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Glycaemic outcomes in adults with type 2 diabetes over 34 weeks with the Omnipod® 5 Automated Insulin Delivery System

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Abstract

Aims: The aim was to evaluate the effect of extended use of the Omnipod® 5 Automated Insulin Delivery (AID) System in adults with type 2 diabetes and suboptimal glycaemic control.

Materials and Methods: Following an 8-week single-arm, multicentre, outpatient trial of AID in adults with type 2 diabetes and baseline HbA1c ≥ 8% (≥ 64 mmol/mol), participants were given the opportunity to continue use of the AID system in a 26-week (~6 month) extension phase. The primary safety endpoints were percentage of time with sensor glucose ≥ 250 mg/dL and < 54 mg/dL. Additional glycaemic measures, including percentage of time in range (TIR) (70–180 mg/dL) and HbA1c, were evaluated. The use of non-insulin anti-hyperglycaemic medications was permitted throughout the entire study.

Results: During the initial 8-week study, participants ($N = 22$) achieved a decrease in percentage of time ≥ 250 mg/dL from 27.4% ± 21.0% to 10.5% ± 8.8% ($p < 0.0001$), which further decreased to 9.7% ± 9.2% during the extension phase ($p = 0.0002$ vs. standard therapy). Percentage of time < 54 mg/dL remained low from standard therapy through extension (median [interquartile range] 0.00% [0.00%, 0.06%] vs. 0.02% [0.00%, 0.05%], $p > 0.05$). HbA1c decreased by 1.6% ± 1.2% (15.5 ± 13.1 mmol/mol, $p < 0.0001$) and TIR increased by 22.4% ± 19.2% ($p < 0.0001$) from standard therapy through extension with no significant change in body mass index and without an observed increase in total daily insulin requirements.

Conclusions: These longer-term findings of Omnipod 5 AID System use demonstrate the potential value of AID in helping people with type 2 diabetes reach glycaemic targets.

KEYWORDS
clinical trial, GLP-1, insulin pump therapy, SGLT-2 inhibitor, type 2 diabetes

Clinical trials registration number: NCT04617795.

1 | INTRODUCTION

Comprehensive management of type 2 diabetes (T2D) requires a multifaceted approach to achieve care goals surrounding blood pressure, lipids and glucose targets to reduce the risks of micro- and macrovascular complications.[1] The use of glucagon-like peptide-1 receptor agonists (GLP-1RA) and sodium glucose cotransporter-2 inhibitors (SGLT-2i) with their associated cardiorenal benefits highlights how advances in glucose-lowering therapy can change the paradigm for pharmacologic treatment selection in T2D. Despite this growing armamentarium of non-insulin agents for treatment of T2D, many people are unable to achieve glycaemic targets without the addition of exogenous insulin therapy.[2,3] Initiating insulin therapy is often met with hesitancy, leading to clinical inertia and resulting in suboptimal glycaemic outcomes that increase complication risk.[4]

Advances in diabetes technology have greatly impacted the ability of people with T2D to manage their care and achieve their goals more effectively. The use of continuous glucose monitoring (CGM) in T2D has dramatically increased over the past several years and has been associated with improved glycaemic control when combined with diverse treatment regimens.[5] Even with close monitoring of glucose values that CGM affords, achieving glycaemic targets in insulin-requiring T2D remains a challenge. Many people on varying intensity insulin regimens (basal-only or basal-bolus) are unable to achieve desired glycaemic outcomes despite significant efforts and insulin dose adjustments.[3] The possibility of using automated insulin delivery (AID) for people with T2D has been of great interest to address needs for more dynamic insulin dosing to cope with daily variations in insulin requirements. Benefits of AID systems have primarily been observed in individuals with type 1 diabetes (T1D). There is little clinical data on the impact AID may have on glycaemic outcomes in adults with T2D on insulin therapy, particularly over longer time frames. The use of AID in those who require insulin has the possibility for improved patient satisfaction and simplification of therapy,[6] thereby reducing care burdens associated with intensive insulin regimens.

The Omnipod® 5 AID System (Insulet Corporation, Acton, MA, USA) includes a wearable, tubeless on-body device (Pod) that adjusts insulin delivery based on sensor glucose readings from a compatible CGM. A handheld device (compatible personal smartphone or provided Controller) is used to interact with the system through Bluetooth wireless technology. The system is cleared by the Food and Drug Administration (FDA) and CE marked for people with T1D age 2 years and older and cleared by the FDA for people with T2D age 18 years and older. Feasibility of the Omnipod 5 AID System in Automated Mode in adults with T2D was previously assessed in an 8-week single-arm, multicentre, outpatient trial in those with a baseline HbA1c ≥ 8% using basal-bolus or basal-only insulin injections. The use of AID was associated with reductions in percentage of time ≥ 250 mg/dL and HbA1c along with improvement in time in range (TIR) 70–180 mg/dL when compared with standard therapy.[7] To build confidence in the durability of these results over a longer period of use, we evaluated the safety and effectiveness of the Omnipod 5 AID System for an additional 6 months beyond the initial study phase.

2 | MATERIALS AND METHODS

This 6-month extension study follows an 8-week single-arm feasibility study of the Omnipod 5 AID System in Automated Mode in adults with T2D. The 8-week study included 24 participants between four clinical sites in the United States (results published previously[7]) in an effort to represent a general clinic sample. Participants were aged 18 to 75 years, diagnosed with T2D and on insulin therapy by injection (basal-bolus or basal-only regimens), with a baseline HbA1c ≥ 8% (≥ 64 mmol/mol) and no insulin pump use within 3 months of screening (complete eligibility criteria presented in Table S1). Participants were also required to have stable doses of any glucose-lowering medications other than insulin over the last 4 weeks, as determined by the investigator. These medications could be discontinued if deemed clinically necessary prior to AID initiation. Otherwise, participants were able to continue using non-insulin glucose-lowering medications throughout the 8-week main study and into the extension phase. An effort was made to recruit an equal split of CGM experienced or inexperienced individuals and basal-bolus or basal-only users. CGM data were collected for 2 weeks in a standard therapy phase before transitioning to AID for 8 weeks using the Omnipod 5 AID System in Automated Mode. Participants were then given the option to continue using the system for an additional 6 months in an extension phase.

2.1 | Study conduct and oversight

This study's protocol was approved by a central Institutional Review Board and local review boards. Oversight was provided by an independent medical monitor. Written informed consent was obtained from each participant prior to the start of the study and prior to the extension for those electing to continue. The US Food and Drug Administration approved an investigational device exemption for use in the main feasibility study and the extension phase to follow. The trial was registered at clinicaltrials.gov (NCT04617795).

