Evaluating the Cost of Bringing People with Type 2 Diabetes Mellitus to Multiple Targets of Treatment in Canada

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ABSTRACT

Purpose: Evidence suggests that clinical outcomes for people with type 2 diabetes mellitus can be improved through multifactorial treatment. The key challenges in the successful treatment of type 2 diabetes include maintaining tight glycemic control, minimizing the risk of hypoglycemia, controlling cardiovascular risk factors, and reducing or controlling weight. The aim of the present analysis was to evaluate the cost per patient achieving a composite clinical end point (glycosylated hemoglobin <7%, with no weight gain and no hypoglycemic events) in patients with type 2 diabetes in Quebec, Quebec, Canada, receiving liraglutide 1.2 mg, liraglutide 1.8 mg, thiazolidinedione, sulfonylurea, insulin glargine, sitagliptin, or exenatide.

Methods: The proportion of patients achieving control was taken from a meta-analysis that was based on the Phase III trial program of liraglutide. Treatment costs, estimated from a health care payer perspective, were calculated on the basis of the trials included in the meta-analysis and captured the study drug, needles, self-monitoring of blood glucose (SMBG) test strips, SMBG lancets, and other antidiabetes medications received. Cost-effectiveness in terms of cost per patient achieving the composite end point (cost of control) was evaluated with an economic model developed in Microsoft Excel. No discounting was applied to cost or clinical outcomes because these were not projected beyond a 1-year time horizon. Sensitivity analyses were performed.

Findings: Liraglutide 1.8 mg was associated with the lowest number needed to treat, with 3 patients needing to be treated to bring 1 patient to the composite end point. Pioglitazone was associated with the highest number needed to treat, with 17 patients requiring treatment to bring 1 patient to the composite end point. Evaluation of only annual pharmacy costs indicated that liraglutide 1.8 mg was the most costly treatment at Can$2780 per patient per year. Pioglitazone and glimepiride were associated with the lowest direct annual costs. Combining the clinical efficacy data with the annual cost of medications produced cost of control values of Can$6070 (liraglutide 1.2 mg), Can$6949 (liraglutide 1.8 mg), Can$7237 (glimepiride), Can$7704 (exenatide), Can$8297 (insulin glargine), Can$8741 (pioglitazone), and Can $9270 (sitagliptin) per patient achieving the composite end point.

Implications: Liraglutide 1.2 mg and 1.8 mg were associated with the lowest cost of control values, driven by the high proportion of patients achieving the composite end point, which offset the higher medication costs. A relatively low cost of control value was achieved for glimepiride, driven by low acquisition costs, despite relatively few patients achieving the composite end point. (*Clin Ther.* 2015;▮:▮▮▮–▮▮▮) © 2015 The Authors. Published by Elsevier HS Journals, Inc.

Key words: Canada, cost, cost-effectiveness, diabetes mellitus, liraglutide, Quebec.

INTRODUCTION

It is well established that diabetes mellitus represents one of the most relevant challenges facing health care systems around the world.[1] Global estimates suggest that the worldwide prevalence of the disease (including type 1 and type 2 diabetes, of which type 2 is the most prevalent) is 8.3%, and this is projected to increase to

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10.1% by 2035.[2] A recent study by Greiver et al[3] estimated the prevalence of diabetes in Canada to be slightly below the worldwide prevalence, at 7.6%, whereas the disease is associated with >17,000 deaths per year.[2] In addition to the substantial clinical burden, the Canadian Diabetes Association reported that the economic burden of diabetes in Canada was ~Can$12.2 billion in 2010, increasing from Can $6.3 billion in 2000 and estimated that the cost would rise to Can$16.9 billion by 2020.[4]

Traditionally, therapy for people with type 2 diabetes has focused on maintaining glycemic control, but it is widely accepted that patients benefit from a multifactorial approach to disease management. This was reported in the Steno-2 study, which compared conventional treatment for multiple risk factors with intensive multifactorial treatment.[5–7] The key challenges in the successful treatment of type 2 diabetes include maintaining tight glycemic control, minimizing the risk of hypoglycemia, controlling cardiovascular risk factors such as blood pressure and serum lipid concentrations, and reducing or controlling weight. Most long-established diabetes interventions are designed to improve glycemic control, but they do little to address other risk factors and meet the multifaceted needs of the patient with type 2 diabetes.[8]

Recently released treatment guidelines now include recommendations that address not only glycemic targets but also a range of other treatment goals. Guidelines released by the Canadian Diabetes Association in 2013 recommend a glycosylated hemoglobin (HbA_{1c}) target of <7% for most patients.[9] However, this target may be raised or lowered slightly, depending on the patient, to produce an individualized treatment target. A systolic blood pressure target of <130 mm Hg and LDL cholesterol target of <2 mmol/L are recommended.[10,11] The guidelines also state that, when a diabetes medication is being chosen, the potential impact on weight and risk of hypoglycemia should be considered.[12,13] These multidimensional treatment goals are also reflected in other guidelines, such as goals released by the American Diabetes Association and the European Association for the Study of Diabetes.[8,14]

In 2011, Zinman et al[15] published a meta-analysis that evaluated the proportion of patients who achieved the composite end point of HbA_{1c} <7%, with no weight gain and no hypoglycemic events, based on the Phase III trial program of liraglutide (a glucagonlike hormone peptide-1 receptor agonist). This end point was chosen because it represents a clinically relevant outcome, reflecting the multifaceted treatment targets for patients with type 2 diabetes mellitus, and was a predefined secondary end point in the liraglutide trial program. The aim of the present analysis was to evaluate, using a simple and transparent economic model, the mean cost per patient who achieved the composite clinical end point (cost of control) in patients with type 2 diabetes in Quebec, Canada, who received liraglutide, thiazolidinedione, sulfonylurea, insulin glargine, sitagliptin, or exenatide, based on the meta-analysis of Zinman et al.[15]

METHODS

Clinical Data

The proportion of patients who achieved control was taken from a meta-analysis based on the Phase III trial program of liraglutide that assessed the proportion of patients who achieved the composite clinical end point of HbA_{1c} <7%, with no weight gain and no hypoglycemic events.[15] The study took data from 7 clinical trials in patients with type 2 diabetes, comparing the efficacy and safety profile of liraglutide in combination with placebo, metformin, sulfonylurea, or thiazolidinedione and compared with placebo, thiazolidinedione, sulfonylurea, insulin glargine, exenatide, or sitagliptin, with a total of 4625 patients included. All data were based on the results at 26 weeks, even if the trial extended for a longer period. The detailed methodology was described previously.[15] Briefly, change in HbA_{1c} and weight were both analyzed by an ANCOVA with previous treatment (combination or monotherapy) and randomized treatment as fixed effects and baseline values of HbA_{1c} and weight as covariates. Weight gain was defined as any positive change in weight for an individual patient at 26 weeks. Hypoglycemic episodes were defined as any subject-reported episode over the 26-week period and were considered major if the subject was not able to self-treat.

This meta-analysis found that a greater proportion of patients who received liraglutide, either 1.2 mg or 1.8 mg, achieved the composite clinical end point of HbA_{1c} <7% without weight gain or hypoglycemia (Figure 1); that is, a greater proportion of patients who received liraglutide achieved control. The odds ratio for achieving control favored liraglutide 1.8 mg over the other therapies (10.5 vs thiazolidinedione,