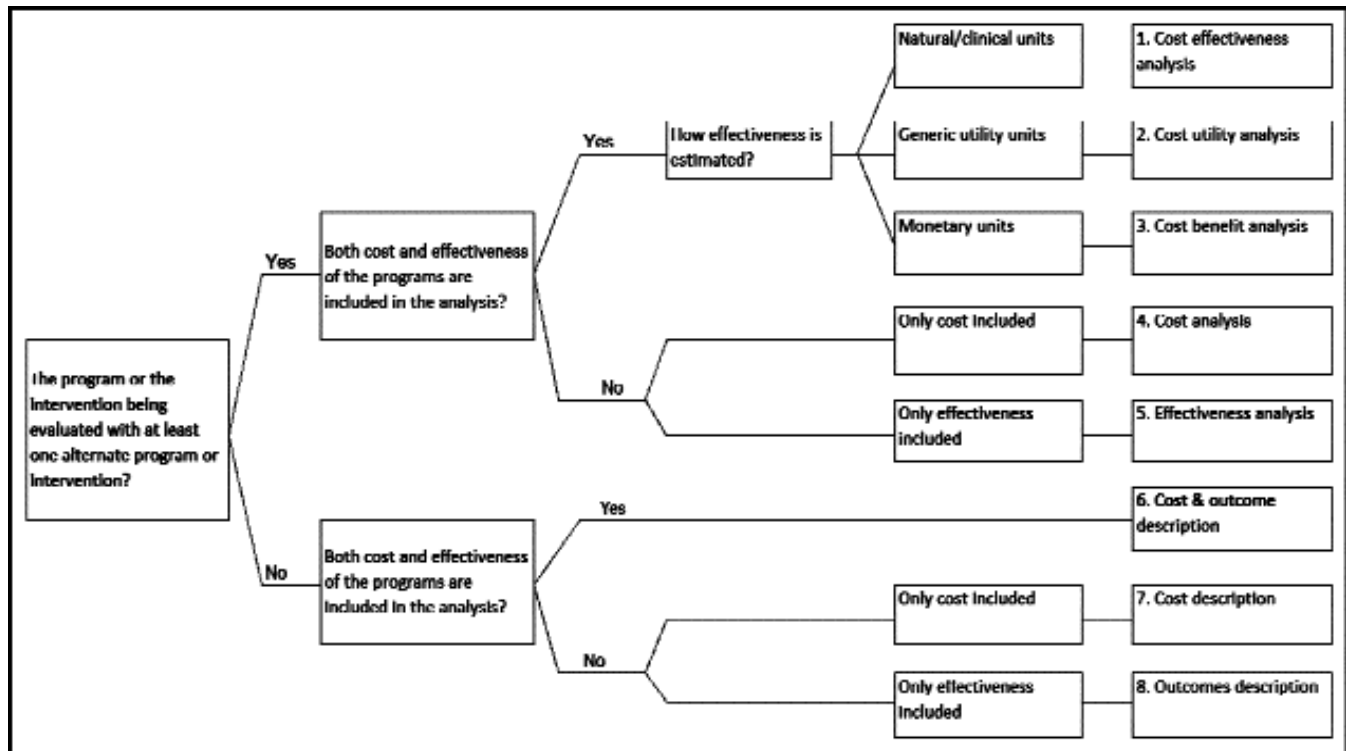
The objective of EE/CEA is choosing the most efficient programme among all available options on the basis of their respective cost and respective effectiveness. Hence, EE/CEA is a relative term which entails two rules; first both cost and effectiveness should be included in the analysis and second, there must be a comparison of a programme, drug or medical intervention with at least one alternative. For example we can only make a statement on cost effectiveness of a poliomyelitis vaccination, if we have accounted for its cost and effectiveness and compare it with the cost and the effectiveness of an alternative programme such as a rehabilitation programme for polio related disability.

The appropriate term is "economic evaluation" with CEA as one of its types. Other types of the economic evaluation include cost benefit analysis (CBA), cost utility analysis (CUA) and cost analysis.

We developed a chart classifying types of economic analysis based on two rules discussed above.<sup>21</sup> Studies if comparing alternatives and taking into account both costs and outcomes Boxes 1-3 in the Figure can be categorized as full economic evaluations (Figure).

## Difference Between Cost and Expenditure

An important starting point in EE is to distinguish between cost and expenditure. Cost means the money value of actual resource-use on a programme or intervention. Expenditure, on the other hand, is the money spent by a programme or intervention. For example article by Abbas and Khan, shows the cost of USD 17 per couple of years protected (CYP) and cost of USD 77 per woman served in the year 2005-06 by the ministry of Population Welfare (MoPW).<sup>20</sup> In fact they have estimated expenditure per CYP and women served. Firstly because expenditure by MoPW on capital goods such as building, equipment, vehicles and even staff training that would have been utilized even after 2005-06, is included in their estimates. As a rule of thumb all capital costs should be annuitized and then included in the costs estimates. Moreover, expenditure on management and stewardship related function may not be added in the



**Figure:** Nature and scope of economic evaluation of health programs/intervention.

cost of services delivery function of MoPW.