2.2 | Study design and participants

Participants were split into two groups based on insulin regimen at study entry: prior basal-bolus injections (group A) and basal-only injections (group B). Both groups began with a 2-week standard therapy phase using their usual therapy (both insulin and non-insulin agents) with a Dexcom G6 CGM used for data collection. Following the standard therapy phase, group A immediately began the 8-week main study phase using the investigational device in Automated Mode. Group B transitioned from standard therapy to 2 weeks of using the investigational device in Manual Mode before transitioning to the main study phase in Automated Mode. Details on the main study design and the approach used for meal boluses between groups were previously published.[7]

During the extension phase, participants attended follow-up visits every 30 days via telephone or office visit (Table S2). For this phase, there was no protocol requirement to use a specific meal bolus regimen (i.e., carbohydrate counting, simplified small/medium/large meal sizes or optional or no meal bolus given); rather, this decision was left to the discretion of the investigator and participant. HbA1c was measured through point-of-care or local laboratory every 3 months from the end of the main study, with the final measurement at the end of the extension. Throughout extension, data on concomitant medications, adverse events, device deficiencies/complaints and device uploads were assessed. The validated Insulin Device Satisfaction Survey–Type 2 Diabetes (IDSS-T2D) was used to evaluate participant satisfaction with the system.[8] Initially taken at screening followed by an assessment at the end of the main study, participants were also surveyed at the end of the extension phase. The IDSS-T2D contains 12 items divided into 3 subscales, reflecting the difficulty, usefulness and freeing nature of device usage. Higher scores indicate greater satisfaction, except for the scale assessing difficulty where a lower score is better.

2.3 | Investigational device

This investigational device includes a tubeless insulin pump with embedded AID algorithm (Pod) and a mobile application (Omnipod 5 App) on a locked-down Android phone, interoperable with a compatible CGM (study CGM: Dexcom G6). The algorithm tested in this study is the same one currently cleared for use in individuals with T1D and T2D. The system has the capability to run in either Manual Mode, with pre-programmed basal rates, or Automated Mode, where the AID algorithm delivers micro-boluses of insulin every 5 min based on current and predicted glucose values to approach the user configurable target glucose values (from 110 to 150 mg/dL in 10 mg/dL increments). The recommended initial target glucose was 120 mg/dL; however, this setting could be adjusted at the discretion of the investigator.

2.4 | Outcomes

Primary safety endpoints were the percentage of time ≥ 250 mg/dL (hyperglycaemia) and < 54 mg/dL (hypoglycaemia). Secondary endpoints included percentage of time in additional glucose ranges of interest (<70 mg/dL, 70–180 mg/dL [TIR], >180 mg/dL and ≥300 mg/dL), mean, standard deviation and coefficient of variation of sensor glucose, HbA1c, body mass index (BMI), total daily insulin dose and percentage of time in Automated Mode. IDSS-T2D scores were evaluated using completed questionnaires.

2.5 | Statistical methods

Analyses were performed using a modified intention-to-treat dataset of participants who entered the extension. Data were stratified by study phase (i.e., standard therapy, extension phase), group (group A: prior basal-bolus, group B: prior basal-only, and overall), and use of other anti-hyperglycaemic medications (using or not using GLP-1RA and/or SGLT-2i). Endpoints were compared between study phases using paired *t*-tests or Wilcoxon signed-rank tests for groups with fewer than 10 participants or if Shapiro–Wilk tests of normality were significant ($p < 0.05$). All *p*-values were considered significant at a two-sided significance level of 5%. As this was an exploratory analysis, *p*-values were not adjusted for multiple testing. Continuous variables were summarized using descriptive statistics, including count, mean, median, standard deviation, and minimum and maximum. Categorical variables were summarized by frequencies and percentages. All analysis was conducted using SAS version 9.4.

3 | RESULTS

3.1 | Participants

Of the 24 participants (12 participants in group A and 12 participants in group B) who entered and completed the initial 8-week study, 22 (92%, 12 from group A and 10 from group B) elected to continue in and complete the optional extension phase. Of the 2 participants who did not participate in the extension, 1 preferred their prior treatment regimen and the other was unable to continue with the trial commitments. Accounting for the initial 8-week main study, participants used the Omnipod 5 AID System in Automated Mode for a total of 34 weeks. Baseline characteristics for extension phase participants are provided in Table 1. A large majority (95%) of participants in the extension phase were taking at least one anti-hyperglycaemic medication other than insulin, with over half (55%) taking more than one medication (Table S3). All participants reported ≥ 1 pre-existing medical condition (Table S4).

3.2 | Glycaemic outcomes

The percentage of time in which sensor glucose was ≥ 250 mg/dL decreased by 9.1% ± 11.2% (mean ± standard deviation [SD]) ($p = 0.02$) in group A and by 19.6% ± 15.6% ($p = 0.003$) in group B from standard therapy to extension. This equates to a decrease of 2.2 and 4.7 h per day, respectively, that each group had spent ≥ 250 mg/dL. Percentage of time < 54 mg/dL remained low from standard therapy through extension with group A at median (interquartile range [IQR]) 0.03% (0.00%, 0.11%) at standard therapy and 0.02% (0.00%, 0.04%) at extension ($p > 0.05$). Group B likewise sustained a low percentage of time < 54 mg/dL (standard therapy: 0.00% (0.00%, 0.00%) vs. extension: 0.02% (0.00%, 0.11%), $p > 0.05$). A detailed outline of the primary outcomes is presented in Table 2, with comparisons from standard therapy to extension provided for the 22 participants who continued into the optional extension.

HbA1c initially decreased from 9.4% ± 0.9% (79 ± 9.8 mmol/mol) at baseline to 8.1% ± 0.7% (65 ± 7.7 mmol/mol) at the end of the

TABLE 1 Characteristics at baseline for those electing to participate in the extension phase.[a]

Characteristic	Group A	Group B	Overall
N	12	10	22
Age (years)[b]	61.8 ± 8.9 (47.8, 72.2)	60.5 ± 6.3 (47.1, 71.4)	61.2 ± 7.7 (47.1, 72.2)
Duration of type 2 diabetes (years)	19.9 ± 10.1 (3.9, 40.1)	17.0 ± 8.7 (6.1, 36.3)	18.6 ± 9.4 (3.9, 40.1)
Body mass index[c]	35.2 ± 4.5 (27.8, 43.2)	32.3 ± 3.9 (25.5, 37.4)	33.9 ± 4.4 (25.5, 43.2)
Number of women (%)	6 (50.0)	5 (50.0)	11 (50.0)
Race/ethnicity (%)[d]			
White	6 (50.0)	7 (70.0)	13 (59.1)
Hispanic or Latino	2 (16.7)	1 (10.0)	3 (13.6)
Not Hispanic or Latino	4 (33.3)	6 (60.0)	10 (45.5)
Black or African American	5 (41.7)	3 (30.0)	8 (36.4)
Asian	1 (8.3)	-	1 (4.5)
HbA1c (%)[e]	9.4 ± 1.0 (8.1, 11.7)	9.4 ± 0.7 (8.1, 10.1)	9.4 ± 0.8 (8.1, 11.7)
HbA1c (mmol/mol)[e]	79.0 ± 10.9 (65.0, 104.0)	79.0 ± 7.7 (65.0, 87.0)	79.0 ± 8.7 (65.0, 104.0)
Creatinine (mg/dL)	1.0 ± 0.2 (0.7, 1.4)	1.0 ± 0.3 (0.6, 1.5)	1.0 ± 0.3 (0.6, 1.5)
Estimated glomerular filtration rate (GFR) (mL/min/1.73 m^2)[f]	80.0 ± 19.2 (41.0, 106.0)	77.0 ± 21.0 (37.0, 101.0)	78.6 ± 19.6 (37.0, 106.0)
Daily insulin dose (U/d)[g]	92.4 ± 44.0 (32.3, 166.7)	31.3 ± 23.9 (4.7, 80.0)	64.6 ± 47.2 (4.7, 166.7)
Number of short-acting insulin boluses per day (number/day)	2.9 ± 0.7 (1.7, 4.0)	0.0 ± 0.0 (0.0, 0.0)	1.8 ± 1.5 (0.0, 4.0)
Previous[h] or current continuous glucose monitor use (%)	6 (50.0)	4 (40.0)	10 (45.5)
Previous[h] or current pump use (%)	1 (8.3)	0 (0.0)	1 (4.5)

