

# Drug cost management in pharmacy management based on pharmacoeconomics: Antimicrobial treatment cases

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**Abstract:** With the increasing demand for health care, the consumption and cost of drugs have increased dramatically. Pharmacoeconomics is a new interdisciplinary subject in recent years. It mainly focuses on the cost and benefit of drug treatment. In this paper, the authors analyze the drug cost management based on an antimicrobial treatment case. The results show that by using cost-effectiveness method, we could reduce the cost of drugs in the course of treatment, the proportion of antimicrobial drugs are also reduced accordingly. By using the concept of pharmacoeconomics, in order to standardize the process of diagnosis and treatment, and to increase the economic performance of the drug delivery plan.

**Keywords:** Drug cost, pharmacy management, cost benefit analysis, antimicrobial treatment.

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## INTRODUCTION

Drug is a special commodity for the diagnosis, prevention and treatment of diseases, with the social demand for health care is increasing, consumption and cost of the drug is also increasing, therefore, the principle of the drug selection, besides the safety and the effect of the treatment of the economy has become another important index (Shi, 2010; Qi, 2015; Altorki *et al.*, 2016). Pharmacoeconomics is an emerging interdisciplinary subject, it is mainly for identification, measuring and comparing the costs and benefits of drug treatment, and provide a scientific basis for the research and development of rational use of drugs, drug administration and drug (Chen, 2012; Cahill, 2015). Its core is to make the limited health resources to play the greatest social and economic benefits, and strive to make the drug safe, efficient and economical service for patients, with the lowest medical costs to achieve the best health care function (Hu, 2013; Dindo *et al.*, 2014; Ghoneum *et al.*, 2015). Medicine is a kind of resource, and it is a special commodity for diagnosing, preventing and treating diseases. No matter what kind of drug production, it is necessary to have factories, raw materials, technology, labor and capital investment, which constitutes its production costs and pricing basis. Unlike other ordinary commodities, consumers are free to choose, in particular, prescription drugs, the need for prescription to the pharmacy to buy (Liu *et al.*, 2013; Mellotte *et al.*, 2015). Consumers know little about the drug, the type and dose of drugs needed for treatment is mainly determined by the physician, and the pharmacist is. Patients participating in medical insurance are paid in part or in full by medical insurance. Medicine is a special commodity, and its demand is affected by four aspects: doctors, pharmacists, patients and medical insurance organizations.

The core of pharmacoeconomics is to improve the cure rate and reduce the cost by optimizing the cost effect structure. From a macro perspective, the economics of pharmacoeconomics are studied, such as the use of drugs and the use of drugs other than the treatment of non drug therapy (Shim *et al.*, 2010; Lu, 2014; Qin *et al.*, 2015; Liu *et al.*, 2016). The microeconomic perspective of pharmacoeconomic research is to compare the cost-effectiveness of a drug to another, or to compare a scheme with another. Its research is to identify, measure, compare the cost and effectiveness of drugs and services, the ideal result is to obtain a high recovery of drug investment, that is, with the smallest cost of pharmaceutical services to achieve the most significant therapeutic effect.

## MATERIALS AND METHODS

### *Pharmacoeconomics*

Objective pharmacoeconomics is how to reasonable allocation and use of health resources and medical limited funds to consider from the whole population, the whole society gain the maximum profit (Tsiaras *et al.*, 2016), that is to make medication achieve safe, efficient and economical services for patients with the lowest medical expenses received the best medical care. Prospective study of drug design in economics is the drug economics research and clinical trials of the drug combination, usually in clinical trials, the drug clinical trial randomized double blind design strictly, internal validity can get strong credibility and high. Moreover, in the collection of health services with data at the same time, also can examine the patient's life and work ability of patients and drug treatment in the process of life quality or utility change information, so it has high efficiency and effectiveness and the pharmacoeconomic research results with the results of clinical trials can be used to get together, timely reporting, medical insurance drug reimbursement and pricing decisions.

