



Smart connected insulin dose monitoring technologies versus standard of care: a Canadian cost–effectiveness analysis

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Aim: There is growing interest in novel insulin management systems that improve glycemic control. This study aimed to evaluate the cost–effectiveness of smart connected insulin re-usable pens or caps for disposable insulin pens versus pens without connected capabilities in the management of adult patients with Type 1 diabetes (T1DM) from a Canadian societal perspective. **Materials & methods:** The IQVIA Core Diabetes Model was utilized to conduct the analyses. Applying data from a non-interventional study, the connected insulin device arm was assumed to result in greater reductions (–0.67%) in glycated hemoglobin from baseline and fewer non-severe hypoglycemic events (–32.87 events/patient annually). Macro- and micro-vascular risks were predicted using the Epidemiology of Diabetes Interventions and Complications study data. Direct and indirect costs and utilities were sourced from literature. Key model outcomes included life years and quality-adjusted life-years (QALYs). Both costs and effects were annually discounted at 1.5% over a 60-year time horizon. Uncertainty was explored in scenario and probabilistic sensitivity analyses (PSA). **Results:** The connected insulin pen device was associated with lower mean discounted total costs (CAD221,943 vs 266,199; –CAD44,256), improvement in mean life expectancy (25.78 vs 24.29; +1.49 years) and gains in QALYs (18.48 vs 16.74; +1.75 QALYs) over the patient's lifetime. Most scenario analyses confirmed the base case results. The PSA showed dominance in 99.5% of cases. **Conclusion:** For adults with T1DM in Canada, a connected insulin pen device is likely to be a cost-effective treatment option associated with greater clinical benefits and lower costs relative to a standard re-usable or disposable pen.

Plain language summary: What is this article about?: People with Type 1 diabetes have challenges with keeping their blood glucose level under control, and risk episodes when these levels drop very low. Connected insulin pen devices are a type of digital technology available in Canada that can help address that. This article explores whether connected insulin pen devices are good value for money compared with standard re-usable or disposable pens.

What were the results?: A cost–effectiveness analysis was done using a specially designed mathematical model that compared the benefits and costs of connected insulin pens with the standard treatment without connectivity technology. The modeling showed that use of connected insulin pens prolong life, improve its quality and save costs in the long run relative to standard re-usable or disposable pens.

What do the results of the study mean?: The results suggest that in Canada, connected insulin pens could be a cost-effective option and should be considered for public reimbursement.

Tweetable abstract: For adults with Type 1 diabetes mellitus in Canada, a connected insulin pen device is a cost-effective treatment option associated with greater clinical benefits and lower costs relative to a standard re-usable or disposable pen.

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Keywords: connected insulin pens • cost–effectiveness • diabetes mellitus • digital health • economics

Canada has one of the highest prevalence rates of diabetes among industrially developed countries: 9.3% of Canadians are diagnosed with diabetes, of which almost 10% have Type 1 diabetes (T1DM) [1,2]. The disease



is commonly associated with considerable patient burden due to macro- and micro-vascular complications and increased mortality [3,4]. The corresponding direct healthcare [5] and societal costs [6] are also a growing concern.

Individuals with T1DM usually require multiple daily insulin injections (MDI) and self-monitoring of glycemic levels and their variability [7]. A recent study based on a Canadian diabetes registry reported a low level of technology use in people with T1DM [8]. As such, the MDI cohort accounted for 60.7% of these individuals, of which only 19.8% used a continuous or intermittently scanned continuous (formerly known as ‘flash’) glucose monitoring device (CGM/isCGM). Emerging technologies such as hybrid closed-loop (HCL) insulin delivery systems (also known as ‘artificial pancreas’) have become recently available in Canada but the extent of their use is unknown [9]. Further, despite routine insulin use, only about a third of T1DM people achieve glycemic targets [4,10]. Also, insulin therapy continues to be associated with a risk of hypoglycemia, despite modern advances in the choice of insulin products and in glucose monitoring [7]. Better solutions are needed that aim to provide additional glucose-lowering benefits without increasing hypoglycemia risk.