A study on cost of primary healthcare provided PKR 295 cost per out-patient visit to a Basic Health unit in Pakistan in the year 2005-06.<sup>13</sup> By one patient served for a common illness at BHU (USD 4.1) is far less costly than one woman served at government family planning centre (USD 77). However such comparison is misleading and might undermine the efforts of ministry of population planning as inefficient. Since the former<sup>13</sup> is actual cost while the latter<sup>20</sup> is an expenditure.

Other studies based on costing from Pakistan can best be described as cost of illness or cost of service studies (Box 7 in the Figure).<sup>13,14,17</sup>

### Types of Cost Effectiveness Analysis

Economic evaluation has four types. Except for cost analysis, the other three types are considered as full economic evaluations. In the following paragraphs the types of economic evaluation are explained.

#### Cost Analysis/ Cost Description

Cost analysis is comparison of costs of two or more programmes (Box 4 in the Figure). In such comparison either the effectiveness is ignored or assumed to be

similar across the interventions included in the analysis. Briggs and O'Brien<sup>24</sup> (2001) discussed its irrelevance for medical decision making.<sup>23</sup> We explain cost description with the help of case study 1.<sup>25</sup>

#### Case Study 1: What is the type of the following economic evaluation?

Ostrowsky and Lippman et al (1985) provided economic account of Montreal Thalassemia Disease Prevention Programme. They compared the cost of prevention of Thalassemia i.e. carrier screening and prenatal diagnosis with treatment of Thalassemia i.e. diagnosis, Splenectomy, Transfusion therapy and Chelation therapy. They concluded that the cost of prevention of Thalassemia is 3.51 times lower than cost of treatment of Thalassemia.<sup>25</sup>

**Answer:** Though the title of the article suggests that it is a cost benefit analysis yet it is cost analysis of two programmes i.e. Box 4 in the Figure.

#### Cost Effectiveness Analysis (CEA)

Cost effectiveness analysis refers to the analysis in which costs are compared with the outcomes measured in natural units, such as "lowered levels of blood pressure",

"ability to accurately diagnosis symptom" and "symptom-free days", or some types of functional and emotional ability scale etc (Box 1 in the Figure). Effectiveness measured in this manner limits the comparison of intervention across clinical areas. We explain this with the help of a case study 2.<sup>10,11</sup>

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### **Case Study 2. Is hypertension management is cost effective than community based case management of Tuberculosis.**

Jafar and Islam (2012) provided cost effectiveness of management of hypertension at a community in Pakistan. They provided a cost per 1 mmHg drop in systolic blood pressure. The authors concluded that combined home health education plus trained GP is cost effective than other interventions in the trial.<sup>11</sup>

Khan and Wally et al. (2002) provided cost effectiveness of management of Tuberculosis (TB) through Directly Absorbed Treatment Strategy (DOTS).<sup>10</sup> The finding suggested adding a community health worker to observe the patient taking treatment, as a cost effective strategy than the other strategies to treat TB.<sup>10</sup>

**Answer:** Interventions with a different set of goals and outcomes cannot be compared. For example cost per mm Hg drop in diastolic blood pressure cannot be compared with cost per tuberculosis case management with DOTS and community health worker.

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Another limitation of CEA is the situation in which there are more than one outcomes of a programme or intervention. For instance comparing cost effectiveness of home based versus care-as-usual for palliative care can yield multiple outcomes such as lowering pain, increased mobility and smooth dying process etc.

### **Cost Utility Analysis (CUA)**

Cost Utility Analysis is type of economic evaluation in which the outcome is measured in terms of survival and quality of life (Box 2 in the Figure). CUA combines life years gained as a result of a health programme with some judgment on the quality of those life years. It is this judgment element that is labelled utility. This approach of using utility is not restricted to similar clinical areas, but can be used to compare very different health programmes in the same terms. For example quality of life scores for Hepatitis B<sup>18</sup> and quality of life scored for hypertension<sup>19</sup> can be compared: which is otherwise not possible.

