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## A Systematic Review on the Extent and Quality of Pharmacoeconomic Publications for China

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### ABSTRACT

**Objectives:** To evaluate the extent and quality of published pharmacoeconomic studies based in China. **Methods:** A systematic literature search was conducted using PubMed, Web of Science, Google Scholar, and China National Knowledge Infrastructure to identify pharmacoeconomic studies conducted in China. The keywords included different combinations of health economics, pharmacoeconomic, cost-effectiveness, and China. The inclusion criteria for the studies were: 1) original research articles; 2) written/published in English; 3) comparing a pharmaceutical to another pharmaceutical, treatment modality, or no treatment; and 4) conducted in China. The articles were reviewed by two independent reviewers using the 100-point Quality of Health Economic Studies scale for pharmacoeconomic studies. General and economic analysis information was collected from the articles. **Results:** A total of 20 studies were included, which were published in 11 different journals between 2006 and 2012 and had an average of  $5 \pm 2$  authors. The mean Quality of Health

Economic Studies scale scores for pharmacoeconomic studies was  $80 \pm 10$ . More than two-thirds of the authors resided in China (70%) and most had a medical background (90%). Most studies were published in foreign journals (not based in China) (90%), conducted cost-effectiveness (65%) or cost-utility analyses (65%), and used modeling as their study design (80%). **Conclusions:** China-based pharmacoeconomic studies written in English are limited in number, but, on average, are of good quality. Economic evaluation of pharmaceuticals should be encouraged in China because appropriate allocation of health care resources is important in a country where, despite economic growth, resources remain scarce relative to needs.

**Keywords:** China, cost-effectiveness analysis (CEA), pharmacoeconomics, Quality of Health Economic Studies (QHES).

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### Introduction

Health care is a major concern for Chinese people. “It is too hard to seek health care and it is too expensive to pay for it!” is a common complaint from this large population with unmet medical needs. Several initiatives addressed this issue during the health care reforms of 2006. A government-run insurance program, the New Cooperative Medical Scheme, covered 86% of the rural population within a year of implementation. Attempts at supporting community health centers have been made to redirect urban patients from large hospitals to community health centers. Approximately \$25 to \$38 billion in government funding had been injected to provide universal basic health care [1].

Although these initiatives mitigated some problems, there are still concerns due to the increasing cost and inefficiencies in the health care delivery system. van Doorslaer et al. [2] found that increased out-of-pocket health spending puts an additional 19% people below the poverty line. It has been estimated that 35% and 43% of urban and rural households, respectively, have difficulties in paying for their health care [3]. A study by Yip and Mahal [4]

found that the cost of hospitalization can be nearly seven times the annual income of a low-income person in the rural areas and four times that in the urban areas. Liu and Mills [5] noted substantial overprescribing of medications and ordering of expensive services when remuneration to physicians was based on the quantity of services provided and the revenue generated by them. These unnecessary services drive up the costs associated with health care. Other problems involve inadequate insurance coverage, inequality, and inefficient use of scarce resources [6].

Currently, China is going through an important phase of transformation in its health care system. Pharmacoeconomic research could be important at this crucial time by providing insights in managing health care costs and ensuring optimal use of scarce resources. This is especially important in a developing country such as China where the gap between required and available resources for health care is wide and continues to widen. For countries such as China, economic evaluations of health care resources can serve as useful tools in resource allocation and decision making. Such research could also help

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government health insurance programs in formulary decision making. The results assessing clinical outcomes and economic benefits could provide guidance to health care providers in selecting appropriate treatment plans and provide more transparency in decision making.

To our knowledge, no published study (in English) has systematically reviewed pharmacoeconomic studies conducted in China. Thus, the objective of this study was to evaluate the extent and quality of published pharmacoeconomic research in China.

## Methods

### Literature Search

A systematic search of the literature was conducted in December 2012 using PubMed, MEDLINE, Web of Science, and Google Scholar to identify pharmacoeconomic studies pertaining to China. Search terms included “pharmacoeconomic,” “health economic,” “cost,” “cost-effectiveness analysis,” “cost-minimization analysis,” “cost-utility analysis,” “cost-benefit analysis,” “economics,” “pharmacy,” “pharmaceuticals,” and “China.” These keywords were used alone and in different combinations. The inclusion criteria for this study were as follows: 1) original studies; 2) carried out comparisons between pharmaceuticals, treatment modality, or against no treatment; 3) conducted in China (including Hong Kong); and 4) manuscript written/published in English. Studies comparing multiple countries were excluded. Articles were excluded if cost was not the main topic of the study. Reference lists of these articles were used to identify additional relevant articles. Full journal publication was required for a study to be included in this review; thus, meeting abstracts, letters to the editor, treatment guidelines or recommendations, expert opinion, and narrative reviews were excluded.