A growing number of digital technologies have emerged globally and in Canada to address that need and help optimize diabetes therapy [11]. Supported by clinical evidence of improved glycemic control and reduced time in hypoglycemia [12–17], their use is endorsed by Canadian and international clinical guidelines [7,18,19]. Connected insulin re-usable pens or connected caps for disposable insulin pens with the ability to track and transfer patient data are examples of such digital technologies [20]. These allow users to access data on insulin dose, type and time of injection resulting in safer insulin therapy. Various versions exist, including connectivity-enabled insulin pens and a connectivity-enabled cap for disposable insulin pens, and may be referred to as connected insulin pens [20].

Although shown to be efficacious in improving insulin therapy and outcomes for people with T1DM, the value for money of digital technologies is poorly studied in Canada. Economic evaluations conducted in other jurisdictions were able to demonstrate cost-effectiveness of connected insulin pens [21]. However, it is important to build a body of Canada specific economic evidence to facilitate decision making in the country. The objective of this analysis was to evaluate the cost-effectiveness of connected insulin pens versus insulin pens without connection capabilities (i.e., standard of care [SOC]) in the management of adults with T1DM in Canadian healthcare settings.

Methods

Model description

This study was performed using the IQVIA Core Diabetes Model (CDM) version 9.0 which was developed to determine the long-term health outcomes and cost consequences of interventions in T1DM or T2DM. It is a nonproduct-specific diabetes policy analysis tool that performs real-time simulations of patient receiving glucose lowering therapy, screening and treatment strategies for microvascular complications, treatment strategies for end-stage complications, and multi-factorial interventions to determine long-term health outcomes and economic results.

Disease progression is based on 17 inter-dependent Markov submodels that simulate progression of disease-related complications (angina, myocardial infarction, congestive heart failure, stroke, peripheral vascular disease, diabetic retinopathy, macular edema, cataract, hypoglycemia, ketoacidosis, nephropathy, end-stage renal disease [ESRD], neuropathy, foot ulcer and amputation) and other-cause mortality. Each submodel uses time-state- and diabetes type-dependent probabilities derived from published sources, utilizing tracker variables to overcome the memory-less properties of standard Markov models. The model facilitates interconnectivity and interaction between the modeled complications, representing the complex and varied sequelae of the disease. Analyses can be performed on patient cohorts with T1DM or T2DM, defined in terms of age, gender, baseline risk factors and pre-existing complications. Figure 1 presents a diagram of model version 9.0.

The model has been described previously and extensively validated [22,23]. It has been used to generate cost-effectiveness results in various jurisdictions ranging from Canada to UK, France, China and Thailand and employed to assist with reimbursement decisions for hypoglycemic drugs and glucose monitoring devices [24,25]. It is accessible on a licensed basis over the internet (www.core-diabetes.com).

Modelling approach

The analysis was conducted from the societal perspective, evaluating costs and effects over a lifetime horizon (60 years). Costs and effects were discounted annually at 1.5% according to the CADTH guideline on economic evaluations [26]. All analyses were run with 1000 individuals for 1000 iterations. The study assessed the economic value of a connected insulin pen versus SOC by evaluating the following model outputs: rate of clinical events,

