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Short Review

Pharmacoeconomics: Cost of Illness Studies

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Abstract

Cost-of-illness studies measure the economic burden of a disease and estimate the maximum amount that could potentially be saved or gained if a disease were to be eradicated. Direct medical costs and indirect costs are measured using top down and bottom up approaches Human Capital approach, Willingness-to-Pay (WTP) approach and Friction Costs approach respectively. The perspectives may measure costs to society, the health care system, third-party payers, businesses, the government, and participants and their families. Incidence-based studies, estimate lifetime costs, measure the costs of an illness from onset to conclusion for cases beginning within the period of the study, usually a year. Incidence costs include the discounted, lifetime medical, morbidity, and mortality costs for the incident cohort. Prevalence-based studies measure the costs of an illness in a year, regardless of the date of onset and include all medical care costs and morbidity costs for a disease. Indirect costs include the loss of resources due to morbidity and mortality, which inherently places a monetary value on the value of life. The human capital method is the most common approach used to calculate the indirect costs of an illness. The costs attributable to an illness depend largely on how the illness is defined diagnostically. Studies typically use the International Classification of Diseases, as a basis of defining the illness of interest and whether to include secondary diagnoses. The appropriate data source to use for a cost-of-illness study varies by the illness, perspective, and approach of the study.

Key words: Cost of illness, diabetes, Direct medical costs and indirect costs, Pharmacoeconomics

Introduction

Diabetes mellitus presents a huge burden for individuals and society. Medical expenditures for people with diabetes are 2-3 times higher than for those not affected by diabetes[1]. Choices and decisions abound in today's health care environment[1]. Decision making on health care issues are becoming increasingly difficult due to paucity of real data, increasing health care costs, limits in healthcare resources and debate over the effectiveness of treatment alternatives. Cost of Illness (COI) estimates are often cited as important elements in the decision making process of a chronic disease like diabetes. Over a 6-8 year time span, as per estimates, the unadjusted cost of diabetes could have risen from $20 billion per year to $137 billion[2].

There is, however considerable debate about the appropriate interpretation of the cost of diabetes (COD). There are two main studies done in the late 1990s, the Bangalore Urban Diabetes Study (BUDS)[3] and the Cost of Diabetes Study (CODS)[4] to estimate the COD in India. The goal of this review is to take a step back and look at where we are collectively regarding our knowledge of the cost of diabetes, to identify the cost strength and limitations of currently available diabetes COI studies and to identify future research areas that will help us better understand the economic burden of diabetes.

Use of Cost-of-Illness Study

"….a tool for appraising the adequacy of resources devoted to specific health problems…"[5]. The uses of COI studies have received much attention over time. Mushkin[2], Weisbrod[6] and others developed a framework to calculate costs related to disease. Most recently, the National Institute of Health (NIH) has cited the value of estimates in identifying "orders of magnitude" related to different diseases[7].

The estimates provide information that describes the resources used and the potential resources lost and thus characterize the burden of the disease.

Actual Uses of Cost-of-Illness Study

Advocacy One of the greatest uses of COI studies is to support advocacy positions of non-governmental organizations (NGO). Cost figures are used by various groups and organizations to gather support for research and societal programs. **Priority Setting** There is evidence that government organizations use COI studies as an aid to

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decision-making. COI estimates are used in determining budgetary allocations, prioritizing research funding and justifying funding for disease projects. **Disease Burden** Researchers use COI estimates as a measure of disease burden. **Citation** Published research papers often cite cost figures to draw attention to the magnitude of the disease. From January 1983 to October, 1997, cost of diabetes studies were cited 184 times in professional journal articles[8].

Methods Used in Estimating the Cost-of-Illness

The origins of today's COI studies lie in the work of Fein[9], Mushkin[2], Weibrod[6], Rice[10] and others in the late 1950s and early 1960s. In 1966, Dorothy Rice published a monograph that proposed a method for estimating costs from the information available in existing data sets. This work became the de facto standard for future COI studies. It addressed the economic cost of illness from the perspective of two categories: direct costs and indirect costs.

A third category, the psychosocial cost of illness or its impact on quality of life, is often mentioned in literature but seldom measured due to difficulty in measuring such costs.

