

Emerging Markets Queries in Finance and Business

Application of cost analysis methods in pharmacoeconomic decisions

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Abstract

By today, in our business environment, mostly based on innovation, the potential opportunities in the pharmaceutical sector and impact of these to the national economic trends has a determining significance. National and international importance of the pharmaceutical industry defined by not only the prominent role of application of the biochemical academic research, but also the humanitarian concerns which increasingly appreciating in the global context. These facts – in view of growing efficient immune substances developing procedures – are stronger pressure on the industrial actors, with this affecting the profitability of future operations. Broader sense pharmacoeconomics includes the examination of the main factors which influence the change of expenditures produced in the health system, furthermore compares the value of different pharmaceutical drugs or drug therapies by using many analytical methods such as cost minimalization analysis, cost benefit analysis, cost effectiveness analysis and the cost utility analysis. Our analysis is mostly theoretical.

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1. Introduction

Simultaneously with the development of pharmaceutical industry in the twentieth century, the related branch of economics also received more attention, because it became more important at what costs could provide effectively the medicines. Beside the research and development, the greater risk of spread of diseases because of the growing population has been also pressured on costs at the provider companies. Therefore the variable circumstances demanded the use of increasingly sophisticated cost-effective analysis, which have several types.

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Our objective is to present how do these analysis methods contribute to make the operation of the health system better in micro and macro level.

2. Methods

Our theoretical analysis based on data from already finished surveys which is performed in the USA and Western Europe. We collected secondary data from studies those examined the impact of main health factor to the costs of care system: our paper evaluates these data solely in view of the use of cost awareness in pharmacoeconomic decisions making micro and macro levels using examples.

3. The importance of the pharmaceutical industry and economics

3.1. Sectoral outlook

The ability of companies to hold themselves in the globalized market economy, the maintenance and improvement of its competitiveness, furthermore inform the foreign investors, and utilization of the different opportunities of financing such as cross-border type of emerging challenges in some innovation-intensive sectors make it necessary strategic-level management of those as well as the spatial and temporal comparison of activity of concerned companies. In the most capital-intensive pharmaceutical industry – in addition to its stable position in the short term has not undermined even by the impact of the 2008-2009's financial crisis – the extent of the R&D and innovation investment – even in 2011 – exceeded all same values recognised in another industry.

The profitability of pharmaceutical sector is determined by the public health and income status of regions population, the social and innovation policy of the state as the price and market conditions which primarily affect the demand trends. Internationally, the most favourable prospects are attributed to this sector since in this area proceed of technological changes relatively rapid due to the introduction of the new medicinal preparations. Partly because of this, the health budget expenditures have increased dramatically worldwide owing to the impact of ever growing costs pressure (Sloan–Hsieh, 2007).

Table 1. Key financial data of the three major segments of the pharmaceutical industry internationally (2012). Revenue = 100%

Segment	Gross profit	Operating income	Net income	R&D	R&D/ Revenues*
Major Drug Manufacturers	70%	21%	17.0%	15%	0.2%
Biotechnology Manufacturers	80%	22%	15.2%	22%	-5.7%
Generics Drug Manufacturers	68%	16%	11.3%	9%	0.6%
Overall Industry	71 %	21 %	16.1 %	15 %	0.56 %

*it shows, how R&D change with every additional bnUSD in net sales. Source: Calzati, 2013.

The pharmaceutical industry is under growing pressure from a range of environmental issues, including major losses of revenue owing to patent expirations, increasingly cost-constrained healthcare systems and more demanding regulatory requirements (Paul et al, 2010).

Industry margins in the sector are high enough and as it can see the splits below, the Major Drug Manufacturers segment is the most profitable one, which also indicates 17% net margin as a result of the exploitation of blockbuster drugs, which brings in high cash flows (Calzati, 2013).

According to wording Carzati (2013) the principle of economy of scale prevails: generally speaking that

overall in the industry, the R&D expenses decrease with the company getting bigger in owing to mostly the fact that many activities are shared and further efficiencies found. According to Getzen (2007) the pharmaceutical market can be divided three sections based on the type of costumers: patients, institutional buyers (hospitals, pharmacies) and the government. In the traditional retail market the price of prescribed medicinal products is paid out by the consumers and/or the social insurance, so this segment is the less price-sensitive.

Although the medical institutions may use certain products limited by the law, these able to cause large demand for some preparations via the freedom of the drug contest, so their strong market position and price sensitivity is also higher than the retail consumers, which has been a key factor in terms of profitability for manufacturers.

3.2. *The field of pharmacoeconomics*

Pharmacoeconomics generally means a scientific discipline that compares the value of one pharmaceutical drug or therapy to another. Pharmacoeconomics arises from a fusion of pharmacy and economics. According to Pradelli (2012) the pharmacoeconomics – against the economics – may that as a social science concerned with the description and analysis of the costs of pharmaceutical products and services and their impact on individuals health care system and society.