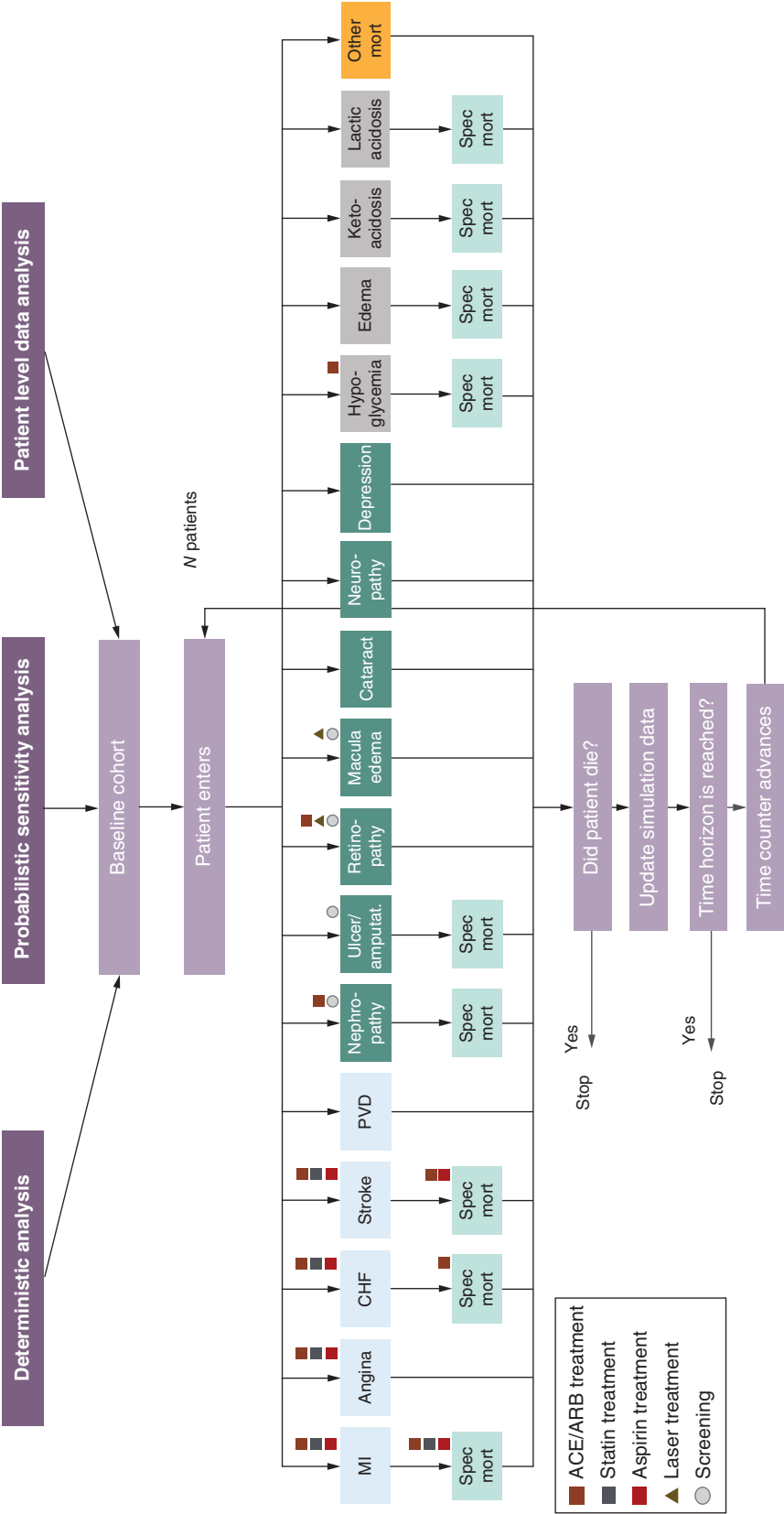


Figure 1. IQVIA Core Diabetes Model v9.0: model structure.
ACE: Angiotensin-converting enzyme; ARB: Angiotensin II receptor blockers; CHF: Congestive heart failure; MI: Myocardial infarction; Mort: Mortality; PVD: Peripheral vascular disease.

Table 1. Baseline characteristics.

Variable	Mean	SD	Unit	Ref.
Patient demographics				
Start age (years)	41.6	13.5	Years	[26]
Duration of diabetes	26.1	14.1	Years	
Proportion male	0.545		[0–1]	
Baseline risk factors				
HbA _{1c}	8.93	0	%-points	[26]
SBP	128.7	16.8	mmHg	[26]
DBP	73.6	9	mmHg	[26]
T-CHOL	146.15	34.41	mg/dl	[26]
HDL	62.64	19.33	mg/dl	[26]
LDL	103.24	30.16	mg/dl	[26]
TRIG	95.58	50.45	mg/dl	[26]
BMI	25.25	3.85	kg/m ²	[26]
eGFR	77.5	0	ml/min/1.73 m ²	[26]
Hemoglobin	14.5	0	g/dl	[26]
WBC	72	0	10 ⁶ /ml	[26]
Heart rate	0.9	0	bpm	[26]
WHR	0.9	0		[26]
uAER	3.1	0	mg/mmol	[26]
Serum creatinine	1.1	0	mg/dl	[26]
Serum albumin	3.9	0	g/dl	[26]
Prop. smoker	0.15		[0–1]	[28]
Cigarettes/day	14			[28]
Alcohol consumption oz/week	5.79		Oz/week	[29]
Racial characteristics				
Proportion White	1		[0–1]	Assumed

