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A Comparison of 1-Year Treatment Costs in Patients with Type 2 Diabetes Following Initiation of Insulin Glargine or Insulin Detemir in Argentina

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ABSTRACT

Objective: To estimate and compare type 2 diabetes mellitus treatment costs in insulin-naive patients following initiation of therapy with either insulin glargine (IG) or insulin detemir (ID) over 1-year time horizon from a payers' perspective in Argentina. **Methods:** We used a pharmacoeconomic model based on a randomized trial comparing IG and ID (Rosenstock J, Davies M, Home PD, et al. A randomised, 52-week, treat-to-target trial comparing insulin detemir with insulin glargine when administered as add-on to glucose-lowering drugs in insulin-naive people with type 2 diabetes. Diabetologia 2008;51:408–16) and Argentinean sources. Clinical, resource use, and cost data were combined to estimate direct medical costs (insulin, test strips, and needles) during the first year. Price per international unit of insulin is similar for IG and ID in the local market. Deterministic analysis was performed on insulin unit cost and probabilistic sensitivity analyses on clinical, resource use, and unit costs to evaluate contribution to variance on the difference in total annual treatment cost. **Results:** Annual mean treatment cost (Argentinean pesos 2013) was AR $6229 for IG and AR $9257 for ID, showing 33% total cost reduction with IG (AR $3028; exchange rate US $1.00 = AR $5.30). Probabilistic sensitivity analysis showed that IG was cost saving in 88% of the simulations. The most influential parameter was the difference in insulin dose requirements. Threshold analysis showed that if the unit price of ID is reduced by 43%, *ceteris paribus,* the total annual costs per person for both insulin regimens would be the same. **Conclusions:** From a payer's perspective in Argentina, cost savings related to the use of IG represented one third of total treatment costs. Sensitivity analyses confirmed the robustness of these results.

Keywords: cost comparison, insulin detemir, insulin glargine, type 2 diabetes.

Introduction

Type 2 diabetes mellitus (T2DM) is a serious public health problem due to its high prevalence and the development of chronic complications (retinopathy, nephropathy, peripheral vascular disease, ulcers, diabetic foot and amputations, cardiovascular disease, and stroke), which increases resource use and socioeconomic costs, especially in developed countries [1]. The economic burden raised by diabetes is challenging health care systems. According to the World Health Organization, direct health care cost of diabetes-related illnesses ranged from 5% to 13% of a country's annual health care budget, depending on local prevalence and treatment costs [2]. In Argentina, diabetes affects 11.9% of the population [3] and is estimated to represent a high proportion of total health expenditure [2].

It has been clearly established that the development and progression of complications can be effectively prevented or delayed through tight glycemic control [4–6]. A number of landmark randomized controlled trials and meta-analysis of randomized controlled trials (RCTs) established that intensive glucose-lowering treatment reduces microvascular complications, and follow-up data from these studies suggest that intensive treatment also lowers macrovascular risk in T2DM [5,7–11]. When considering effectiveness, tolerability, and cost of the various diabetes treatments, insulin is not only the most potent but also the most cost-effective intervention [12,13].

In spite of the existing evidence, there has been a stepwise introduction of glucose-lowering interventions, with the final step of insulin therapy being administered 10 to 15 years after diagnosis [14]. Both patients and physicians are often reluctant to start insulin because of fears of painful injections, hypoglycemia, and weight gain [15–17]. In recent years, long-acting insulin analogues, insulin glargine (IG) and insulin detemir (ID), were introduced and proposed as a therapeutic alternative with the potential to overcome some of these barriers as data from trials

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and meta-analysis showed a lower rate of symptomatic, overall, and nocturnal hypoglycemia in patients treated with either IG or ID compared with neutral protamine hagedorn (NPH) insulin [18].

According to the American Diabetes Association and the European Association for the Study of Diabetes guidelines for the management of T2DM, insulin could be initiated with either once-daily NPH insulin or long-acting insulin analogues [19]. Regimes involving long-acting insulin analogues can achieve clinically important improvements in glycemic control similar to those achieved with NPH, but with less risk of hypoglycemia [20,21].

Studies that compared IG and ID in patients with T2DM showed that both analogues did not differ in efficacy and safety profiles [22–25].

The economic impact of the use of these insulins was estimated in Spain by Guisasola et al. [26] on the basis of the only 52-week randomized trial to date (Rosenstock et al.) [22], which compared clinical outcomes related to the addition of basal insulin analogues ID or IG in a sample of 582 insulin-naive patients with T2DM who were inadequately controlled with oral glucose-lowering drugs. In this study, it was found that the use of IG instead of ID would result in annual saving on treatment costs of 34% or 534.96 (€ 2006) for a patient with T2DM.

