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VALUE IN HEALTH

Cost of Hypoglycemia in Patients with Type 2 Diabetes in Sweden

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ABSTRACT

Objectives: Hypoglycemia is a common side effect of antidiabetic therapy. In addition to reducing well-being, hypoglycemic events may lead to substantial costs of medical care and lost productivity. The cost of hypoglycemia is, however, not well identified, particularly in patients with Type 2 diabetes. The purpose of this study was to assess the cost of hypoglycemia in Type 2 diabetes in Sweden.

Methods: A cost-of-illness approach, based on an incidence methodology, was used to estimate the cost of hypoglycemia in patients with Type 2 diabetes. A hypoglycemic event was defined as an episode with symptoms of low blood glucose levels during which the patient required assistance from another person. The events were divided into mild, moderate, and severe, and the incidence and costs of the different events were estimated based on data in the literature.

Results: Assuming that there are 300,000 patients with Type 2 diabetes in Sweden, it was estimated that 26,942 hypoglycemic events would occur annually in these patients, corresponding to a rate of 0.09 events per patient-year. The total cost of hypoglycemia was, in base case, estimated at about €4,250,000 (€14 per patient with Type 2 diabetes) per year. Moderate hypoglycemia contributed the largest proportion of these costs.

Conclusions: The results indicate that hypoglycemic events lead to substantial costs, but data are scarce and more studies are needed to better understand the cost and consequences of hypoglycemia.

Keywords: cost of illness, hypoglycemia, Sweden, Type 2 diabetes mellitus.

Introduction

In Sweden the prevalence of diabetes mellitus has been estimated to be about 3%, with Type 2 diabetes accounting for 85% to 90% of all diabetes cases [1]. The prevalence of Type 2 diabetes is increasing, mostly resulting from the aging population, but also resulting from changes in lifestyle factors (diet, exercise, smoking, etc.). By 2030, the World Health Organization predicts that diabetes will affect more than 370 million people worldwide [2]. Because diabetes is a major cause of morbidity and premature mortality, it has significant socioeconomic implications in both industrialized and developing nations, and the largest share of the costs is attributable to late complications of the disease (micro- and macroangiopathy) [1,3,4].

It is already well established that tight glycemic control reduces the development of diabetic complications [5,6]. Nevertheless, glycemic control is often forfeited to avoid treatment-related hypoglycemia, a common and feared side effect of insulin treatment [7]. The symptoms of hypoglycemia vary from very mild, for example, dizziness or headache, to severe symptoms requiring hospitalization. The prevalence of hypoglycemia varies depending on therapy options; in general, insulin therapy has been associated with the greatest incidence of hypoglycemia [8]. A large proportion of patients with Type 2 diabetes are treated with insulin [1], but hypoglycemia is less common in Type 2 versus Type 1 diabetes. Nevertheless, it is a cause for concern, and tends to be under-recognized [9]. Moreover, as physicians continue to move toward tighter glycemic controls in these patients, the incidence of hypoglycemia in Type 2 patients may increase in the future.

The cost of hypoglycemia is a complex issue as hypoglycemia affects the diabetic patient in multiple ways, and also because of the varying definitions of hypoglycemic events. Costs are incurred when healthcare resources are consumed to treat hypoglycemia (direct medical costs), and also because of loss in production when patients are absent from work (indirect costs). The direct medical costs in association with a hypoglycemic event depend on the severity of the event. Severe hypoglycemia may result in hospitalization, the moderate forms may need emergency care and consultation by a physician, and a mild hypoglycemic event may only require a glucagon injection or other assistance at the place of the event.

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Although the impact of hypoglycemia on quality of life (QoL) is unclear, patients experiencing several episodes of hypoglycemia have reported lower QoL [10]. Whether patients with low QoL experience many hypoglycemic events, or whether many hypoglycemic events lead to low QoL is, however, not known.

Apart from the distressing acute symptoms, hypoglycemia may also have a negative impact on the health of a patient with diabetes in the long term [11]. Another important aspect is the constant fear of developing hypoglycemia that some patients experience [12].