DIRECT COSTS

Direct economic costs of disease are those generated by the resources used in treating or coping with a disease, including expenditures for medical care and the treatment of the illness (hospital care, physician services, nursing home care, drugs and other medical needs). Recently transportation costs and costs of care-giving by family members are also included. These costs are captured with the help of surveys and studies.

Most of the COI studies used either a top-down approach or a bottom-up approach. The approaches and methods described by Rice[6,11,12,] have served as a guide for many subsequent COI studies.

Top-down approach

This approach is based on costs examined in an aggregate form for specific diseases[13]. Costs are calculated by multiplying the total health care expenditures by the proportion of health care services used by the disease group.

Bottom-up approach

This approach is based on the costs of individual units of service performed[14,15]. It uses average cost of service estimates and applies these data to the total number of health care encounters related to the disease to arrive at the health care costs of a disease.

INDIRECT COSTS

Indirect economic costs look at the potential resources that are lost as a result of a disease. They include the societal costs of morbidity, disability and premature mortality. These non-medical costs of disease are not easily measured or calculated. Costs may include lost productivity, caregiver costs, loss of leisure, pain and suffering, and quality of life. A proposed global measure such as quality-adjusted-life year (QALY) could capture these elements and prevent double counting. There is however disagreement about whether productivity and time costs is included in the QALY measure[16,17,18].

Three approaches have been advocated for the estimation of indirect costs: a human capital base[10,15,19], a willingness-to-pay or contingent valuation base[20,21,22,23] and a friction cost base[37,38,39].

Human Capital approach

In this approach, indirect costs are seen as the earnings, present and future, lost to that individual as a result of the illness. Each person's output is considered equal to his market earnings at that time. Indirect costs are often valued on the basis of disability and premature mortality[27]. Disability refers to individuals who are working or keeping house and lost earnings or outputs are quantified. Indirect costs related to premature mortality should be based on disease specific deaths, the survival experience of the general population, employment rates, earnings and discount and productivity rates[10, 15, 28, 29]. Discount rates and productivity rates often selected at the discretion of the researcher.

Willingness-to-Pay (WTP) approach

As per the WTP approach, life and lifestyle changes are valued as equal to the amount that the individual is willing to spend to reduce their risk of death or illness. WTP values can be estimated directly via questionnaires.

Friction Costs approach

Friction costs represent the costs associated with the replacement of a sick worker. The concept behind the use of friction costs is that production losses due to illness may not be as great as expected because existing labor pools and workplace structures can absorb some of the lost productivity. Friction costs include costs associated with the amount of time needed to replace a sick worker, training costs of a new worker, and costs associated with any decreases in productivity during temporary work absence of the sick employee.

The choice of which method to employ in a study can significantly influence overall results. For example, estimates based on WTP approach are generally larger than those generated by a human capital approach. Of the three methods, human capital approach has been applied most frequently and is the design used in all cost-of-diabetes studies.

Data Sources

In India, the primary data sources for COI studies have been the surveys and reports of the Ministry of Health and Family Welfare, Government of India. General and Health indices and health expenditure data can be assessed from Central Statistical Organisation[37]. The data from websites of World Health Organization can provide disease specific data[38,39]. Moreover, associations in the particular field of study

publications of newspaper, Insurance organizations can provide valuable data in the respective fields. National data on employment and income are also available through government publications. Nationally representative data are preferable because they permit cost estimates to be generalized to the entire population without bias.

Perspectives

Nearly all of the COI studies conducted today follow the framework proposed by Dorothy Rice in 1966[5]. The framework examines costs from the societal perspective. Nowadays, cost of disease from the perspective of the patient is gaining more attention. There are also studies conducted from the perspective of the health maintenance organization (HMO).

Summary

The diabetes economics literature is extensive and diverse. Although many discrepancies exist between the studies conducted, one can draw many conclusions from a review of the literature. Much attention and effort has been put in assessing the cost of diabetes over the past four decades. In the first part of this review, attention was paid to the process and methods of collecting data. These studies have repeatedly found a large economic burden associated with diabetes. It is reasonable to conclude that diabetes is a comprehensive chronic disorder with short term and long term complications. Established methods in estimating the cost of diabetes that rely on primary diagnosis are likely to severely underestimate the impact of diabetes. Unless the data is based on individual responses, unlike the studies based on national data, the estimates will clearly be unrealistic and incomprehensive. Despite several advances in the approach to estimating the costs of diabetes, there is no standard for estimating these costs.

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