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Review

Cost-of-illness studies of diabetes mellitus: A systematic review



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ABSTRACT

Background: Diabetes mellitus (DM) is recognised as a major health problem.

Objectives: The aims of this study are two-fold: (1) to describe the methods used in the identified cost-of-illness (COI) studies of DM and (2) to summarise their study findings regarding the economic impact of DM.

Methods: This is a systematic review of MEDLINE and Scopus journal articles reporting the cost of type 1 and/or 2 DM that were published in English from 2007 to 2011. Costs reported in the included studies were converted to US dollars.

Results: The systematic search yielded 30 articles. The studies varied considerably in their study design, perspective and included cost categories. Estimates for the total annual costs of DM ranged from US\$141.6 million to US\$174 billion; direct costs ranged from US\$150 to US\$14,060 per patient per year (pppy) whereas indirect costs ranged from US\$39.6 to US\$7,164 pppy. Inpatient cost was the major contributor to direct cost in half of the studies that included inpatient costs, physician services and medications.

Conclusion: There is a considerable economic burden associated with DM. Future research should focus on improving methods of estimating costs, enhancing the interpretation of study findings and facilitating comparisons between studies.

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1. Introduction

Diabetes mellitus (DM) a leading cause of mortality worldwide [1], accounting for approximately 4.6 million deaths in 2011 [2]. There are an estimated 382 million people living with DM in 2013 and this number is expected to increase to 592 million by 2035 [3]. This global increase in DM is attributed to population growth and aging and an increasing trend towards unhealthy diets, sedentary lifestyles and obesity [4]. Individuals with DM often develop macrovascular (cardiovascular, cerebrovascular and peripheral vascular diseases) and microvascular (retinopathy, nephropathy and neuropathy) diseases [5,6]. These chronic complications are highly prevalent in patients with type 2 DM, with 4 in 10 developing one or more of the complications [7,8].

The chronic nature of DM and its many complications make it a costly disease [9]. In 2010, the estimated worldwide cost to treat and prevent DM and its associated complications was at least US\$376 billion [10]. This led to an increased interest in identifying the costs of DM in order to determine cost-saving solutions for the management of patients with DM. Such aims can be achieved by reviewing studies that examine the cost of DM.

Cost-of-illness (COI) studies summarise the resources used and lost as a result of a particular disease, making possible an analysis of the medical and economic burden that a disease may have on society as a whole, the health service in particular and/or the individual patient [11,12]. It should be noted that COI studies serve a different purpose than health economic evaluations, such as a cost effectiveness analysis, which focus on evaluating the costs and effectiveness of interventions rather than estimating the cost of a particular disease [12].

1.2. An overview of cost-of- illness studies

The framework for present COI studies stems from the work of Fein [13], Mushkin and Collings [14], Weibrod [15], Rice and Cooper [16] and others during the mid-1900s. In particular, in 1966, Dorothy Rice published a monogram that proposed a method of estimating costs from available information in existing data sets. This monogram established what has now become the standard for all COI studies: addressing the economic COI in the two categories of direct costs and indirect costs. A third category, the psychosocial cost of illness or its impact on quality of life, is often mentioned in the literature but seldom measured in COI studies due to the complexity of such cost measurement

[10,17–20] COI studies can estimate the maximum amount that could potentially be saved or gained if a disease were to be eradicated [21]. However, arriving at this figure, or even estimating the economic burden of a disease, is a challenging task due to the fact that important data are not always available.

1.3. Direct, indirect and intangible costs

In a COI study, the three cost components that can be estimated are: (1) direct medical and non-medical costs, (2) indirect costs and (3) intangible costs. Direct costs represent the opportunity costs of all kinds of resources used for treating diabetes. Direct medical costs include hospital inpatient care, physician inpatient care, physician outpatient care, emergency department visits, nursing home care, hospice care, rehabilitation care, specialists' and other health professionals' care, diagnostic tests, prescription drugs and medical supplies [19,21]. A more specific example is the laboratory costs incurred for the testing of HbA1c in patients with diabetes. Direct non-medical costs refer to costs incurred by patients and their families that are directly associated with diabetes but are not medical in nature, such as transportation costs, relocation expenses and informal care [21–23].

Indirect costs include productivity losses related to morbidity and mortality [21]. Productivity loss includes both work absences resulting in foregone productivity ("absenteeism") and decreased productivity for those who continue to work despite having diabetes ("presenteeism") [24]. Indirect costs usually account for a large proportion of total costs in most COI studies [21,23].

Intangible costs refer to patients' psychological pain, discomfort, anxiety and distress related to diabetes [25]. Such costs are usually in the form of quality of life measures.

1.4. Perspective

In addition to different types of costs, another important consideration in COI studies is the perspective taken. Depending on the perspective chosen, the cost estimation will vary. Possible perspectives include those of the patient (e.g., out-of-pocket costs), the employers (e.g., cost of worker's compensation insurance premiums and loss of productivity), the insurance company (e.g., cost of claims), the government (e.g., cost of public health services) or the society. The societal perspective is the most comprehensive and commonly used approach in cost-of-diabetes studies [26], as it avoids cost underestimation that may occur when a narrower perspective is taken [21,22].

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