BDR: Background diabetic retinopathy; BPM: Beats per minute; DBP: Diastolic blood pressure; eGFR: Estimated glomerular filtration rate; HDL: High-density lipoprotein; LDL: Low-density lipoprotein; SBP: Systolic blood pressure; SD: Standard deviation; T-Chol: Total cholesterol; TRIG: Triglyceride; uAER: Urinary albumin/creatinine ratio; WBC: White blood cell; WHR: Waist-to-hip ratio.

per-patient costs, per-patient life-years (LYs) gained, per-patient quality adjusted LYs (QALYs) gained, and by calculating the incremental cost–effectiveness ratio (ICER).

All input data used in the analyses has been previously published. Therefore, institutional review board approval was not required.

Simulation cohort & treatment effects

Baseline characteristics of the simulation cohort were sourced from a similar analysis conducted recently in Sweden by Jendle *et al.* (Table 1) [27,28]. These included mean age, duration of diabetes, ethnicity, physiological parameters (heart rate, blood pressure, BMI, etc.). The proportion of smokers, number of cigarettes smoked per day, and mean weekly alcohol consumption were assumed to be the same as the Canadian general population [29,30].

The baseline HbA_{1c} was calculated from baseline % time in range (TIR) based on a prospective, noninterventional study by Adolfsson *et al.* [16] using the conversion algorithm reported by Vigersky *et al.* [31] for people with T1DM. Adolfsson *et al.* defined %TIR as the time spent with glucose within the acceptable range (3.9–10.0 mmol/l) as a percentage of all readings on a given day, and estimated it to be 41.4% (95%CI: 37.4–45.3). Vigersky *et al.* established a linear relationship between HbA_{1c} and %TIR showing that every absolute 10% change in %TIR resulted in a 0.8% (9 mmol/mol) change in HbA_{1c}. For our study, the TIR conversion calculations arrived at HbA_{1c} values at baseline (8.93%).

Treatment effects were also taken from the Adolfsson study [16]. It was a single arm trial that examined how a connected insulin pen affected insulin regimen management and glycemic control. As the comparator data in the study come from the status before the trial, no treatment effect was applied in the SOC arm of our CEA. The

Table 2. Efficacy inputs.

Parameter	Connected insulin pen mean (SD)	SOC, mean (SD)	Unit	Ref.
HbA1c	8.27(0.00)	8.93(0.00)	Percentage/mmol/mol	[15]
NSHE rate	3287.25 (0.00)	6574.50 (0.00)	/100 pt.yrs	[15]
SHE rate	0.000 (0.00)	0.000 (0.00)	/100 pt.yrs	Assumed

NSHE: Non-severe hypoglycemic event; Pt yr – Patient year; SD: Standard deviation; SHE: Severe hypoglycemic event; SOC: Standard of care.

TIR conversion estimated HbA1c values at the end of the trial at 8.27% resulting in a HbA1c treatment effect of -0.66% (8.93%-8.27%). This was applied in the connected insulin pen arm (Table 2).

Rates of non-severe hypoglycemic events (NSHE) per 100 patient years were informed by Adolfsson *et al.* for the active arm and SOC arm using the same approach (i.e., before and after comparison) resulting in 3287.25 and 6574.50 events per 100 patient-years, respectively. Rates of severe hypoglycemia (SHE) were assumed not to be different between arms (Table 2).

After the initial treatment effect, an evolution of the risk factors was modeled over time. Natural progression of various patient characteristics was calculated based on Framingham data [32]. No progression was assumed for several values (HbA1c, blood pressure, BMI) over the time horizon, consistent with the previous analysis [28]. Macro – and microvascular risk was predicted using data from the Diabetes Control and Complications Trial for the first 10 years of time horizon and the Epidemiology of Diabetes Interventions and Complications, its observational follow-up, for the following years [33]. No next line therapy is foreseen in the base case.