Pharmacoeconomics is a subset of health economics, which deals with health care services in general rather than being restricted specifically to pharmaceuticals. Outcomes research is the study of the clinical (e.g., presence of disease, economic, or humanistic (e.g., patient quality of life, QoL) and results of providing health care services. The term pharmacoeconomics has been coined to depict the economic assessment of pharmaceuticals, to assess the extent to which they provide additional benefits relative to the additional costs incurred (Pradelli-Wertheimer, 2012). Inside of the health economics the medical costs can be categorized in three ways in terms of measuring of these: it can distinct direct medical, direct nonmedical and indirect costs.

The direct medical costs contain the hospitalization, outpatient visits (to primary care providers and to specialists), procedures and tests (blood analysis, ultrasound scans, surgical interventions), medical devices, home care, nursing care and medications. The direct nonmedical costs comprise the transportations, nonmedical services (home helper, meals on wheels, social assistance), devices and investments or the informal care. The indirect costs are mostly mean the sick leave or absences, reduced productivity at work, early retirement due to illness and the premature death (MacKinnon, 2013).

Table 2. Number of studies reporting the influence of economic evaluations on healthcare decision making. Source: Glick, Pharmacoeconomics [online], 2014.

Degree of influence	“Micro”	“Meso”	“Macro”
	Physicians	MCOs, P&T committees, etc.	Nat decis makers, Health auth, etc.
Minor	2	6	12
Moderate	4	3	6
Major	1	6	1
Number of studies	18	20	22
Number of respondents	3766	1430+	1159+

3.3. *Cost-minimization analysis (CMA)*

Cost-minimization or cost-identification is an analytical process used in pharmacoeconomics to examine the cost of drug treatment when the clinical effectiveness of the alternative therapies is identical.

In micro level the application of CMA could serve as an example the following case. There are two medication (or form of therapy): “A” and “B”, and clinical effectiveness of these is equivalent (providing the comparability of their costs). First of all the analysts identify then determine the costs of the preparation, production and supply of dose of medications. After that summarize the expenditures and decide for further use of that medication which has the lowest cost – in this case this medicine is the “A”, because that could prepare and construct cheaper by 30 Euro than “B”, based on the summarized expenditures (Table 3).

Table 3. Example for the application of CMA in pharmacoeconomic decisions in micro level. Source: own resource.

The name of the medication / form of therapy	Medication “A”	Medication “B”
Clinical effectiveness of dose	Equivalent	
Cost of preparation of dose	160 Euro/dose	180 Euro/dose
Cost of supply of dose	100 Euro/dose	90 Euro/dose
Other expenditures related to preparation	40 Euro/dose	60 Euro/dose
All costs of dose	300 Euro/dose	330 Euro/dose
Decision on further application	Yes	No

In macro level we examine not only the clinical effectiveness of medication, but also the impact of that in long term to the main factors which determining the expenditure size of health budget such as structure of types of diseases in society, the income status or the technical quality of the health system: the impact of drug groups to these factors must also be equivalent to compare the related drug price subsidies or tax benefits connection with the research and development activities. Nonetheless, in reality mostly this method is not suitable for analysis, because there cannot find reliable equivalence between two form of therapy or drug group.

3.4. Cost-effectiveness (CEA) and cost-utility analysis (CUA)

The professional literature distinguishes two analysis methods, where the costs and the utilities or benefits – opposite to the cost-benefit analysis – measured in different units: these are the cost-effectiveness (CEA) and the cost-utility analysis (CUA). As long as at the former method the outcomes are measured in some clinical characteristics, at the CUA the outcomes are expressed in special units, in quality adjusted life years (QALY), while the costs are calculated in monetary units.

According to Wonderling (2011) cost-effectiveness analysis (CEA) is an economical or management tool for evaluating which therapy are the most cost-effective, so how to achieve greater effect next to unchanged expenditures or lower costs next to unchanged effects.

The expansion in use of economic evaluation by health agencies has mirrored the growing recognition of the usefulness of health-related quality of life (HrQoL) as an important indicator of outcome of disease treatment among clinicians and patients (Kind, 2009).

Like the CMA in micro level the application of CEA could show in the following example: there are four therapies, which treated the same type of disease (providing the comparability of their costs) and the effects are measured in quality of life generally (QoL).

Table 4. Example for the application of CEA in pharmacoeconomic decisions. Source: own resource.

The name of form of therapy		Therapy “A”	Therapy “B”	Therapy “C”	Therapy “D”
Type of disease being treated		Identical			
Without therapy	Cost ₁ (EUR)	200	500	400	0

	QoL ₁	0.4	0.7	0.3	0.3
With the therapy	Cost ₂ (EUR)	50	700	100	360
	QoL ₂	0.2	0.5	0.6	0.6
Additional cost, Cost ₂ -Cost ₁ (EUR)		-150	+200	-300	+360
Effect: QoLs gains, QoL ₂ -QoL ₁		-0.2	-0.2	+0.3	+0.3
ICER (EUR/QoLs gains)		+750	-1000	-100	+1200
Evaluation		Less expensive; less effective	More expensive; less effective	Less expensive; more effective	More expensive; more effective
Decision on further application		No	No	Yes	No

Based on data in example that therapy is applicable according to the CEA which exceeds the cost-effectiveness threshold at the same time the effect of therapy is also positive. In compare of the four treatment the analyst decide besides the Therapy “C” (Table 4) which using the health institution – and thus the health budget – is decrease their costs by 200 EUR in such a way further expenditures are also saving in the long run: because of the QALY increasing the therapy can decrease the risk of further illnesses so the further costs of hospital care in micro level, while can improve the tendencies of national economy such as the average age or the health situation and endurance of labor supply in macro level. During the examination of therapies the analysts are assume not only that these treat the same diseases but also that every micro and macro impact factors must be identical each of the four compared therapies. Therefore, in practice within the drug groups and health attributes the calculation of relative favorable additional charges is difficult.