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**Drug cost analysis**

Cost is a kind of resource consumption, which can be divided into direct cost, indirect cost and recessive cost. Direct costs are all costs consumed for prevention, diagnosis and treatment of diseases, such as the provision of drugs and services, medical diagnosis and treatment, nursing, inspection, hospitalization expenses indirect costs consumed accommodation is caused by absenteeism, labor loss, loss and even death due to illness is caused by the hidden costs of suffering is difficult to determine the exact cannot expressed in monetary costs because of illness, it is also called the implicit cost of literature is difficult to determine the cost of. Evaluate inputs or costs only, do not involve outputs or outcomes, such as cost analysis, cost analysis and cost analysis of adverse drug reactions.

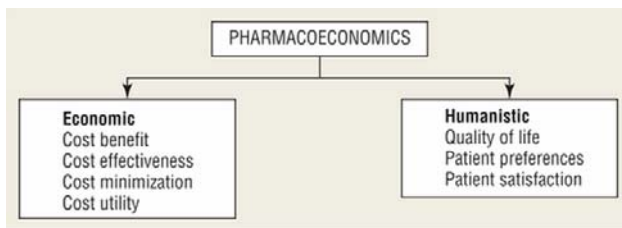


Fig. 1: Pharmacoeconomics



Fig. 2: Cost control

Because it can not carry out the same effect or benefit comparison, it has no obvious therapeutic significance, which can provide reference for cost control and resource optimization. The analysis of cost and benefit is the main content of pharmacoeconomics. Cost effectiveness analysis is one of the earliest evaluation methods of pharmacoeconomics and the purpose of CEA analysis is to find the lowest cost of treatment. All the expenses including the cost benefit analysis CBA identify, measure

and compare the implementation of the plan and treatment strategies and naturally produced by this plan or strategy for the treatment of all benefits, is a kind of cost and results in monetary unit of measurement of economic analysis method. The cost of drug treatment includes direct costs and indirect costs such as the cost of the disease, including the recovery of patients after treatment, the cost of early recovery, increased labor income, etc.

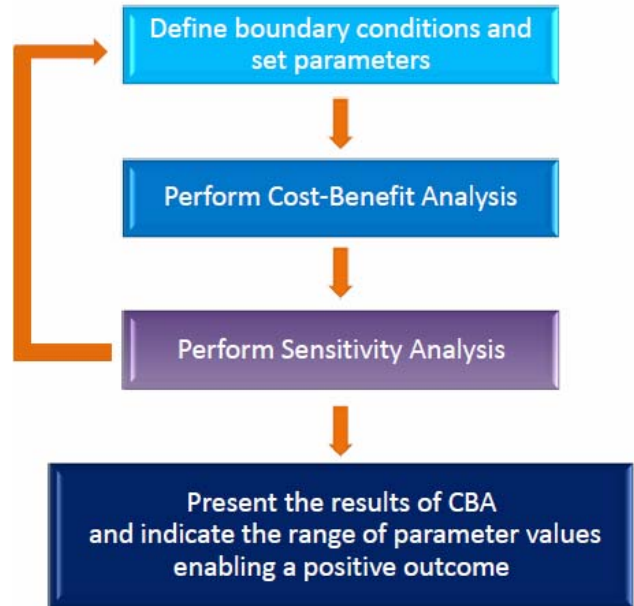


Fig. 3: Cost benefit analysis process

**Experimental scheme**

Community acquired pneumonia clinical path specified by the standard time of hospitalization, the diagnostic tests and treatment steps are detailed form, which hospital treatment including initial empiric antimicrobial therapy and subsequent examination of etiology and treatment response adjustment of antimicrobial treatment, to avoid the process of diagnosis and treatment of blindness and randomness and unnecessary examination. Pharmacists in CP, according to clinical symptoms, with local pathogens, antibiotic resistant bacteria distribution and drug susceptibility test results, application principle and method of pharmacoeconomics, cost-effectiveness, selection of optimal individualized dosing regimens, to provide guidance for the clinical path management and rational use of drugs. The clinical pathway is defined by the various disciplines professionals including physicians, pharmacists, nurses, psychiatrists and hospital managers according to the principle of evidence-based medicine, some key disease treatment, examination and nursing for standardization, so that patients get the best standard of medical service. Randomly selected -6 months of January 2016 in Harbin City, a hospital in the Department of respiration of community acquired pneumonia without CP before treatment in patients with 200 cases, male 148 cases, female 152 cases, aged 20 to 65 years old, the

