Introduction

Hypoglycaemia is a substantial healthcare burden in terms of resource utilization, costs and quality of life for people with type 2 diabetes [1]. Non-serious hypoglycaemic episodes (NSHE) occur more frequently than severe episodes and account for the majority of hypoglycaemic burden; recent data has quantified the per-event costs of NSHE in terms of productivity loss and ‘out of pocket’ (OOP) expenses [2].

The aim of this study was to assess the implications for cost-effectiveness (CE) associated with the inclusion of NSHE related indirect costs; illustrated by comparing the CE of sulfonylurea (SU) versus DPP-4 based dual combination blood glucose lowering regimens.

Methods

The IS COMET Diabetes Model (CDM, version 8.5) was validated and widely used simulation model [3,4] initiated with baseline characteristics derived from NHANES (Table 1) and dual therapy and efficacy profiles for metformin + sulfonylurea (H-SU) versus metformin + DPP-4 (H-DPP4) obtained via a missed treatment comparison [5] (Table 2). Mean duration on 2nd line therapy was set to 4 years with both cohorts escalating to a basal insulin regimen.

Published data was used to obtain workplace productivity costs, output-of-pocket (OOP) expenses and estimates of the frequency of NSHE [2]. This provided a mean weighted productivity cost for each of $24.63 for NSHE during working time (applied to 10.9% of subjects), $31.12 for NSHE outside working hours (applied to 8.5% of subjects) and $55.16 for nocturnal NSHE (applied to 14.1% of subjects). Mean OOP expenses were $35.56.

We based our analysis on the profile of patients who reported NSHE frequency of ‘likely’ to ‘about 1 event’ which was self-reported in 24.9% of 92309 DM patients surveyed [2]. Consequently, we modelled a scenario in which the impact of experiencing 52 NSHE per year was compared to a scenario with no NSHE to assess the impact of NSHE on overall cost-effectiveness.

Health state utilities for type 2 diabetes and its complications were derived wherever possible from the UKPDS (5) Disability values for major and minor hypoglycaemic events were -0.0118 and -0.0035, respectively, based on data published by Currie et al. [7].

Cost of complications were taken from Pellegrini et al. [6] and reported in Table 2; therapy costs reflect wholesale acquisition cost and are in USD. Future costs and benefits were discounted at 3%.

Results

Overall, the model predicts modest gains in discounted life expectancy (0.02 years) and more substantial adjusted quality adjusted life expectancy gains (0.61 QALY) when comparing H-DPP4 versus H-SU with the greater QALE gained being driven by hypoglycaemia disaggregated losses.

Scenarios including and excluding NSHE demonstrate the tangible impact of productivity costs and OOP expenses on total predicted costs with an incremental cost of $2,349 when including NSHE costs vs $8,613 when excluding NSHE costs. Predictably, this substantially impacts the estimated cost-effectiveness results; with the incremental cost-effectiveness ratio (ICER) increasing from $2,282 to $14,169 when including and excluding NSHE respectively (Table 4).

Figures 1 and 2 reflect this finding in the ICER scatterplots and cost effectiveness acceptability curves.

Conclusion

The use of glucose lowering therapies that are associated with hypoglycaemia (such as sulfonylurea and insulin) are potentially associated with substantially greater economic consequences for employers and patients compared to therapies with a low, or negligible, risk of hypoglycaemia (such as DPP-4 based regimens).

In those patients at risk of hypoglycaemia and a working age, failing to capture the full range of economic consequences associated with NSHE is likely to result in inflated estimations of cost-effectiveness. This is particularly relevant for NSHE given their relatively high frequency, in particular patients treated with sulfonylurea and insulin.

References


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