This process is expressed as so-called incremental cost-effectiveness ratio (ICER), the ratio of change in costs to the change in effects, so this is a differential coefficient.

$$ICER = \frac{Costs_1 - Costs_0}{Outcomes_1 - Outcomes_0} = \frac{\Delta C}{\Delta Q} < R_c$$

At the cost–utility analysis (CUA) – in contrast with CEA – the effects or the utility of decisions are measured in terms of quality-adjusted life years (QALY) or disability-adjusted life years (DALY). In micro level the cost-utility analysis has applied because it is suitable for the comparison of two treatment or drugs used and developed within an institutional framework. In that case the benefits are expressed in QALY, so the previous example – next to unchanged data – will change as follows (Table 5). In terms of the change of expected lifespan the therapy which is less expensive but more effective is the “A” instead of “C” what the analyst would chose based on the CEA. The basis of comparison is assuming that the other facts which influencing the age of examined patients should be ignored.

Table 5. Example for the application of CUA in pharmacoeconomic decisions based on data in Table 4. Source: own resource.

The name of form of therapy		Therapy “A”	Therapy “B”	Therapy “C”	Therapy “D”
Without therapy	Expected lifespan	3	2	8	3
	QALY ₁	3*0.4=1.2	2*0.7=2.1	6*0.3=1.8	3*0.3=0.9
With the therapy	Expected lifespan	8	5	2	1
	QALY ₂	8*0.2=1.6	5*0.5=2.5	2*0.6=1.2	1*0.6=0.6
Unchanged additional cost (EUR)		-150	+200	-100	+360
Effect: QALYs gains, QALY ₂ -QALY ₁		+0.4	+0.4	-0.6	-0.3

ICER (EUR/QALYs gains)	-375	+500	+166.67	-1200
Evaluation	Less expensive; more effective	More expensive; more effective	Less expensive; less effective	More expensive; less effective
Decision on further application	Yes	No	No	No

3.5. Cost-benefit analysis (CBA)

According to David (2013) the cost-benefit analysis is a technique that is used to determine options that provide the best approach for the adoption and practice in terms of benefits in labour, time and cost savings. Like the CEA and CUA, the CBA also compare the costs and the benefits but those are expressed in the same monetary units – as the health project forming part of government policy may take several years, so in the CBA the time value of money take part too. The common basis can provide the comparability: this is the net present value. Cost-benefit analysis, which used by institutions those operate the total health system, can influence a health policy of government so this analysis used rather in macro level. Therefore the applied discount rate we should assume that the examined health projects are occurred in the same interest rate environment and because of the dependence of method from the net present value – so from the time value of money – the duration of projects should also be identical.

The Table 6 shows an example for the application of cost-benefit analysis: there are 4 health projects from which the government has to make decision. If these projects treat the same type of disease and hold identically 5 years, in addition generate such benefits as in Table 6, so the recommended choice the Project “C”.

Table 6. Example for the application of CBA in pharmacoeconomic decisions in macro level. Source: own resource.

The name of health project	Project “A”	Project “B”	Project “C”	Project “D”
Type of disease being treated	Identical			
The duration of the projects	5 years			
Discount rate	12%			
Initial costs of the project (EUR)	2000	2500	1000	1200
1. year	600	100	360	80
2. year	610	130	340	100
3. year	590	160	310	100
4. year	540	180	280	100
5. year	480	200	300	90
Σ PV (r=12%)	2057	535	1161	337
Net present value (NPV), Σ PV-Initial cost	+57	-1965	+161	-863
Cost-benefit ratio	0,97	4,68	0,86	3,56
Decision on further application	No	No	Yes	No

The difficulty of this method is valuation of costs and benefits at beginning of analysis for the further years: the projects are realized not only in same interest rate environment, but also between such frameworks in which the other macroeconomic factors – those can influence the changes of benefits – are the same.

4. Consequences

According to our current knowledge there are three different analysis methods used in the health economy: the cost- minimization, the cost-effectiveness – inside of this the cost-utility – and the cost-benefit analysis. Application of all three methods has difficulty because of the effects or benefits of therapies or health projects are estimated hardly. Therefore it can determine that these methods apply effectively when the compared therapies treated the same type of diseases, the main health, financial and other economic factors those can impact to the valuation consider equivalent, so these are realized under the same macroeconomic conditions, finally all information should be available for the estimation. However experts formulated several critics against the QALY, in micro level the cost-utility analysis is advisable to apply, since in macro level the use of cost-benefit analysis can contribute mostly to the better operation of health supply system.

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