**Table 1:** Clinical curative effect comparison

| Group                 | cases | cured | become better | Not cured | effective rate |
|-----------------------|-------|-------|---------------|-----------|----------------|
| Before the experiment | 200   | 125   | 69            | 6         | 97             |
| After the experiment  | 200   | 127   | 83            | 0         | 100            |

**Table 2:** Adverse reaction comparison

| Group                 | cases | Rash | Dizzy | Phlebitis | diarrhea | Total |
|-----------------------|-------|------|-------|-----------|----------|-------|
| Before the experiment | 200   | 1    | 1     | 1         | 2        | 5     |
| After the experiment  | 200   | 1    | 1     | 1         | 1        | 4     |

**Table 3:** Drug cost effectiveness comparison

| Group                 | C - drug     | C -total     | C - drug/E | C - total /E |
|-----------------------|--------------|--------------|------------|--------------|
| Before the experiment | 3512.1±894.5 | 5014.3±978.3 | 36.2       | 51.8         |
| After the experiment  | 2804.2±416.2 | 3712.0±824.5 | 29.8       | 38.2         |
| P                     | <0.001       | <0.001       | <0.05      | <0.05        |

**Table 4:** Antimicrobial drugs cost comparison

| Group                 | C -Antibacterial drugs | C -total     | C -Antibacterial drugs / C-total |
|-----------------------|------------------------|--------------|----------------------------------|
| Before the experiment | 1624.5±476.2           | 3812.6±964.1 | 42.6                             |
| After the experiment  | 1216.7±298.4           | 2508.3±462.5 | 48.4                             |

**Table 5:** Hospitalization cost comparison

| Group                 | Hospitalization time/D | Inspection fee/yuan | Other expenses / yuan |
|-----------------------|------------------------|---------------------|-----------------------|
| Before the experiment | 12.1±2.4               | 1028.6±230.6        | 540.2±240.3           |
| After the experiment  | 10.5±1.9               | 957.2±150.2         | 475.6±124.6           |

average (52.3+10.1) years; the implementation of CP in the treatment of patients with 200 cases, including 153 cases of male and female in 147 cases, aged 20 to 65 years old, the average (51.8+11.3) years; between the 2 groups in terms of sex and age had no significant difference. 2 groups of patients with antibiotic treatment, the path group before no pharmacists who participate in the drug plan, according to the conventional method of diagnosis and treatment; path group pharmacists and intervention regimen, treatment given initial antibiotic treatment, and timely submission of specimens, according to the pathogenic examination and drug sensitivity test results and clinical symptoms. To improve the situation to decide whether to replace antibiotics, complete with pharmaceutical care and pharmacy services until follow-up.

Cost refers to the value of resources consumed by a particular method or drug treatment, expressed in monetary units, including direct costs, indirect costs and implicit costs. Direct costs refer to the costs of prevention, diagnosis and treatment of disease. Indirect costs is caused by illness absenteeism, labor loss, death caused by the costs. Implicit cost refers to the cost of the patient in the course of the treatment of pain, sadness, etc. Because

the patients in this study come from different places and the family economic conditions are different, indirect costs and implicit costs are difficult to calculate.

## RESULTS

### *Comparison of clinical efficacy*

Before and after the implementation of clinical pathway, 2 groups in the total efficiency comparison, no statistically significant difference ( $\chi^2=0$ ,  $P=1$ ), there was no significant difference between the 2 groups ( $P>0.05$ ) (table 1). Record path before cases 5 adverse drug reactions, the path group 4 cases of adverse reactions were not found to cause serious adverse reactions ( $\chi^2=0.047$ ,  $P=0.715$ ), there was no significant difference between 2 groups (table 2).