[a]Plus–minus values are means ± standard deviation (SD). Unless otherwise indicated, remaining values are range (minimum, maximum). Baseline characteristics were reported following study enrolment and prior to the 2-week standard therapy phase, unless otherwise specified.
[b]Age was determined at the date of informed consent.
[c]Body mass index is the weight in kilograms divided by the square of the height in metres.
[d]Race and ethnicity were reported by the participants and are displayed exactly as reported. Ethnicity delineation is shown for racial categories where at least one person identified as Hispanic or Latino.
[e]Participant eligibility for the study was determined using a point-of-care HbA1c measurement performed at screening, which in some cases differed from the laboratory assessment displayed here and used for analysis.
[f]GFR was calculated using the National Kidney Foundation and the American Society of Nephrology's CKD-EPI Creatinine Equation (2021) to estimate GFR.
[g]Baseline total daily insulin dose was determined from 3 days of data collected during the standard therapy phase.
[h]Previous use is defined as having used the device for any duration in the past.

initial 8-week study and settled at 7.8% ± 0.7% (62 ± 7.7 mmol/mol) at the end of the extension phase (Table 2; Figure 1). After 34 total weeks of use, group A experienced a decrease in HbA1c of 1.3% ± 1.2% (14.2 ± 13.1 mmol/mol, $p = 0.001$ vs. baseline), while group B experienced a decrease of 1.9% ± 1.1% (20.8 ± 12.0 mmol/mol, $p = 0.0004$ vs. baseline).

From standard therapy to extension, TIR increased by 22.4% ± 19.2%, from 36.6% ± 19.6% to 61.4% ± 15.2% ($p < 0.0001$). TIR increased from 42.8% ± 20.4% to 58.1% ± 15.1% ($p = 0.01$) for group A and from 30.5% ± 17.4% to 65.3% ± 15.2% ($p = 0.0005$) for group B, corresponding to an increase of 3.7 h per day and 7.4 h per day in target range, respectively. Percentage of time < 70 mg/dL decreased from 0.31% (0.06%, 0.66%) at standard therapy to 0.09% (0.04%, 0.18%) at extension ($p = 0.02$) for group A, whereas group B maintained a low percentage of time < 70 mg/dL throughout (standard therapy: 0.01% (0.00%, 0.24%) vs. extension: 0.07% (0.03%, 0.19%), $p > 0.05$). Percentage of time > 180 mg/dL decreased by 14.5% ± 18.0% ($p = 0.02$) for group A and 30.7% ± 18.8% ($p = 0.0006$) for group B. Percentage of time ≥ 300 mg/dL showed an overall decrease from standard therapy to extension of 6.4% ± 8.9% ($p = 0.0002$). The percentage of users meeting consensus targets[9] can be found in Table S5. A plot of median sensor glucose throughout the day can be found in Figure S1.

While using the lowest target glucose setting of 110 mg/dL ($n = 18$), TIR increased by 24.1% ± 21.5% ($p = 0.0002$) from standard therapy to extension (Table S6). For group A, TIR increased from 44.2% ± 20.8% to 60.0% ± 14.1% ($p = 0.02$) or 3.8 more hours per day in target range and for group B, TIR increased from 29.3% ± 15.6% to 66.4% ± 18.0% ($p = 0.02$) or 8.9 more hours per day. Glycaemic outcomes using additional target glucose settings (120 mg/dL and 130 mg/dL) are provided in Table S7.

Primary and secondary glycaemic outcomes were stratified by concurrent use of GLP-1RA and/or SGLT-2i during the extension phase (Table 3). There were a total of 14 participants who used these medications. The frequency and dose of medications were stable through extension apart from 2 participants, 1 of which switched the

TABLE 2 Primary and secondary safety and efficacy results.[a]

