# Switching to insulin degludec is a cost saving therapy for patients with type 1 and type 2 diabetes in the Swedish setting based on real world data

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## Background

- Good glycemic control, measured via HbA1c, in patients with both type 1 (T1D) and type 2 diabetes (T2D) has been associated with a decrease in the incidence of long-term diabetes-related complications, such as retinopathy and cardiovascular disease, and corresponding healthcare costs.[1-3]
- The recent ReFLeCT study showed that switching to long-acting basal insulin degludec (degludec) was associated with improved glycemic control and reductions in hypoglycemic events in T1D and T2D, and basal and bolus insulin doses in patients with T1D, versus previous basal insulin therapies.[4]
- ReFLeCT was a prospective, observational, single-armed, descriptive study including patients with T1D (n=566) and T2D (n=611) from seven European countries, with a four-week baseline period and a 12-month follow-up period.
- A previous short-term cost-effectiveness analysis based on ReFLeCT concluded that switching to degludec was cost-saving in patients with T1D and highly cost-effective in patients with T2D after 1 year from a Swedish societal perspective.[5]

## Aim

- The present analysis aimed to assess the impact of better glycemic control and fewer hypoglycemic events on the long-term cost-effectiveness of degludec versus continuation of previous basal insulin therapies in patients with T1D and T2D.

## Methods

- Cost-effectiveness was evaluated separately in patients with T1D and T2D, using the IQVIA CORE Diabetes Model (version 9.0) to project clinical and cost outcomes over a 50-year time horizon.
- Patient characteristics, resource use and changes in clinical parameters for degludec were sourced from the ReFLeCT study (Tables 1 and 2). Only statistically significant changes from baseline were applied.
- Patients were assumed to receive degludec or continue previous insulin therapy (with or without bolus insulin) for 5 years. All patients were then assumed to intensify to degludec plus bolus insulin for the remainder of their lifetimes.

**Table 1** Baseline cohort characteristics

| | T1D | T2D |
|---|---|---|
| Age (years) | 47.4 | 65.2 |
| Diabetes duration (years) | 21.4 | 18.0 |
| Male (%) | 55.8 | 59.6 |
| HbA1c (%) | 8.1 | 8.2 |
| BMI (kg/m$^2$) | 26.1 | 31.1 |
| Insulin treatment | IGlar U100 63.8%<br>IDet 22.7%<br>other/missing 13.5% | IGlar U100 59.1%<br>IDet 20.8%<br>other/missing 20.1% |

T1D, type 1 diabetes; T2D, type 2 diabetes; IGlar U100, insulin glargine 100 units/mL; IDet, insulin detemir; HbA1c, glycated hemoglobin; BMI, body mass index. Values are means.

**Table 2** Changes in clinical parameters in patients switching to degludec

| | T1D | T2D |
|---|---|---|
| HbA1c (%) | -0.15 | -0.32 |
| BMI (kg/m$^2$) | +0.28 | +0.02* |
| Reductions in severe hypoglycemic events (per 100 patient years) | -58.32 | N/A |
| Reductions in non-severe hypoglycemic events (per 100 patient years) | -1,339.12 | -638.48 |
| Basal insulin dose reduction (IU) | -2.2 | -1.6* |
| Bolus insulin dose reduction (IU) | -3.6 | -0.6* |

T1D, type 1 diabetes; T2D, type 2 diabetes; HbA1c, glycated hemoglobin; BMI, body mass index; IU, international unit. * Change from baseline was not statistically significant and therefore was excluded from the analysis. Values are means.

- Patients continuing with previous insulin therapy were assumed to remain unchanged from baseline.
- Sensitivity analyses were performed; changing the time horizon, discount rate and previous treatment cost and using HbA1c, hypoglycemia and BMI differences only.
- For insulin glargine 100 units/mL (IGlar U100), the base case analysis applied the pack price of a prefilled pen of original IGlar U100 (SEK 541.49 per 1,500 IU), with the pack price of a prefilled pen of biosimilar IGlar U100 (SEK 476.18 per 1,500 IU) applied in a sensitivity analysis.
- Costs were estimated from a Swedish societal perspective and expressed in 2018 Swedish krona (SEK). Costs and clinical outcomes were discounted at 3.0% annually, in line with health-economic guidance for the Swedish setting.[6]

## Results

- Degludec was associated with gains in life expectancy and quality-adjusted life expectancy and reductions in costs, in patients with T1D and T2D, versus continuation of previous insulin therapy (Tables 3 and 4).