In cost utility analysis the outcomes are valued according to their desirability.<sup>21</sup> Quality Adjusted Life Years (QALY) is a generic outcome measure which

combines quality and length of life into one arithmetic product. Cost utility analysis using QALYs as outcome measure can potentially address the resource allocation challenges with a given budget and thus is widely used for health policy making.<sup>9</sup> In case study 3 we explain distinguish CEA and CUA.<sup>26</sup>

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### **Case Study 3. What is the type of the following economics evaluation?**

Cost Utility Analysis by Wiwanitkit (2006) on the right method for screening haemoglobin E among Thai pregnant women compared the costs of four methods of screening namely Red blood cell index Determination, Application of mathematical Model (based on RBC parameters), Dichloro-Phenol-Indo-Phenol (DCIP) test and Haemoglobin electrophoresis. The authors estimated cost of each test and compared this with their respective utility as rate of ability to accurately detect carriers of haemoglobin disorders in pregnant women.<sup>26</sup>

**Answer:** This type of analysis is more appropriately classified as cost effectiveness analysis rather than cost utility analysis as the ability of the test to accurately diagnose is the sensitivity of the test rather than the utility derived from the test. In their analysis Griffin and Barber et al (2007) provided a CUA with an appropriate methodology to estimate quality and length of life: that is comparable across interventions. They concluded the CBAG is cost effective with GBP 22000 per QALY than other intervention at the threshold of GBP 30000/QALY.<sup>27</sup>

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### **Cost benefits analysis (CBA)**

Cost Benefit Analysis is considered as the most comprehensive and theoretically sound than other forms of economic evaluation. CBA seeks to place monetary values on both the inputs (costs) and outcomes (benefits) of health care, making it possible to say that what a particular programme is worth selecting without any external reference: in the sense that its total benefits exceed its total costs (Box 3 in the Figure).

CBA enables comparisons to be made between programmes in different areas of healthcare, even outside the field of medicine, owing to its virtue of converting benefit into monetary term. However, the analysis may ignore important benefits that are difficult to assign a monetary value (for instance relief of anxiety).

A recent practice on monetary valuation of outcomes is placing a monetary value on one QALY. In the UK the common threshold value of one QALY is British pound

30000. Intervention with cost per QALY less than BP 30000 usually qualifies for NHS funding. In United States of America (USA) this threshold is United States Dollar 50000 per QALYs. The World Health Organization recommends three times per capita Gross Domestic Product (GDP) of a country as a threshold value of one Disability Adjusted Life Year (DALY).<sup>28</sup>

### Incremental Analysis

Health policy relevant component of EE is the incremental cost effectiveness ratio (ICER). Numerically this is the ratio of difference in the costs of two programmes over difference in effectiveness of these programmes i.e.

$$\text{ICER} = (C1 - C2) / (E1 - E2)$$

In the equation above C1 and C2 are the cost of programme 1 and programme 2 and E1 and E2 are the effectiveness of programme 1 and programme 2 respectively. The incremental analysis informs a policy maker on a more pressing decision dilemma of "how much does it cost incrementally for switching from current programme to the cost effective programme. Interpretation of ICERs is explained in case study 4.<sup>11</sup>

### Case Study 4. Interpreting incremental cost effectiveness ratios.

What is the policy interpretation of the ICER reported in Jafer and Islam (2011) i.e. for management of Hypertension that Household health education (HHE) plus GP training is cost effective than control arm (care as usual) with ICER of USD 23 per 1 mmHg drop in systolic blood pressure.<sup>11</sup>

**Answer:** If a health policy maker replaces the usual care of hypertension with HHE plus GP at the primary care level, then each additional drop in one mmHg in systolic blood pressure will cost the society an addition of USD 23.

### Limitations

In medical evidence results of clinical trials can be applied for medical decision making across countries, economic evaluation does not have this liberty. This suggests that an intervention being cost effective than another intervention in a country would not necessarily be cost effective in other countries. One most prominent example to refer here is the case of comparing cost effectiveness of Coronary Artery Bypassing Grafting (CABG) versus percutaneous coronary intervention (PCI). The summary findings of Stroupe and Morrison et al (2006) is that PCI is cost effective than CABG in the patient population from USA. On the other hand, findings by Griffith and Barber

et al (2006)<sup>27</sup> concluded that CABG is cost-effective than PCI in the United Kingdom settings.<sup>29</sup> Besides many differences in the methodology, patient population and outcomes etc. applied in both the papers the results are contradictory: indicating a key limitation of EE.

### Conclusion

In our explanation of economic evaluation of healthcare programmes we focused on the scope and types of cost effectiveness analysis. We demonstrated that there are ambiguities and incompleteness in the locally available books. We also demonstrated that such ambiguities and incompleteness also exist in peer reviewed scientific literature.

This article is one of the first steps to spread knowledge of EE in Pakistan. However we recommend more systematic efforts to ensure that EE contents are included and properly taught at the medical and public health schools in the country.

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**Disclaimer:** We declare that this manuscript is not submitted to any other journal and has not been published anywhere else.

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