Parameter	Group	Standard therapy (ST) phase (2 weeks) ($N = 24$)	Main study (8 weeks) ($N = 24$)	Extension study (26 weeks) ($N = 22$)	Change from ST to main study	*p*-Value* ST vs. main	Change from ST to extension study[b]	*p*-Value* ST vs. extension
Primary outcomes								
Percentage of time < 54 mg/dL	A	0.19 ± 0.36	0.05 ± 0.09	0.02 ± 0.02	−0.13 ± 0.38	0.4922[2]	−0.16 ± 0.37	0.3652[2]
		0.03 (0.00, 0.11)	0.02 (0.00, 0.07)	0.02 (0.00, 0.04)	0.00 (−0.11, 0.01)		−0.01 (−0.08, 0.02)	
	B	0.02 ± 0.07	0.01 ± 0.02	0.04 ± 0.05	−0.01 ± 0.08	1.0000[2]	0.02 ± 0.07	0.5009[1]
		0.00 (0.00, 0.00)	0.00 (0.00, 0.01)	0.02 (0.00, 0.11)	0.00 (0.00, 0.01)		0.01 (0.00, 0.04)	
	Overall	0.11 ± 0.27	0.03 ± 0.07	0.03 ± 0.04	−0.07 ± 0.27	0.4543[2]	−0.08 ± 0.29	0.8983[2]
		0.00 (0.00, 0.06)	0.00 (0.00, 0.03)	0.02 (0.00, 0.05)	0.00 (−0.02, 0.01)		0.00 (−0.04, 0.02)	
Percentage of time ≥ 250 mg/dL	A	21.5 ± 16.8	9.3 ± 5.6	12.4 ± 11.1	**−12.2 ± 13.3**	**0.0089[1]**	**−9.1 ± 11.2**	**0.0171[1]**
		20.4 (6.8, 31.5)	9.4 (5.5, 13.7)	9.1 (4.0, 14.7)	**−9.4 (−17.8, −1.1)**		**−7.6 (−15.5, 1.6)**	
	B	33.3 ± 23.8	11.7 ± 11.3	6.4 ± 4.8	**−21.6 ± 17.9**	**0.0015[1]**	**−19.6 ± 15.6**	**0.0033[1]**
		26.8 (14.2, 50.3)	7.1 (3.7, 17.3)	6.0 (2.4, 9.2)	**−14.5 (−34.2, −9.8)**		**−16.0 (−22.2, −10.4)**	
	Overall	27.4 ± 21.0	10.5 ± 8.8	9.7 ± 9.2	**−16.9 ± 16.2**	**<0.0001[2]**	**−13.9 ± 14.1**	**0.0002[1]**
		20.7 (11.5, 42.5)	9.4 (4.3, 14.1)	7.1 (3.7, 12.2)	**−14.0 (−21.4, −5.7)**		**−13.6 (−21.2, −2.6)**	
Secondary outcomes								
HbA1c (%)	A	9.4 ± 1.0	8.1 ± 0.8	8.0 ± 0.7	**−1.2 ± 0.7**	**0.0001[1]**	**−1.3 ± 1.2**	**0.0010[2]**
		9.1 (8.7, 9.8)	7.9 (7.6, 8.6)	7.8 (7.5, 8.2)	**−1.1 (−1.7, −0.8)**		**−1.0 (−1.9, −0.8)**	
	B	9.5 ± 0.8	8.1 ± 0.6	7.5 ± 0.6	**−1.4 ± 0.7**	**<0.0001[1]**	**−1.9 ± 1.1**	**0.0004[1]**
		9.6 (9.1, 10.0)	8.2 (7.7, 8.4)	7.3 (7.2, 7.5)	**−1.6 (−2.1, −0.9)**		**−2.2 (−2.4, −1.5)**	
	Overall	9.4 ± 0.9	8.1 ± 0.7	7.8 ± 0.7	**−1.3 ± 0.7**	**<0.0001[1]**	**−1.6 ± 1.2**	**<0.0001[1]**
		9.4 (8.8, 10.0)	8.0 (7.6, 8.5)	7.6 (7.3, 8.0)	**−1.4 (−1.9, −0.8)**		**−1.5 (−2.3, −0.8)**	
HbA1c (mmol/mol)	A	79.0 ± 10.9	65.0 ± 8.7	64.0 ± 7.7	**−13.1 ± 7.7**	**0.0001[1]**	**−14.2 ± 13.1**	**0.0010[2]**
		76.0 (72.0, 84.0)	63.0 (60.0, 70.0)	62.0 (58.0, 66.0)	**−12.0 (−18.6, −8.7)**		**−10.9 (−20.8, −8.7)**	
	B	80.0 ± 8.7	65.0 ± 6.6	58.0 ± 6.6	**−15.3 ± 7.7**	**<0.0001[1]**	**−20.8 ± 12.0**	**0.0004[1]**
		81.0 (76.0, 86.0)	66.0 (61.0, 68.0)	56.0 (55.0, 58.0)	**−17.5 (−23.0, −9.8)**		**−24.0 (−26.2, −16.4)**	
	Overall	79.0 ± 9.8	65.0 ± 7.7	62.0 ± 7.7	**−14.2 ± 7.7**	**<0.0001[1]**	**−17.5 ± 13.1**	**<0.0001[1]**
		79.0 (73.0, 86.0)	64.0 (60.0, 69.0)	60.0 (56.0, 64.0)	**−15.3 (−20.8, −8.7)**		**−16.4 (−25.1, −8.7)**	
Mean sensor glucose, mg/dL	A	199 ± 33	176 ± 17	181 ± 23	**−24 ± 26**	**0.0085[1]**	**−18 ± 25**	**0.0281[1]**
		203 (168, 222)	177 (159, 191)	173 (163, 194)	**−22 (−38, −5)**		**−17 (−34, 1)**	
	B	225 ± 41	182 ± 25	170 ± 17	**−43 ± 32**	**0.0008[1]**	**−43 ± 33**	**0.0026[1]**
		212 (193, 252)	172 (167, 204)	167 (160, 178)	**−36 (−62, −23)**		**−38 (−58, −32)**	
	Overall	212 ± 38	179 ± 21	176 ± 21	**−33 ± 30**	**<0.0001[1]**	**−30 ± 31**	**0.0002[1]**
		206 (188, 238)	173 (165, 193)	170 (160, 186)	**−33 (−47, −10)**		**−32 (−39, −4)**	

(Continues)

TABLE 2 (Continued)

Parameter	Group	Standard therapy (ST) phase (2 weeks) ($N = 24$)	Main study (8 weeks) ($N = 24$)	Extension study (26 weeks) ($N = 22$)	Change from ST to main study	*p*-Value* ST vs. main	Change from ST to extension study[b]	*p*-Value* ST vs. extension
Standard deviation of sensor glucose, mg/dL	A	58 ± 18	48 ± 9	53 ± 13	**−10 ± 12**	**0.0005**[2]	−6 ± 14	0.1910[1]
		55 (48, 64)	49 (44, 54)	50 (43, 58)	**−5 (−15, −3)**		−5 (−16, 1)	
	B	61 ± 16	50 ± 14	44 ± 9	**−12 ± 18**	**0.0456**[1]	**−16 ± 15**	**0.0064**[1]
		54 (50, 72)	43 (40, 58)	44 (39, 49)	**−12 (−22, −2)**		**−15 (−25, −3)**	
	Overall	60 ± 17	49 ± 11	49 ± 12	**−11 ± 15**	**<0.0001**[2]	**−10 ± 15**	**0.0035**[1]
		54 (49, 65)	45 (41, 55)	47 (41, 55)	**−7 (−20, −3)**		**−8 (−20, −1)**	
Coefficient of variation of sensor glucose, mg/dL[c]	A	29.2 ± 6.8	27.3 ± 3.8	29.0 ± 4.3	−1.9 ± 4.9	0.2040[1]	−0.2 ± 5.8	0.8943[1]
		28.7 (23.4, 33.3)	27.9 (24.3, 30.7)	29.1 (24.6, 32.1)	−1.5 (−4.7, 0.6)		−0.6 (−3.5, 1.2)	
	B	27.6 ± 6.5	27.0 ± 5.1	25.6 ± 4.5	−0.6 ± 6.6	0.7668[1]	−2.6 ± 3.8	0.0622[1]
		27.5 (23.5, 32.5)	24.6 (23.7, 28.8)	25.1 (23.6, 27.1)	−2.5 (−4.4, 3.9)		−2.6 (−5.6, −0.9)	
	Overall	28.4 ± 6.6	27.1 ± 4.4	27.4 ± 4.6	−1.2 ± 5.7	0.2981[1]	−1.3 ± 5.0	0.2386[1]
		27.7 (23.4, 33.0)	26.4 (23.7, 30.5)	26.5 (24.3, 30.7)	−2.0 (−4.5, 0.9)		−1.1 (−3.5, 0.2)	
Percentage of time in glucose range, %								
<70 mg/dL	A	0.91 ± 1.54	0.15 ± 0.13	0.11 ± 0.08	**−0.77 ± 1.46**	**0.0210**[2]	**−0.80 ± 1.53**	**0.0210**[2]
		0.31 (0.06, 0.66)	0.10 (0.03, 0.29)	0.09 (0.04, 0.18)	**−0.27 (−0.47, −0.05)**		**−0.26 (−0.44, 0.01)**	
	B	0.26 ± 0.56	0.08 ± 0.13	0.15 ± 0.22	−0.18 ± 0.44	0.5693[2]	−0.16 ± 0.41	0.5703[2]
		0.01 (0.00, 0.24)	0.04 (0.02, 0.07)	0.07 (0.03, 0.19)	0.01 (−0.18, 0.03)		0.01 (−0.14, 0.03)	
	Overall	0.58 ± 1.18	0.11 ± 0.13	0.13 ± 0.16	**−0.47 ± 1.10**	**0.0142**[2]	**−0.51 ± 1.18**	**0.0149**[2]
		0.13 (0.00, 0.51)	0.06 (0.02, 0.15)	0.09 (0.03, 0.18)	**−0.08 (−0.41, 0.02)**		**−0.11 (−0.39, 0.03)**	
70–180 mg/dL	A	42.8 ± 20.4	60.5 ± 14.3	58.1 ± 15.1	**17.8 ± 15.2**	**0.0019**[1]	**15.3 ± 17.4**	**0.0110**[1]
		40.8 (26.1, 61.9)	59.0 (48.4, 72.3)	61.5 (45.3, 71.3)	**19.0 (6.1, 22.1)**		**13.2 (0.9, 25.7)**	
	B	30.5 ± 17.4	56.6 ± 17.7	65.3 ± 15.2	**26.1 ± 14.6**	**<0.0001**[1]	**30.8 ± 18.7**	**0.0005**[1]
		30.5 (17.4, 45.9)	61.1 (40.7, 70.0)	66.0 (58.2, 73.0)	**26.2 (19.3, 34.2)**		**28.7 (23.2, 50.8)**	
	Overall	36.6 ± 19.6	58.6 ± 15.9	61.4 ± 15.2	**21.9 ± 15.2**	**<0.0001**[1]	**22.4 ± 19.2**	**<0.0001**[1]
		40.4 (19.7, 50.0)	61.0 (45.9, 70.0)	63.7 (51.7, 73.0)	**21.6 (12.6, 30.7)**		**22.4 (7.1, 33.3)**	
>180 mg/dL	A	56.3 ± 20.6	39.3 ± 14.3	41.8 ± 15.2	**−17.0 ± 15.5**	**0.0030**[1]	**−14.5 ± 18.0**	**0.0175**[1]
		58.8 (37.6, 71.4)	40.8 (27.4, 51.4)	38.3 (28.6, 54.7)	**−17.6 (−21.4, −4.5)**		**−12.3 (−25.6, −0.4)**	
	B	69.2 ± 17.6	43.3 ± 17.7	34.5 ± 15.1	**−25.9 ± 14.6**	**<0.0001**[1]	**−30.7 ± 18.8**	**0.0006**[1]
		68.6 (53.9, 82.6)	38.6 (30.0, 59.3)	33.6 (26.8, 41.7)	**−26.3 (−34.1, −19.0)**		**−28.7 (−50.8, −21.9)**	
	Overall	62.8 ± 19.9	41.3 ± 15.9	38.5 ± 15.3	**−21.4 ± 15.4**	**<0.0001**[1]	**−21.8 ± 19.7**	**<0.0001**[1]
		58.8 (49.6, 80.3)	38.8 (29.9, 54.0)	35.8 (26.8, 48.3)	**−20.8 (−30.7, −12.2)**		**−21.8 (−33.5, −5.1)**	