Two researchers (S.J. and X.M.) carried out the literature search using the English-based search engines and identified articles independently. They assessed the abstracts of the identified studies, and all abstracts that met the inclusion criteria were confirmed by a third researcher (P.D.). Full articles were then obtained for further evaluation. To examine and compare the number of articles written in Chinese that were not included in English-based search engines, a fourth researcher (L.Y.) used the China National Knowledge Infrastructure search engine to determine the number of articles written in Chinese up to 2012 using the same key words in Chinese.

### Evaluation of Studies

A data collection form similar to the one developed by Gavaza et al. [7], which has been used in several previous studies [8–10], was used to collect general and economic information. General information included the total number of authors for the study, country of residence of the primary author, primary training of first author, year of publication of the study, journal in which the study was published, and type of publication. Economic information included type of costs, perspective of study, method of economic evaluation defined in study, study design, primary outcomes, type of data, disease state investigated, funding source, type of medical function, and the decision reached on whether treatment was cost-effective.

We used the Quality of Health Evaluation Studies (QHEs) scale to assess full pharmacoeconomic studies [11,12]. The QHEs scale is a 16-item scale covering evaluation of study objectives, perspective, economic model, study design, and methodology. Each item is weighted appropriate to its importance in assessing quality. The QHEs scale is a 100-point scale, with lower scores

representing poor quality. A modified version of the Quality of Health Economic Survey instrument was used. Instead of using a zero versus full-score technique, three scoring points—full score, a midpoint score, or a zero—were used [8]. Two blinded reviewers assessed each article independently. All disagreements were resolved through discussions and assessment by a third reviewer. If the difference between the scores given by the two reviewers exceeded 10, it was passed to a third reviewer for further evaluation. In this case, the final score of the article was defined as the average score of the third reviewer and a closer score given by either reviewer.

### Statistical Analysis

Descriptive statistics were reported for all the variables. The differences in QHEs scale scores by variables (country of residence of the primary author, type of publication, geographic location, funding source, and type of medical function) were compared using independent sample *t* tests. The difference in QHEs scale scores by type of data collection was compared using analysis of variance. The relationship between the QHEs scale and the number of authors and the year of publication was assessed using Pearson’s correlation coefficient. The alpha level was set at 0.05. All statistical analyses were conducted using SPSS version 20.

## Results

The literature search using both English-based and Chinese-based search engines identified almost 6000 (5943) abstracts, but only 97 were available in English. After reviewing the abstracts of these 97 articles, 62 articles were excluded because of being multiple-country comparisons ( $n = 13$ ), having no cost analyses ( $n = 36$ ), being a cost-of-illness study ( $n = 7$ ), or a review article ( $n = 6$ ). Fifteen studies were further excluded because although the abstract was available in English, the full article was written in Chinese ( $n = 11$ ) and the study did not compare pharmaceutical products ( $n = 4$ ). Therefore, a total of 20 studies were included for further evaluation (Fig. 1 and Table 1).

The earliest article was published in 2006, and the latest one was published in 2012 (Fig. 2). The 20 articles were published in 11 different journals based in the United Kingdom ( $n = 9$ ), the United States ( $n = 5$ ), China ( $n = 2$ ), The Netherlands ( $n = 2$ ), and Japan ( $n = 2$ ). More than half (60%;  $n = 12$ ) of the articles were published in medical journals, and the other articles (40%;  $n = 8$ ) were published in health/medical economic journals. Articles had an average of five authors (mean  $5 \pm 2$ ). On the basis of institutional affiliation, most of the primary authors (i.e., first authors) were from China (70%;  $n = 14$ ) and had medical or clinical training (90%;  $n = 18$ ). Nationwide studies accounted for 70% of the studies ( $n = 14$ ), and the rest were subnational studies (Table 2).

The articles discussed various disease states including cancer ( $n = 7$ ), hepatitis ( $n = 4$ ), cardiovascular disease ( $n = 3$ ), diabetes ( $n = 2$ ), influenza ( $n = 2$ ), schizophrenia ( $n = 1$ ), and enterovirus71 infection ( $n = 1$ ). More than half of the studies ( $n = 13$ ; 65%) assessed disease treatment. The most common perspective was the third-party payer ( $n = 12$ , 60%). Economic evaluation was the primary objective for all the included studies. Most of the studies ( $n = 13$ ; 65%) conducted cost-effectiveness analysis, and 10 articles (50%) conducted both cost-effectiveness analysis and cost-utility analysis. Three articles (15%) conducted cost-minimization analysis, and only one article conducted cost-benefit analysis. Most studies used modeling ( $n = 16$ ; 80%) for their analyses. All the studies included direct medical costs, but only two (10%) included direct nonmedical costs, and two (10%) included indirect costs. In addition, 18 (90%) studies used

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