Pscherer et al. [27] compared treatment costs of IG with those of ID, both combined with bolus insulin as part in patients with T2DM in Germany. The authors concluded that IG may represent a cost-saving option for patients with T2DM in this country, with potential annual cost savings of €684 (19%) per patient compared with ID at 2008 prices.

In contrast, a retrospective cohort analysis of health care claims data in a large US managed care organization (since May to December 2006) found that patients receiving ID incurred lower diabetes-related medical costs ($707 vs. $1510; $P = 0.03$) and total health care costs ($2261 vs. $3408; $P = 0.03$) than did those using IG [28].

We found many other similar cost comparison studies between these insulins for many countries [26,27,36], but none of them was for any Latin American country. The Latin-American Diabetes Association guidelines recommend the use of insulin analogues when hypoglycemia is limiting glycemic control [29]. Up to date, no studies in Latin America have compared the economic impact of the use of IG versus ID.

This study attempts to estimate and compare the economic implications of IG and ID therapy initiation in insulin-naive patients with T2DM with 1-year time horizon, from a payer's perspective in Argentina incorporating a probabilistic sensitivity analysis (PSA).

Methods

We used a pharmacoeconomic exercise based on Guisasola et al. [26], and Pscherer et al. [27] constructed on MS Excel based on the results of Rosenstock et al. [22]. Although other trials comparing the efficacy and safety of both insulin have been published [23–25], the study by Rosenstock et al. [22] is the only trial to date that compared IG and ID in an annual duration of treatment in insulin-naive patients with T2DM.

Clinical, resource use, and cost data were combined in the model to estimate annual direct medical costs associated with the use of insulin, test strips, and needles required during the first year of insulin treatment in T2DM.

Clinical Parameters

Table 1 lists the clinical parameters for each insulin regime. At the end of follow-up, 55% of the patients treated with ID required twice-daily application. All patients treated with IG required once-daily injections.

Table 1 – Clinical parameters.

Parameter	Insulin glargine	Insulin detemir	
		Once daily injection	Twice daily injection
Initial mean body weight (kg)	87.4	87.4	87.4
Final weight (kg)*	91.3	89.7	91.1
Initial doses (IU)	12	12	12
Final doses (IU/kg)	0.44	0.52	1
Average dose (IU)	26.09	29.32	51.55

Note. Estimated and adapted from Rosenstock et al. [22].

* This indicator was calculated adding to the initial mean body weight the mean change registered at the end of the trial for each insulin scheme.

This trial informed the initial and final doses of each insulin regimen, so an average total dose per each insulin regimen was estimated on the basis of the initial dose (12 international unit [IU] for all patients) and the final dose per insulin regimen reported in Rosenstock et al. [22] considering a linear titration over the 52 weeks. This is a conservative assumption, given that 80% of the patients requiring ID twice daily (n = 103) were transferred to this scheme during the first 12 weeks of treatment.

$$\text{Average total dose} = \left[\text{Initial dose per kg} + \frac{\text{Final dose per kg} - \text{Initial dose per kg}}{2}\right] \times \text{Final body weight}$$

As the equation shows, mean dose per each insulin regimen was calculated using patient's final weight. As in Rosenstock et al. [22], only the mean initial and incremental body weight from baseline at 52th week were reported and the final body weight was estimated as the initial plus the incremental one. As in the case of the average total dose, this estimation was also a conservative assumption for IG because the final body weight estimated was higher for IG than for ID per each insulin regime.

Because the difference in hypoglycemic events was neither clinical nor statistically significant among both regimens (0.04 episodes per patient-year) [22], it was not considered in the model.

Costs associated with the change in body weight of each insulin regimen are a relatively new issue and usually not included in the literature, and they were not considered in ours because of the difficulty in identifying an unbiased cost estimate for the Argentinean context.

Utilization of Resources and Cost Parameters

The commercial forms considered for insulins were Lantus Solostar and Levemir FlexPen for IG and ID, respectively. This decision is based on the fact that both presentations are the only ones available in the Argentinean market that contain the same quantity of insulin (five prefilled pens of 3 mL with 100 IU/mL).

In relation to the use of needles, we assumed a utilization rate of one per each insulin application. Finally, regarding the use of test strips, a consumption rate of three and six units per week for once-daily and twice-daily injection scheme, respectively, was assumed. Both assumptions were based on expert opinion of diabetes specialists. It is recognized that a lower number of applications may have advantages in terms of quality of life, but this issue will not be considered in monetary terms in this cost comparison exercise because it is out of scope of this article and because of the absence of local estimates.

Monetary values for insulins were obtained from the Argentinean market. Unit prices for the commercial forms considered