TABLE 2 (Continued)

Parameter	Group	Standard therapy (ST) phase (2 weeks) ($N = 24$)	Main study (8 weeks) ($N = 24$)	Extension study (26 weeks) ($N = 22$)	Change from ST to main study	*p*-Value* ST vs. main	Change from ST to extension study[b]	*p*-Value* ST vs. extension
≥300 mg/dL	A	8.8 ± 9.1	2.2 ± 1.8	4.5 ± 5.8	**−6.6 ± 7.8**	**0.0138**[1]	**−4.3 ± 5.5**	**0.0215**[1]
		7.0 (0.7, 13.2)	2.0 (0.9, 3.2)	2.4 (0.8, 4.4)	**−4.1 (−10.0, −0.1)**		**−3.4 (−9.4, 1.0)**	
	B	16.0 ± 17.3	4.3 ± 5.9	1.5 ± 1.4	**−11.7 ± 14.0**	**0.0015**[2]	**−9.0 ± 11.6**	**0.0098**[2]
		9.9 (2.6, 26.2)	1.5 (0.4, 5.7)	1.0 (0.2, 3.1)	**−5.9 (−17.4, −1.6)**		**−5.2 (−11.5, −2.0)**	
	Overall	12.4 ± 14.0	3.2 ± 4.4	3.1 ± 4.6	**−9.2 ± 11.4**	**<0.0001**[2]	**−6.4 ± 8.9**	**0.0002**[2]
		8.0 (1.9, 16.5)	2.0 (0.7, 3.6)	1.7 (0.5, 3.4)	**−4.8 (−13.2, −0.8)**		**−4.2 (−9.8, −0.3)**	
Glycaemia risk index (GRI)	A	63.1 ± 26.7	39.3 ± 15.5	43.6 ± 20.5	**−23.8 ± 19.2**	**0.0013**[1]	**−19.5 ± 21.3**	**0.0089**[1]
		67.5 (36.3, 88.0)	40.5 (25.0, 53.8)	38.5 (25.0, 56.8)	**−26.0 (−35.3, −8.5)**		**−17.5 (−31.0, −0.0)**	
	B	76.8 ± 22.6	44.0 ± 22.1	33.1 ± 15.6	**−32.8 ± 20.4**	**0.0010**[2]	**−39.1 ± 23.8**	**0.0006**[1]
		79.0 (54.3, 100.0)	37.0 (26.8, 66.5)	32.5 (24.0, 41.5)	**−32.0 (−40.3, −18.3)**		**−37.0 (−58.8, −23.8)**	
	Overall	70.0 ± 25.2	41.6 ± 18.9	38.8 ± 18.8	**−28.3 ± 19.9**	**<0.0001**[2]	**−28.4 ± 24.1**	**<0.0001**[1]
		71.0 (49.5, 99.8)	39.0 (26.8, 55.5)	37.0 (24.8, 47.8)	**−30.0 (−37.5, −11.8)**		**−28.5 (−43.0, −6.5)**	

Note: Bold values indicate significance ($p < 0.05$).

[a]Plus–minus values are means ± standard deviation (SD), median (IQR). IQR denotes interquartile range. To convert the values for glucose to millimoles per litre, multiply by 0.05551.

[b]Change from ST to extension study is reported for the 22 participants who continued into the optional extension phase.

[c]Coefficient of variation of sensor glucose is standard deviation divided by the mean.

*p-Value determined using [1]unadjusted two-sided paired t-tests or [2]two-sided Wilcoxon signed-rank test.