Few empirical studies have assessed the cost of hypoglycemia. Leese et al. estimated the cost of severe hypoglycemia to be about £380 per event [13] and a French study estimated the total hospital cost of a stay for hypoglycemia to FF14,000 (US$2100) [14]. A German study estimated the cost of severe hypoglycemia to US$44,338/100,000 inhabitants [15]. There is little data on the specific costs of hypoglycemia in Type 2 diabetes. The purpose of this study was therefore to assess the cost of hypoglycemia in Type 2 diabetes in Sweden.

Research Design and Methods

Method for Analysis of the Cost of Hypoglycemia

Cost-of-illness methodology was used to estimate the cost of hypoglycemia in patients with Type 2 diabetes in Sweden. The study design was incidence-based, considering all new events of hypoglycemia during a given year [16,17]. A bottom-up approach was used, with the costs of different hypoglycemic events being calculated and extrapolated to a national level, based on the estimated incidence rates of hypoglycemia. The calculation model is illustrated schematically in Figure 1.

Definition of Hypoglycemic Events

A hypoglycemic event was defined as an episode of hypoglycemia during which the patient required assistance from another person to resolve the situation (Table 1). A mild event required no medical attention and assistance from family or friends only. A moderate event required the help of medical personnel, typically a physician visit, but did not require admission to a hospital. A severe event was defined as a hypoglycemic episode requiring inpatient care. This definition of severe hypoglycemia differs from another definition often found in the literature, namely an event during which the patient requires assistance. This classic definition is not associated with resource use; therefore, the alternative definition was applied for the purposes of this analysis.

The definitions and reporting of rates of hypoglycemic events varies between studies in the literature. Many studies report the risk of having at least one event during a specified time period, whereas others report total number of events per patient per unit of time. As our summary estimates include studies that report the risk of having at least one event, there may be a slight underestimation of the total number of events as these patients may have experienced multiple events during the time period.

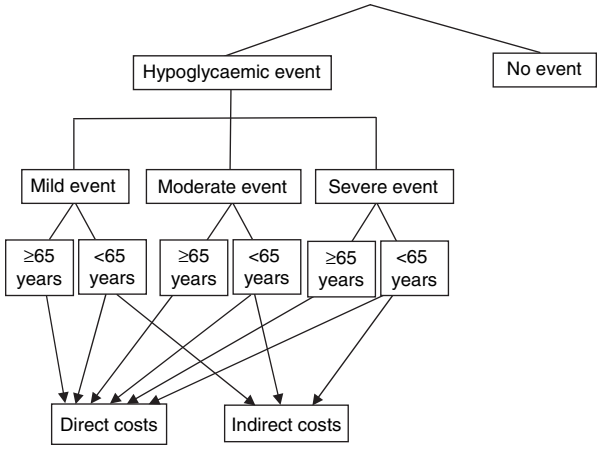

Figure 1 Model description.

Cost Calculations

Direct as well as indirect costs of hypoglycemia were considered. Direct costs included costs for the medical treatment of hypoglycemia, and indirect costs included productivity lost because of hypoglycemic events. When calculating the cost of lost productivity three basic assumptions were made: 1) a person experiencing a hypoglycemic event would not return to work that day; 2) if the event occurred at night, half a day of productivity would be lost; and 3) an event occurring after work but before sleep would result in no loss of productivity. Probabilities of a hypoglycemic event occurring at different times of the day were based on published data in patients with Type 1 diabetes [18]. There are no equivalent data available for patients with Type 2 diabetes; the analysis assumes that the diurnal patterns of hypoglycemia is comparable in Type 2 diabetes.

Table 1 Definition of hypoglycemic events

Hypoglycemia	Definition
Mild	Patient experiences symptoms of hypoglycemia and requires assistance from a second person (a relative or friend, etc.) to resolve the situation. No medical attention is needed
Moderate	Patient seeks medical attention for hypoglycemia but is not admitted to hospital overnight
Severe	Patient is admitted to hospital because of hypoglycemia