Management settings included the proportion of individuals on preventive medication, the proportion of individuals undergoing routine screening for diabetic complications, the sensitivity and specificity of the screening tests performed. More detail on risk factor progression and other management settings is available in (Supplementary Tables 1–4).

Resource use & costs

Consistent with the societal perspective of the analyses, both direct and indirect costs were substantiated and informed health state or event costs in the model. Details are summarized in (Supplementary Tables 5 & 6).

Direct costs included annual treatment costs (including the cost of the connectivity device for the intervention arm), management costs (screening test, concomitant medication) and the costs of T1DM complications (cardio-vascular complications, renal complications, eye disease, neuropathy, foot ulcer and amputation and hypoglycemic events) (Supplementary Table 5). The study medications consisted of basal and bolus insulin. The unit costs of treatments were obtained from the Ontario Drug Benefit program [34]. Costs associated with preventive interventions of diabetes complications (management costs) and direct costs for treating diabetes-related complications, were sourced from literature or official Canadian sources such as the Ontario Schedule of Physician Benefits [35], CIHI Patient Cost Estimator [36] and CADTH [37].

Indirect costs included costs of lost productivity captured through the human capital approach [26]. In it, the value of lost time is derived by multiplying the amount of time off work due to complications by the lost compensation rate (age- and/or sex-adjusted). Annual indirect costs were applied until retirement age (i.e., 65 years). All costs were inflated to November 2021 using the Consumer Price Index [38] (Supplementary Table 6).

Measurement & valuation of health

Effectiveness results were expressed in life years (LYs) and quality-adjusted life years (QALYs). For the derivation of QALYs, the model used a comprehensive set of utility weights obtained from published literature on diabetes [39,40] (Supplementary Table 7). The minimal approach was applied to utility estimation: in the case of multiple comorbid conditions/events, the utility value assigned was the lowest value among the conditions. Hence, we conservatively assume that the disutility for comorbidities is not additive [22]. Disutility for NSHEs was modeled using the diminishing approach. It assumes that the utility impact per event decreases with the increasing number of hypoglycemic events annually.

The model requires non-specific mortality tables as inputs. Life tables for Canada were corrected for disease specific mortality, both obtained from Statistics Canada [41,42]. General mortality was corrected for the following conditions: diabetes, ischemic heart disease, cerebrovascular disease and chronic kidney disease.

Table 3. Cost–effectiveness results of base-case analysis.

Parameters	Connected insulin pen	SOC	Incremental
Undiscounted			
Life expectancy (years)	34.33	31.87	2.47
QALYs	24.26	21.60	2.66
Discounted			
Life expectancy (years)	25.78	24.29	1.49
QALYs	18.48	16.74	1.75
Total costs	\$221,943	\$266,199	-\$44,256
Direct costs	\$102,977	\$114,497	-\$11,520
Indirect costs	\$118,966	\$151,702	-\$32,736
ICER	Dominant		
NMB	\$131,606		

CAD: Canadian dollar; ICER: Incremental cost–effectiveness ratio; LY: Life-year; NMB: Net monetary benefit; QALY: Quality-adjusted life-year; SOC: Standard of care.

Uncertainty

Parameter uncertainty was addressed using a probabilistic analysis (PSA). The CDM uses Monte Carlo simulations ($n = 1000$) together with a non-parametric bootstrapping approach. The parameters included in the PSA are the patient characteristics, treatment efficacy (beta distribution), utility (beta distribution), and cost of complications (log-normal distribution). Results were presented in a cost–effectiveness plane. It plots the results of 1000 simulations across 4 quadrants created by y-axis (incremental costs) and x-axis (benefits [i.e., QALYs]) crossing at 0. Results in quadrant 1 (up left) have higher costs and lower benefits (the intervention is dominated by the comparator), quadrant 2 (up right) have higher costs and greater benefits, quadrant 3 (bottom right) represent lower costs and greater benefits (best option, the intervention is dominant over the comparator), and quadrant 4, lower costs and lower benefits. Further, the cost–effectiveness acceptability curve (CEAC) is used to present the probability of the intervention being cost-effective across a range of possible willingness to pay (WTP) thresholds. Of note, the WTP threshold of CAD50,000 is commonly used in Canada for reimbursement decisions [43].

