

Cost-Effectiveness of Insulin Detemir Versus NPH Insulin for Type 1 Diabetes Patients Treated with Basal-Bolus Therapy in Portugal

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Background and Aims

- A number of randomized controlled trials (RCTs) have demonstrated that insulin detemir is associated with fewer hypoglycemic events and moderate improvements in HbA_{1c} (glycosylated hemoglobin) compared to traditional insulins such as Neutral Protamine Hagedorn (NPH).
- The present cost-effectiveness analysis was based on a meta-analysis of 3 comparable RCTs of basal-bolus treatment, which compared differences of the basal part only, i.e. same bolus medication in the different treatment arms.
- Acquisition costs of newer medications, such as insulin detemir, are higher than older insulin treatments. Thus, payers are interested in their long term clinical and economic value.

The aim of this health economic evaluation was to assess cost-effectiveness of insulin detemir compared to NPH for use in basal-bolus treatment in type 1 diabetes mellitus (T1DM) in Portugal

Study Design and Methods

- The validated CORE Diabetes Model was used to project lifetime clinical and economic outcomes for patients with T1DM on detemir versus NPH.
- Baseline cohort characteristics (Table 1) and treatment effects (Table 2) were obtained from a pooled analysis (n=1,555).

Table 1. Cohort Characteristics

	Mean	SD
Age	40.3	12.2
Gender (% male)	60%	
Duration of diabetes (years)	16.3	10.6
HbA _{1c}	8.3	1.2
BMI (kg/m ²)	25.2	3.4

HbA_{1c}=glycosylated hemoglobin; BMI=body mass index

Table 2. Treatment Effects

	Detemir	NPH	Net effect	p-value
ΔHbA _{1c}	-0.47	-0.34	-0.13	0.0057
ΔBMI	-0.04	0.17	-0.21	<.0001
Hypoglycemia (per 100 patient years)	5,059.92	5,292.54	-4.4%	NA
Severe hypoglycemia (per 100 patient years)	37.61	31.16	20.7%	NA

- Costs were accounted from the Portuguese NHS perspective. Resource use was estimated by clinical experts and unit costs were obtained from published sources.
- The time horizon was set to 60 years to ensure that long-term outcomes, such as cardiovascular disease and end-stage renal disease associated with T1DM, were captured.
- Future clinical and cost outcomes were discounted at 5% *per annum*.

Results

- Comparing NPH to insulin detemir, discounted life expectancy was projected to improve slightly from 12.47(±0.115) to 12.53(±0.12), i.e. +0.062 years.
- Patients' quality of life is influenced by complications and adverse events and this is summarized as quality-adjusted life years (QALYs). QALYs were projected to increase by 0.184 for patients treated with insulin detemir (6.30±0.06 QALYs) compared with NPH (6.12±0.06 QALYs).

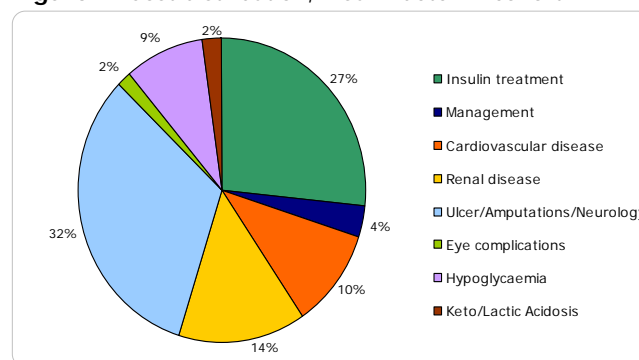
- Higher acquisition costs of insulin detemir compared to NPH is partly offset by lower costs of complication treatment costs. Total average costs of the insulin detemir and NPH were €37,760(±743) and €33,403 (±738), respectively. Cost distribution for insulin detemir is shown in Figure 1.
- Incremental cost-effectiveness ratio (ICER) of insulin detemir versus NPH is estimated to be €23,691
- Setting the willingness to pay at €40,000/QALY, the analysis demonstrated that detemir has a 83% probability of being cost-effective.

Table 3. Health Economic Outcomes

Outcome	Detemir	NPH
Life Expectancy (years)	12.53±0.12	12.47±0.12
QALYs (years)	6.302±0.06	6.118±0.06
Direct Costs (\$CAN)	37,760±743	33,403±738
ICER (\$CAN/QALY gained)	\$23,691	

QALY=Quality-adjusted life years; ICER=Incremental cost-effectiveness ratio

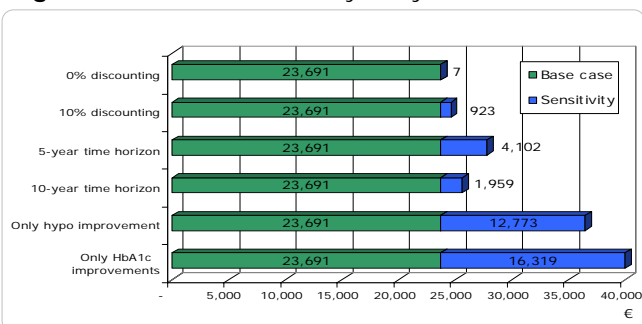
Figure 1. Cost distribution, insulin detemir cohort



Sensitivity Analysis

- Parameter sensitivity analysis was undertaken it shows that results were quite robust (Figure 2).
- Most influential parameters of the study are HbA_{1c} and hypoglycemia. Hence, if taking one of these effects out of the analysis, the ICER will increase.
- Time horizon is of relatively low importance, which is an important message.

Figure 2. Parameter sensitivity analysis, ICER



ICER=incremental cost-effectiveness ratio for detemir vs. NPH

Conclusions

Short-term improvements seen with insulin detemir versus NPH in basal-bolus therapy were projected to show improvements in quality-adjusted life expectancy with a cost-effectiveness ratio which fell well within the range usually considered acceptable value for money in Portugal.