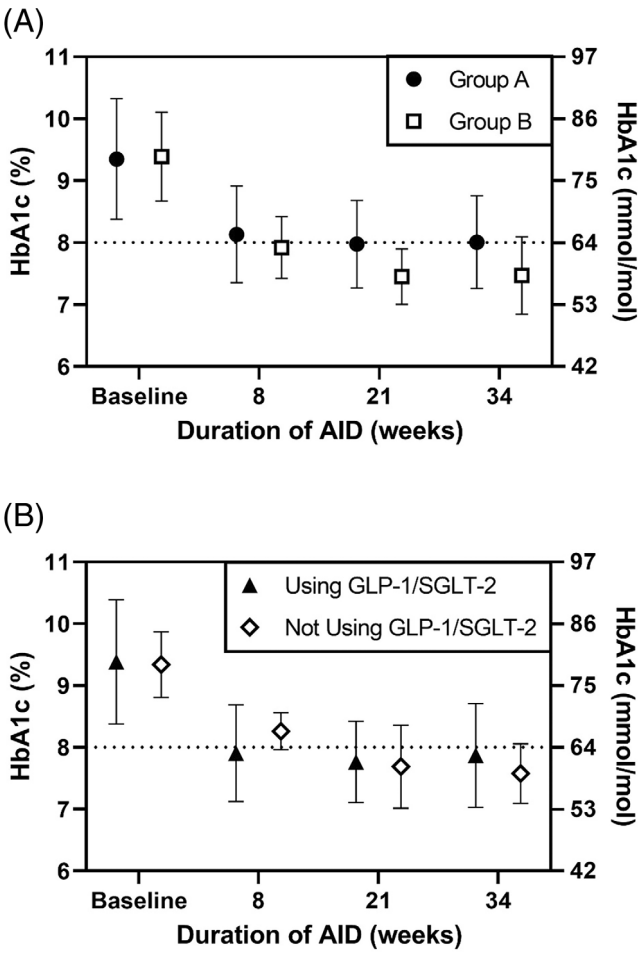

FIGURE 1 Mean HbA1c at baseline, 8-week automated insulin delivery (AID) phase and extension phase. Results are shown stratified by prior therapy (panel A) by group A: prior basal-bolus injections and group B: prior basal-only injections, as well as stratified by other medication use (panel B) for those using or not using glucagon-like peptide-1 (GLP-1) receptor agonists or sodium glucose cotransporter-2 (SGLT-2) inhibitors. Error bars show the standard deviation. The HbA1c at each follow-up time point (8, 21 and 34 weeks) was significantly different from baseline for all groups ($p < 0.05$).

frequency of GLP-1RA medication from a daily to weekly dose, and another participant who switched from a GLP-1RA once weekly to SGLT-2i daily. These 14 participants experienced a decrease in HbA1c of 1.5% ± 1.3% (16 ± 14 mmol/mol) after 34 weeks of AID, from 9.4% ± 1.0% (79 ± 11 mmol/mol) during standard therapy to 7.9% ± 0.8% (63 ± 9 mmol/mol) during extension ($p = 0.0008$) (Figure 1). This group using these anti-hyperglycaemic medications in conjunction with AID experienced a significant increase in TIR of 22.3% ± 19.0%, from 37.8% ± 21.6% to 60.1% ± 16.3% ($p = 0.0008$). In comparison, the 8 participants not using GLP-1RA or SGLT-2i saw a decrease in HbA1c of 1.8% ± 0.9% (20 ± 10 mmol/mol), from 9.3% ± 0.5% (78 ± 6 mmol/mol) to 7.6% ± 0.5% (60 ± 6 mmol/mol) ($p = 0.008$). TIR for this group increased by 22.5% ± 20.9%, from 41.1% ± 11.9% to 63.6% ± 13.9% ($p = 0.02$).

3.3 | Safety outcomes

Through extension, there were zero occurrences of severe hypoglycaemia, diabetic ketoacidosis or hypoglycaemia (Table S8). Hypoglycaemia is reported as an adverse event when it meets the criteria for severe hypoglycaemia (hypoglycaemia requiring assistance of another person to actively administer carbohydrate, glucagon or other resuscitative actions due to altered consciousness) or when hypoglycaemia leads to a serious adverse event that may not meet the definition of severe hypoglycaemia. There was one instance of hyperglycaemia due to sensor and transmitter failure and nine instances of prolonged hyperglycaemia (metre blood glucose measuring ≥ 300 mg/dL after CGM reading > 300 mg/dL for 1 h or > 250 mg/dL for 2 h). A detailed list of all adverse events is reported in Table S8.

3.4 | Insulin and body weight

There was no significant change in BMI between baseline and end of the extension for group A ($p > 0.05$) or group B ($p > 0.05$) (Table S9).

Total daily insulin requirements revealed a significant decrease for group A of 23.7 ± 30.7 U/day during the extension as compared with standard therapy ($p = 0.02$), whereas it did not change significantly from standard therapy through extension for group B. Although total daily basal insulin units did not significantly change across groups, total daily bolus insulin decreased by 17.0 ± 23.8 U ($p = 0.04$) in group A with group B delivering 13.0 ± 13.7 U. In group A, the number of boluses delivered per day did not significantly change with extension. Group B (the basal-only group) delivered 1.9 ± 1.2 boluses/day at extension (Table S9).

3.5 | System use

In the extension phase, group A participants spent median (IQR) 90.8% (84.7%, 96.1%) of time in Automated Mode and group B spent 87.9% (84.8%, 92.8%) of time in Automated Mode. Overall, this amounted to 88.9% (84.8%, 94.1%) of time in Automated Mode across both groups. Twenty-three total device deficiencies occurred through extension system use: 69.6% related to the Pod, 8.7% related to the Omnipod 5 App on the Controller, 13.0% related to the CGM transmitter and 8.7% related to the CGM sensor.

During the extension phase, group A used the 110, 120 and 130 mg/dL targets for 84.7%, 12.4% and 2.1% of cumulative study time, respectively (other targets were not used). Group B used the 110, 120, 130, 140 and 150 mg/dL targets for 66.7%, 15.6%, 13.4%, 0.0% and 4.3% of cumulative study time, respectively. Activity feature was used for 0.8% of time in group A and was not used in group B. Percent of cumulative study time using the 110 mg/dL target increased in both groups during the extension compared with the 8-week initial study, with group A using the lowest target for 57.1% of time during the initial study phase then 84.7% of time during the

TABLE 3 Primary and secondary efficacy outcomes by medication use.[a]