**Table 3** Cost-effectiveness of degludec versus continuation of previous insulin therapy — **Key result**

| Scenario | Cost difference (SEK) | QALY difference | Cost (SEK)/ QALY |
|---|---|---|---|
| **T1D** | | | |
| IGlar U100 price: original | -137,020 | +0.14 | Degludec dominant |
| IGlar U100 price: biosimilar | -135,868 | +0.14 | Degludec dominant |
| **T2D** | | | |
| IGlar U100 price: original | -2,009 | +0.07 | Degludec dominant |
| IGlar U100 price: biosimilar | -468 | +0.07 | Degludec dominant |

SEK, Swedish krona; QALY, quality-adjusted life years; T1D, type 1 diabetes; T2D, type 2 diabetes; IGlar U100, insulin glargine 100 units/mL. Values are means.

- Clinical benefits and cost savings were a result of a reduced incidence of diabetes-related complications with degludec, most notably severe hypoglycemia in patients with T1D and ulcer, amputation, or neuropathy in patients with T2D.
- With greater clinical benefits and cost savings, degludec was considered dominant versus previous insulin therapy, in patients with T1D and T2D.

**Table 4** Costs of degludec and continuation of previous insulin therapy (SEK)

| | Degludec | Continuation of previous insulin therapy | Difference between treatments |
|---|---|---|---|
| **T1D** | | | |
| **Total costs** | **3,457,682** | **3,594,702** | **-137,020** |
| Direct costs | 654,767 | 664,200 | -9,434 |
| Indirect costs | 2,802,915 | 2,930,501 | -127,586 |
| **T2D** | | | |
| **Total costs** | **551,538** | **553,547** | **-2,009** |
| Direct costs | 551,538 | 553,547 | -2,009 |
| Indirect costs | 0 | 0 | 0 |

SEK, Swedish krona; T1D, type 1 diabetes; T2D, type 2 diabetes. Values are means.

- Sensitivity analyses showed that fewer hypoglycemic events and greater reductions in HbA1c and insulin dose were the key drivers of outcomes in patients with T1D and T2D, respectively. The sensitivity analyses using the biosimilar glargine U100 price led to the same conclusions as the base case analysis.

## Discussion

- Over a patient's lifetime, treatment of patients with T1D and T2D with degludec was associated with increased quality-adjusted life expectancy, as a result of fewer diabetes-related complications.
- Key drivers of reductions in direct costs were reductions in HbA1c and fewer hypoglycemic events, which resulted in degludec being considered dominant versus previous insulin therapy in both T1D and T2D.
- A reduced incidence of complications also led to reduced indirect costs in patients with T1D treated with degludec. Together with the lower direct costs, degludec treatment showed lower combined costs for the treatment of patients with T1D and T2D versus previous insulin therapy.
- Using data from a single-armed descriptive study may have led to overestimation of clinical benefits and cost savings.
- A potential limitation of the present analyses is the projection of long-term outcomes from short-term data, but this is an essential tenet of health economic modeling and it remains one of the best available options to inform decision making in the absence of long-term clinical trial data.
- Additionally, every effort was made to minimise uncertainty, primarily by using a model of diabetes that has been extensively published and validated against real-life data.[7]

## Conclusion

- Degludec represents an effective and cost-saving treatment option versus other basal insulin therapies for the treatment of patients with T1D and T2D in the Swedish setting over patient lifetimes.

This trial was sponsored by Novo Nordisk A/S and is registered with ClinicalTrials.gov (NCT02392117).
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**References:** (**1**) Nathan DM *et al. N Engl J Med* 2005;353(25):2643-53; (**2**) Ismail-Beigi *et al. Lancet* 2010;376:419-30; (**3**) Gaede *et al. N Engl J Med* 2008;358:580-91; (**4**) Fadini GP *et al. J Clin Endocrinol Metab* 2019; jc.2019-01021; (**5**) Jendle *et al. Diabetologia* 2019;62:S436; (**6**) TLV. *General guidelines for economic evaluations.* 2017. (**7**) McEwan *et al. Value Health* 2014;17(6):714-24.