A series of scenario analyses were conducted to evaluate methodological uncertainty. The analyses were performed by varying key model parameters. Details of the scenarios are presented in (Supplementary Table 8). Briefly, the influence of treatment effect was examined in analyses in which HbA1c change was modified. The influence of time horizon on the outcomes generated by the model was assessed by running analyses over 2 and 10 years. As the base-case analysis used the baseline HbA1c from a prospective, noninterventive study, a scenario analysis was conducted with variation in this input parameter. Additional scenario analyses were conducted removing treatment effects in terms of HbA1c and hypoglycemic event rates, doubling the cost of the connected insulin pen, and introducing a treatment switch from the non-connected pen to the connected insulin pen after 3 years.

Results

Base case

Overall, the connected insulin pen provided additional incremental discounted LYs (1.49) and corresponding incremental QALYs (1.75) at lower incremental total costs (–CAD44,256) dominating the SOC. Assuming a WTP threshold of CAD50,000 per QALY gained, the intervention resulted in a positive net monetary benefit (NMB) of CAD131,606 (Table 3).

For costs, the treatment cost in the connected insulin pen arm was higher compared with the SOC: CAD46,202 versus CAD40,295, respectively. Also, management costs were slightly higher in the intervention group due to longer survival (e.g., medications, screening tests, etc.). However, the costs of complications and indirect costs were higher for the SOC resulting in greater total costs for the SOC (Supplementary Table 9).

For clinical outcomes, subjects in the intervention arm had a lower risk of cardiovascular disease, eye disease, microalbuminuria, gross proteinuria and end-stage renal disease (ESRD) compared with the SOC (Supplementary Table 10). Also, individuals on connected insulin pen had fewer occurrences of hypoglycemia compared with the SOC.

The PSA findings are shown on the cost–effectiveness plane: almost all (99.5%) of the simulated observations fall in quadrant 3 of the scatterplot (presented in Figure 2) and are below the WTP threshold of CAD50,000 (yellow

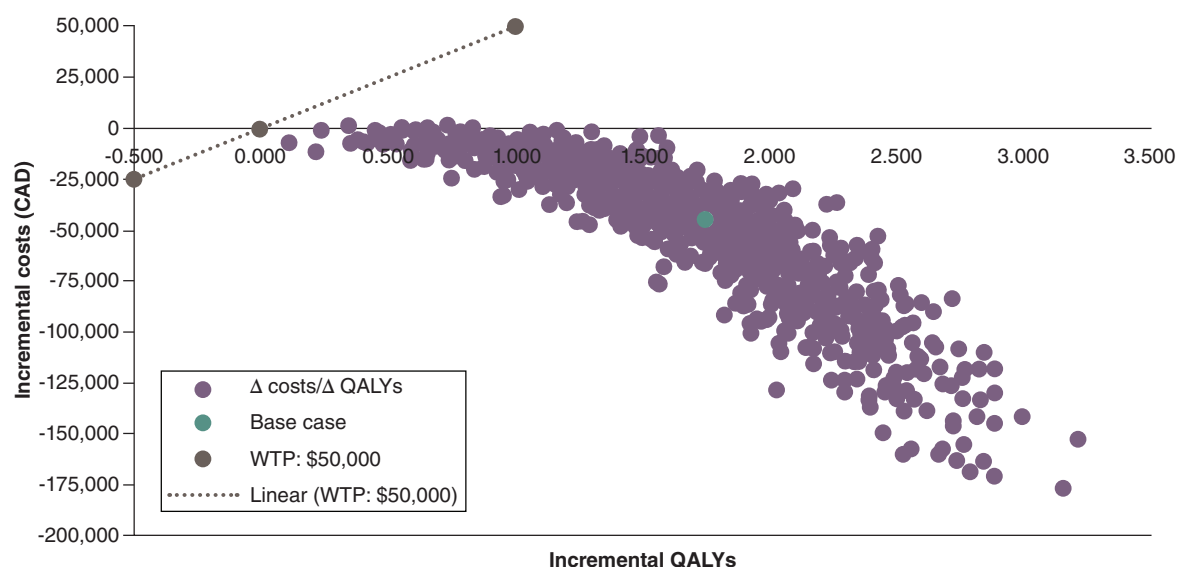


Figure 2. Cost-effectiveness plane (base case).