	Using GLP-1RA/SGLT-2i (group A, $n = 8$; group B, $n = 6$; overall, $n = 14$)				Not using GLP-1RA/SGLT-2i (group A, $n = 4$; group B, $n = 4$; overall, $n = 8$)			
	ST[b] (2 weeks)	Extension	Change	*p*-Value*	ST[b] (2 weeks)	Extension	Change	*p*-Value*
HbA1c (%)	9.4 ± 1.0	7.9 ± 0.8	**−1.5 ± 1.3**	**0.0008**[1]	9.3 ± 0.5	7.6 ± 0.5	**−1.8 ± 0.9**	**0.0078**[2]
HbA1c (mmol/mol)	79 ± 11	63 ± 9	**−16 ± 14**	**0.0008**[1]	78 ± 6	60 ± 6	**−20 ± 10**	**0.0078**[2]
Mean sensor glucose (mg/dL)	207 ± 37	178 ± 23	**−29 ± 32**	**0.0053**[1]	202 ± 22	172 ± 16	**−31 ± 30**	**0.0391**[2]
Percentage of time in glucose range, %								
<54 mg/dL	0.00 (0.00, 0.13)	0.02 (0.01, 0.05)	0.01 (−0.11, 0.04)	0.6221[2]	0.00 (0.00, 0.04)	0.01 (0.00, 0.04)	0.00 (−0.02, 0.01)	0.8438[2]
<70 mg/dL	0.14 (0.00, 0.54)	0.11 (0.05, 0.19)	0.00 (−0.40, 0.03)	0.2734[2]	0.18 (0.08, 0.47)	0.05 (0.02, 0.14)	**−0.17 (−0.33, −0.03)**	**0.0391**[2]
70–180 mg/dL	37.8 ± 21.6	60.1 ± 16.3	**22.3 ± 19.0**	**0.0008**[1]	41.1 ± 11.9	63.6 ± 13.9	**22.5 ± 20.9**	**0.0234**[2]
>180 mg/dL	61.4 ± 22.0	39.8 ± 16.3	**−21.6 ± 19.8**	**0.0013**[1]	58.4 ± 11.9	36.2 ± 13.9	**−22.2 ± 21.0**	**0.0234**[2]
≥250 mg/dL	23.3 ± 17.6	10.9 ± 10.8	**−12.4 ± 13.6**	**0.0046**[1]	23.9 ± 14.0	7.5 ± 5.1	**−16.4 ± 15.6**	**0.0234**[2]
≥300 mg/dL	9.8 ± 11.8	3.7 ± 5.6	**−6.1 ± 10.0**	**0.0085**[2]	9.1 ± 7.0	2.0 ± 1.9	**−7.0 ± 7.2**	**0.0391**[2]
BMI (kg/m^2)	33.8 ± 5.1	34.4 ± 5.6	0.6 ± 2.1	0.3125[1]	34.1 ± 3.0	33.6 ± 3.6	−0.5 ± 2.1	0.7422[2]
TDD (U)	62.4 ± 46.8	52.8 ± 34.7	−9.6 ± 30.2	0.2571[1]	68.6 ± 51.0	59.1 ± 33.6	−9.6 ± 32.6	0.5469[2]
	54.2 (30.0, 100.0)	47.6 (24.7, 87.5)	−9.7 (−20.3, −2.1)		58.0 (26.2, 97.0)	55.5 (31.7, 92.0)	−5.6 (−26.5, 11.0)	

Note: Values in bold ar significant at $p < 0.05$.

Abbreviation: BMI: body mass index; ST: standard therapy; TDD: total daily dose.

[a]Plus–minus values are means ± standard deviation (SD). Unless otherwise indicated, remaining values are median (IQR). IQR denotes interquartile range. To convert the values for glucose to millimoles per litre, multiply the values by 0.05551.

[b]Baseline and follow-up data were used for the outcome of HbA1c; the remaining outcomes are described for the standard therapy phase and the extension phase.

*p-Value determined using unadjusted [1]two-sided paired t-tests or [2]two-sided Wilcoxon signed-rank tests.

extension and group B using the lowest target for 50.7% of time during the initial study phase then 66.7% of time during extension.

3.6 | Psychosocial outcomes

Outcomes of the IDSS-T2D questionnaire revealed significant improvements by end of the extension phase. For the total cohort, total IDSS score increased by 1.05 ± 0.75, from 3.54 ± 0.70 at baseline to 4.59 ± 0.49 at extension ($p < 0.0001$), with an effect size of 1.40 highlighting the increased satisfaction participants experienced with the AID system. Both groups saw significant improvements overall and in all 3 subscales. Detailed results from the IDSS-T2D questionnaire are provided in Table 4.

4 | DISCUSSION

The results of this study demonstrated that the initial improvements in glycaemic outcomes seen after 8 weeks of AID system use in adults with T2D were maintained for 34 total weeks of use. These improvements were observed in a diverse group of previous basal-only or basal-bolus insulin injection users, many of whom were using other non-insulin anti-hyperglycaemic medications. There was a significant decrease in percentage of time spent ≥ 250 mg/dL, particularly within the prior basal-only group (group B: 4.7 less hours/day in this range) compared with the basal-bolus group (group A: 2.1 less hours/day). Adults in both groups experienced a significant increase in percent TIR with an overall increase of 22.4% ± 19.2% from standard therapy to extension. HbA1c was reduced by 1.6% ± 1.2% (17.5 ± 13.1 mmol/mol) overall, with no increase in BMI for either group and a significant decrease in total daily insulin for group A.

With many people being prescribed anti-hyperglycaemic medications (other than insulin) for the treatment of T2D, participants of this study were allowed to continue using these glucose-lowering medications throughout the extension. This provided valuable insight into the effect these treatments may have in conjunction with AID system use, as many people with T2D using anti-hyperglycaemic medications eventually need to augment their treatment with insulin.[2,3] Sub-analysis on the concurrent use of GLP-1RA and SGLT-2i revealed that of the 14 participants who were using these medications, HbA1c was reduced by 1.5% ± 1.30% (16 ± 14 mmol/mol) settling at 7.9% ± 0.8% (63 ± 9 mmol/mol) at the end of the extension; TIR increased by 22.3% ± 19.0%; and time ≥ 250 mg/dL decreased by 12.4% ± 13.6%. In

TABLE 4 Insulin Device Satisfaction Survey - Type 2 Diabete version results.[a]

Questionnaire	*N*	Score range (optimal score)	Baseline	Extension	Change	*p*-Value[b]	Cohen's *d*
Combined A + B							
IDSS, overall	22	1 to (5)	3.54 ± 0.70	4.59 ± 0.49	**1.05 ± 0.75**	**<0.0001**[1]	1.40
			3.50 (3.00, 3.92)	4.79 (4.33, 5.00)	**1.04 (0.25, 1.58)**		
Difficult	22	(1) to 5	2.17 ± 0.70	1.47 ± 0.64	**−0.70 ± 0.73**	**0.0002**[1]	0.96
Useful	22	1 to (5)	3.58 ± 0.81	4.73 ± 0.46	**1.15 ± 0.85**	**<0.0001**[1]	1.35
Freeing	22	1 to (5)	3.22 ± 0.93	4.50 ± 0.59	**1.28 ± 1.00**	**<0.0001**[1]	1.28
Group A							
IDSS, overall	12	1 to (5)	3.48 ± 0.68	4.62 ± 0.50	**1.14 ± 0.80**	**0.0004**[1]	1.43
			3.50 (2.92, 3.92)	4.79 (4.46, 4.96)	**1.04 (0.67, 1.63)**		
Difficult	12	(1) to 5	2.29 ± 0.72	1.48 ± 0.72	**−0.81 ± 0.71**	**0.0022**[1]	1.14
Useful	12	1 to (5)	3.50 ± 0.80	4.73 ± 0.48	**1.23 ± 0.86**	**0.0004**[1]	1.43
Freeing	12	1 to (5)	3.23 ± 0.97	4.60 ± 0.46	**1.38 ± 1.09**	**0.0012**[1]	1.27
Group B							
IDSS, overall	10	1 to (5)	3.62 ± 0.74	4.55 ± 0.51	**0.93 ± 0.71**	**0.0020**[2]	1.31
			3.50 (3.00, 3.92)	4.67 (4.33, 5.00)	**1.17 (0.17, 1.50)**		
Difficult	10	(1) to 5	2.03 ± 0.68	1.45 ± 0.56	**−0.58 ± 0.76**	**0.0413**[1]	0.76
Useful	10	1 to (5)	3.68 ± 0.86	4.73 ± 0.45	**1.05 ± 0.89**	**0.0046**[1]	1.18
Freeing	10	1 to (5)	3.20 ± 0.93	4.38 ± 0.73	**1.18 ± 0.92**	**0.0029**[1]	1.28