### *Cost effectiveness comparison*

In the research methods of pharmacoeconomics, the effects of different drug treatments are different. Cost effectiveness analysis aims to find out to a treatment effect, with consumption of lower cost in the cost of treatment (C) and (E) find a balance point, and cost effectiveness ratio (C / E) will be organically linked. It represents the cost of the unit effect, the smaller the better.

Also consider the cost of each additional unit of effect, that is, the incremental cost effectiveness ratio, if the cost of each additional unit is too high, then this program is a non optimal program. In the study of the lowest cost of the program as a reference, the other programs will be compared with (table 3). The analysis results show: the path cost effect before group on average each received 1 treatment units need to spend 51.8 yuan, which costs 38.2 yuan; the average path group received 1 treatment units need to spend 33.2 yuan, which costs 29.8 yuan; and the path before the group, after the path group hospitalization costs on average spend 1302.3 yuan visible; acquired pneumonia in community, dosing regimens are major determinants of cost effectiveness, the path group after treatment for pharmacists to participate in a more cost - effect value,  $P < 0.05$ , the 2 groups in a statistically significant difference. For the case of prescription drugs accounted for, the drug proportion analysis in patients with community-acquired pneumonia, drug costs are the decisive factors of the total hospitalization expenses, the proportion of antimicrobial drugs accounted for in the total cost is the evaluation of the dosing regimen is the key index of rational norms (table 4). Analysis of the hospitalization time, inspection fees and other expenses. The hospitalization time in days, the inspection fee including CT fees, fees and test fees and ultrasound radiation fees, other costs including treatment costs, material costs, suction fees, bed charges (table 5).

## DISCUSSION

Drug economics as a marginal subject, in western countries has been widely used in medical decision making. In the United Kingdom, hospital pharmacists use pharmacoeconomics to help patients choose the right medicine to make more efficient use of health service resources. Pharmacoeconomics not only pays attention to the cost of drug treatment, but also pays attention to the result of drug treatment, so it is more scientific and acceptable in controlling the cost of medicine. Pharmacists by using the principle and methods of pharmacoeconomics, combined with the basic knowledge of epidemiology, biostatistics, medical bacteriology, in patients with community-acquired pneumonia dosing regimens for the same disease can have one or more drug treatment, and the use of different therapeutic schemes for the same disease may have different clinical effect. This requires pharmacists to assist physicians to develop a good drug delivery plan, not only requires safe, effective, but also economic and reasonable, treatment, appropriate usage.

Community acquired pneumonia is a high incidence and high mortality diseases, mainly rely on antibiotics to kill the bacteria, by fever, cough and phlegm, antiviral drugs to support therapy were cured or improved. Pharmacists into the clinical combination of drug safety and drug

resistance to the physician to recommend both to ensure the treatment effect and economic and rational drug. Among them, the choice of antibiotics is the effect of the most important factors is the direct factors that determine the administration cost, the application of pharmacoeconomics methods to reduce the administration cost is one of the important measures to reduce the total cost of hospitalization. But it is not only to reduce costs, ignore the therapeutic effect and physician autonomy. The results of this study show that pharmacists in clinical pathway in patients with drug regimens after reducing the average hospitalization expenses, average hospitalization time shortened, especially by Pharmacoeconomic cost-effectiveness method, the drug cost decreased, the proportion of medicine, antibacterial drugs the proportion of the cost is also correspondingly lowered, improve the rational use of antibiotics in clinic and effectively prevent the occurrence of drug resistant bacteria, so as to improve the quality of the medical quality and patient survival. By using the concept of pharmacoeconomics, in order to standardize the process of diagnosis and treatment, and to increase the economic performance of the drug delivery plan, to select the appropriate cost effective drug delivery plan for each patient. To find out the best balance point of C/E, not only to ensure the treatment effect and reduce the economic burden of patients, but also to make better use of limited medical resources.

## CONCLUSION

In conclusion, pharmacogenomics and clinical pathway combined with each other, mutual influence, mutual penetration, bound for China to explore a scientific, rational and economic health reform of the road, have a profound impact, which is indispensable for pharmacists to participate in, will also be better for clinical services for patients and health care professionals. This study is of great practical significance to control the excessive growth of medical costs and reduce the burden of individual and society.

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