CAD: Canadian Dollar; QALY: Quality-adjusted life-year; WTP: Willingness to pay.

Table 4. Summary of scenario analyses (deterministic, discounted).

#	Description	Incremental QALYs	Incremental total costs	ICER	NMB
	Base case	1.747	-\$44,256	Dominant	\$131,606
SA1	Time horizon 2 yr	0.028	-\$384	Dominant	\$1784
SA2	Time horizon 10 yr	0.213	-\$6873	Dominant	\$17,523
SA3	Baseline_HbA1c 7.1%	1.198	-\$18,699	Dominant	\$78,599
SA4	HbA1c reduction 0.4%	1.192	-\$27,612	Dominant	\$87,212
SA5	HbA1c reduction 0.8%	2.035	-\$52,159	Dominant	\$153,909
SA6	HbA1c difference not applied	0.304	\$764	\$2512	\$14,436
SA7	Hypoglycemia difference not applied	1.425	-\$41,532	Dominant	\$112,782
SA8	SoC switch at 3 years	0.349	-\$12,394	Dominant	\$29,844
SA9	Doubled cost for connected pen	1.747	-\$43,596	Dominant	\$130,946
SA10	Discount rate - 3%	1.198	-\$34,539	Dominant	\$94,439

HbA1c: Glycated hemoglobin; ICER: Incremental cost-effectiveness ratio; NMB: Net monetary benefit; QALY: Quality-adjusted life-year; SA: Scenario analysis; SOC: Standard of care.

dotted line). Further, a CEAC shows that the probability of connected insulin pen to be cost-effective was 100% of the iterations compared with the SOC at different WTP thresholds: CAD10,000–150,000 ([Supplementary Figure 1](#)).

Scenario analyses

The results of the scenarios support the base case showing that connected insulin pen dominated the SOC across all the pre-selected scenarios, except one ([Table 4](#)). In scenario #6 (HbA1c difference is not applied) the intervention accrued more QALYs (0.304) and greater costs (CAD764) over the SOC. Still, the resulting ICER of CAD2512 per QALY gained was well below the Canadian WTP (i.e., CAD50,000). The cost-effectiveness of the intervention was also supported by positive NMB values for all scenarios.

Discussion

This cost-effectiveness study showed that the connected insulin pen was a cost-effective diabetes management tool, both in the base case and the vast majority of the scenarios explored in comparison with the SOC at the WTP threshold of CAD50,000. The intervention arm demonstrated a reduction in cumulative incidences of micro- and macrovascular complications observed at the end of the simulation, and was associated with additional incremental

LYs (1.49, discounted) and QALYs (1.75, discounted) at lower incremental total costs (-CAD 44,256) dominating the SOC. Assuming a WTP threshold of CAD 50,000 per QALY gained, the intervention also resulted in a positive NMB of CAD 131,606 indicating that the cost to derive the benefits was less than the maximum amount that a decision maker would be willing to pay for the benefit. Uncertainty analyses supported the base case.

Globally, HTA agencies rely on the economic evidence as an important deliberation factor in their reimbursement decision making [44]. However, there is a paucity of Canada-based economic evidence for digital technologies in T1DM. A recent systematic review has identified only 5 Canadian studies (7% of the total number identified) that assessed the value for money of technologies such as subcutaneous insulin infusion and CGM/isCGM with varying results [21]. Ours is the first Canadian study that examines the cost-effectiveness of a technology designed to capture insulin dosing information. The motivating example for this study was a cost-effectiveness analysis published by Jendle *et al.* for NovoPen® 6 from the societal perspective in Sweden [28]. It is a type of connected insulin pen that, similar to other versions of connected pens, allows users to track, transfer, and access their insulin therapy data (e.g., dose and time of injection). Consistent with the results of our study, this smart connected insulin pen technology was dominant over the SOC in the base case and across all the scenario analyses yielding lower costs and higher benefits (with the exception of SA9, where HbA1c difference was not applied).