[a]Plus–minus values are means ± standard deviation (SD). Unless otherwise indicated, remaining values are median (IQR). IQR denotes interquartile range.
[b]*p*-Value is determined using unadjusted [1]two-sided paired *t*-tests, unless otherwise specified. [2]Two-sided Wilcoxon signed-rank tests were used for Insulin Device Satisfaction Survey (IDSS) overall for group B. Cohen's *d* is calculated as the mean change divided by the standard deviation of the change.

comparison, those not using GLP-1RA/SGLT-2i medications (8 participants) saw similar improvements. For those participants who used GLP-1RA/SGLT-2i medications and those who did not use these medications, similar benefits were observed in both TIR (increased TIR by 22.3% using medications vs. increased TIR by 22.5% not using medications) and HbA1c (decreased HbA1c by 1.5% (16.4 mmol/mol) using medications vs. decreased HbA1c by 1.8% (19.7 mmol/mol) not using medications). These results suggest that adults with T2D using GLP-1RA or SGLT-2i medications could benefit from AID system use when insulin therapy is needed to achieve glycaemic targets.

Studies on the impact of AID in adults with T2D have shown promising benefits in enabling this population to meet glycaemic targets. Although this is the longest outpatient study on AID in T2D to date at 34-week duration, the results are comparable with those reported for another single-arm, multicentre study[10] and other outpatient, randomized controlled trials on hybrid and fully closed–loop (no boluses) AID in T2D for shorter durations (6–16 weeks).[11–13] Levy et al. shared results of a 6-week single-arm prospective study of a hybrid closed-loop AID system.[10] An increase of 15% TIR was observed among 30 participants. Reznik et al. reported the use of a hybrid closed-loop AID system in a randomized controlled trial, with a 12-week period assisted by Home Health Care.[11] Participants achieved a between-group reduction in HbA1c of 1.3% (14.2 mmol/mol) and a TIR increase of 27.4%, similar to the results of the present study. Two additional studies shared results on the impact of fully closed-loop AID systems in adults with T2D, further supporting the use of AID in this population.[12,13] Daly et al. presented findings of a randomized crossover trial with two 8-week periods comparing a fully closed-loop system and standard injection therapy.[12] HbA1c decreased by 1.4% (15.3 mmol/mol) and TIR increased by 35.3%. In another randomized crossover trial of fully closed-loop insulin delivery with two 20-day periods of closed-loop therapy and standard injection therapy, participants achieved a greater TIR of 57.1% during closed–loop as compared with 42.5% during the control phase.[13] Differences in glycaemic outcomes of these studies as compared with the present single-arm study are expected due to the fully closed-loop systems being assessed and differences in study populations. Overall, these studies, while limited in their direct comparison to this current study using the Omnipod 5 AID System, support the feasibility of AID use in adults with T2D.

Notable limitations of this work are the single-arm design which lacked a control group to provide a comparison with intervention results and the patient selection and clinical site interactions, potentially impacting the generalizability of these results. Although this study did recruit a diverse population, sample size was small, thus requiring further investigation into the larger-scale impact of AID for adults with T2D. A primary strength of this study is the duration in which participants of this demographic were followed, for 34 weeks, providing the longest assessment to date of AID in adults with T2D. With this extended duration came a reduction in follow-up visits as compared to the main study phase, which may have reduced the 'study effect' associated with frequent clinical interactions, yet these

outcomes may not be generalizable in a real-world setting, as the follow-up visits were still more than typical observation outside of a clinical study. This study included participants from diverse gender, racial and ethnic backgrounds, considering the total sample size of 22. Additionally, most participants had little or no baseline experience using diabetes technology, including CGM (12/22, 55%) and insulin pumps (21/22, 95%), with extension data showing feasibility, including improving frequency of bolus insulin dosing over time in participants previously using once-daily basal insulin injections. Data on basal and bolus insulin dosing from the initial phase through extension may provide some insight into overcoming barriers to insulin therapy. For example, participants initially on basal insulin alone maintained similar daily insulin dose requirements with AID therapy but experienced changes in the proportion of insulin used for basal vs. bolus dosing in AID. The use of AID may be a tool to help overcome clinical inertia and reduce the use of unnecessarily high basal insulin doses to cover prandial glucose excursions in an attempt to minimize the number of daily insulin injections.

Initial glycaemic improvements found using the Omnipod 5 AID System in adults with T2D were durable following 34 weeks of extended use. These findings further support the feasibility of AID among adults with T2D requiring insulin and reinforce the importance of additional investigation into the benefit AID could provide for this population beyond this prospective study.

AUTHOR CONTRIBUTIONS

Conception and design of the study: Todd E. Vienneau and Trang T. Ly; acquisition of data: Georgia M. Davis, Anne L. Peters, Bruce W. Bode, Anders L. Carlson and Bonnie Dumais; analysis of data: Lauren M. Huyett and Trang T. Ly; interpretation of data: Anne L. Peters, Bruce W. Bode, Anders L. Carlson, Todd E. Vienneau, Lauren M. Huyett and Trang T. Ly; drafting of the manuscript: Georgia M. Davis, Lauren M. Huyett and Trang T. Ly; critical revision of the manuscript: Georgia M. Davis, Anne L. Peters, Bruce W. Bode, Anders L. Carlson, Bonnie Dumais, Todd E. Vienneau, Lauren M. Huyett and Trang T. Ly. Trang T. Ly had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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CONFLICT OF INTEREST STATEMENT

Georgia M. Davis reports research support from Insulet and has served as a consultant for Medscape. Anne L. Peters served on an advisory board for Medscape and Vertex. Anne L. Peters has received research support from Insulet and Abbott Diabetes Care. She has stock options in Omada Health. Bruce W. Bode reports research support from Insulet during the conduct of the study, as well as research support from Abbott, Advance, Diasome, Dexcom, Janssen, Lilly, Medtronic, Novo Nordisk, Provention Bio, Sanofi, Sanvita, Senseonics, REMD Biotherapeutics, Xeris and vTv Therapeutics. Bruce W. Bode reports consultant and speaking fees from Boehringer Ingelheim, Insulet, Lilly, Mannkind, Medtronic, Novo Nordisk, Sanofi, Senseonics, Sanofi, Xeris and Zealand. Anders L. Carlson is an advisory board member, has received consulting fees and has spoken for Mannkind, Medtronic and Sanofi. Anders L. Carlson reports research support from Insulet, Dexcom, Medtronic, Abbott, Sanofi, Lilly, Novo Nordisk and UnitedHealth. Anders L. Carlson is an employee of the International Diabetes Center at Park Nicollet. Bonnie Dumais, Todd E. Vienneau, Lauren M. Huyett and Trang T. Ly are full-time employees of and own stock in Insulet Corporation..

PEER REVIEW

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/dom.15993.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not publicly available due to privacy or ethical restrictions.

PRIOR PUBLICATION OF DATA IN ABSTRACT FORM

The extension data were presented at the 82nd Scientific Sessions of the American Diabetes Association during June 3–7, 2022, and at the Annual Meeting of the American Pharmacists Association during March 24–27, 2023.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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