Limitations

The CDM is a validated platform for the evaluation of cost-effectiveness among people with diabetes that is accepted globally and frequently called upon by HTA agencies. Our study however had a few limitations to note. First, our analyses were informed by clinical data collected in a noninterventional and small size study from adults with T1DM in Sweden who used a connected insulin pen as the intervention and the hypothetical comparator arm consisted of individuals who did not use a connected pen [16]. The comparable efficacy across different types of connected insulin pens and caps was assumed based on the equivalence of the digital features that these products offer to monitor insulin therapy. No head-to-head trial or an indirect comparison have been conducted to support the assumption. However, following consultations with clinical experts, the clinical data was deemed transferable to support the efficacy of other versions of connected insulin pens and caps. This assumption was tested by conducting a scenario analysis where the difference in clinical end points (HbA1c, %) was lower than in the base case. Further, in alignment with the clinical study subjects being from Sweden, model inputs for the baseline characteristics were based on the Swedish population which may limit the generalizability of the results. However, a comparison with data from the Canadian LMC Diabetes Registry showed considerable similarities across key patient characteristics, both demographic and clinical, between the Swedish and Canadian populations [8]. The registry consists of patient health records from a large national endocrine practice group which includes >50 endocrinologists across three Canadian provinces. It is very representative of the Canadian diabetes population, therefore any positive correlation across patient characteristics between the two countries supports generalizability of the results.

Conclusion

This study contributes to a growing body of evidence that suggests digital technologies add value to the treatment of T1DM. Despite limitations, the analyses demonstrate that the use of the connected insulin pen is a cost-effective treatment solution for people with T1DM that can reduce the number of diabetes-related complications and costs when compared with the SOC in Canada.

Supplementary data

To view the supplementary data that accompany this paper please visit the journal website at: <https://bpl-prod.literatumonline.com/doi/10.57264/cer-2023-0124>

Author contributions

All named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship for this article, take responsibility for the integrity of the work as a whole, and give their approval for this version to be published. K Chan, K Hansen, S Muratov, S Khoudigian, M Lamotte contributed to the conception and design of the work and interpretation of the data/results. M Lamotte, S Muratov, S Khoudigian contributed to the data identification and analysis. K Chan, K Hansen, S Muratov, S Khoudigian, M Lamotte contributed to drafting and further revisions of the manuscript. All authors have approved the submitted version of the manuscript.

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Competing interests disclosure

K Chan is an employee of Novo Nordisk, received funding for travel, accommodation and congress fee to present the study results at CAPT 2022. K Hansen is an employee of Novo Nordisk, received funding for travel, accommodation and congress fee to present the study results at EASD 2022; holds stocks and stock options of Novo Nordisk (not depending on this project). IQVIA received consulting fees from Novo Nordisk Canada Inc. for author contributions as per above. S Muratov and S Khoudigian are full-time employees of IQVIA. IQVIA receives license fees from NovoNordisk, Lilly, Sanofi, Boehringer Ingelheim, NICE, South Carolina University, Warwick University, Dexcom, Medtronic, Roche Diagnostics to have access to the IQVIA Core Diabetes Model. The authors have no other competing interests or relevant affiliations with any organization or entity with the subject matter or materials discussed in the manuscript apart from those disclosed.

Writing disclosure

No writing assistance was utilized in the production of this manuscript.

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Summary points

- A growing number of digital technologies have emerged globally and in Canada to address patient needs and help optimize diabetes therapy.
- Although shown to be efficacious in improving insulin therapy and outcomes for people with T1DM, the value for money of digital technologies is poorly studied in Canada.
- A cost-effectiveness analysis was performed using the IQVIA Core Diabetes Model, a validated computer-simulation model of diabetes.
- Baseline characteristics for the simulated cohort and clinical efficacy were informed by population data and a prospective noninterventonal study.
- The connected insulin pen provided additional incremental discounted LYs (1.49) and corresponding incremental QALYs (1.75) at lower incremental total costs (~\$44,256) dominating the SOC.
- A CEAC shows that the probability of connected insulin pen to be cost-effective was 100% of the iterations compared with the SOC at the WTP threshold of \$50,000 per QALY gained.
- This study contributes to a growing body of evidence that suggests digital technologies add value to the treatment of T1DM.

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