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Real-world evaluation of automated insulin delivery therapy in type 1 diabetes: A multicentre study across regional and metropolitan Queensland, Australia

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Abstract

Background: Automated insulin delivery (AID) systems, which integrate continuous glucose monitoring (CGM) with automated insulin dosing, have emerged as a transformative therapy. However, real-world data on AID effectiveness, particularly in regional Australia, remain limited.

Methods: We conducted a retrospective audit across three Australian hospital sites—Logan (metropolitan), Mackay and Townsville (regional)—to evaluate the impact of AID therapy in adults with Type 1 Diabetes Mellitus (T1DM). Data on demographics, comorbidities, CGM metrics and clinical outcomes were extracted from medical records and device platforms. The primary outcome was change in HbA1c and CGM time-in-range (TIR; 3.9–10 mmol/L) at follow-up. Follow-up data were recorded up to 12 months following AID commencement. Secondary outcomes included changes in body weight, glycaemic variability and predictors of HbA1c reduction.

Results: The study consisted of 158 people living with T1DM who were initiated on AID. Following AID initiation, mean TIR improved from 53.4% (SD 21.1%) to 70.0% (SD 14.6%) ($p < 0.0001$), and time in hyperglycaemia (>13.9 mmol/L) declined from 18.7% (SD 19.4%) to 8.4% (SD 9.31%) ($p < 0.0001$). The mean HbA1c significantly decreased from 8.62% (SD 1.70) at baseline to 7.34% (SD 1.31) at follow-up across the entire study cohort ($p < 0.0001$), with 42.7% achieving <7% and 64.1% achieving <7.5% at follow-up. Multivariable regression identified higher baseline HbA1c

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($p < 0.0001$) as a significant predictor of HbA1c reduction. Improvements were consistent across AID system types and geographical settings.

Conclusions: AID therapy significantly improves glycaemic control in adults with T1DM in both regional and metropolitan Australia. Our findings support the real-world effectiveness of AID systems and highlight their potential to bridge care gaps across diverse settings.

KEYWORDS
continuous glucose monitoring, insulin pump therapy, population study, real-world evidence

1 | INTRODUCTION

Type 1 diabetes mellitus (T1DM) is a chronic autoimmune disorder currently affecting over 130 000 people in Australia. Representing around 10% of all cases of diabetes, T1DM has been highlighted as one of the most prominent chronic childhood conditions, and international efforts continue to be made towards the optimization of glycaemic control in affected patients.[1,2] In addition to the increased risk of major vascular and ischaemic complications associated with T1DM, the continuous struggle of blood glucose monitoring and insulin titration often imposes a significant psychological burden on affected patients. As such, the disease has been recognized as a major cause of global morbidity, disability and reduced quality of life.[3,4]

Traditionally, patients living with T1DM have managed their insulin administration through multiple daily injections, with some eligible patients also utilizing insulin pump delivery systems. However, in recent years, automated insulin delivery (AID) systems have emerged as a promising advancement in the management of T1DM. The integration of continuous glucose monitoring (CGM) data with insulin pump systems through automated algorithms represents a novel mechanism through which glycaemic control can be optimized, thereby reducing complication risks and disease burden. Several clinical trials have demonstrated the efficacy of AID systems in improving glycaemic outcomes, reducing hypoglycaemic events and reducing the psychological stress associated with the chronic nature of T1DM.[5–7]

However, despite the introduction of these novel systems, there exists a current paucity of real-world data demonstrating the effectiveness of AID therapy in the Australian context. In Australia, access to continuous glucose monitoring (CGM) for individuals with type 1 diabetes is subsidized through the National Diabetes Services Scheme (NDSS), with a small co-payment. However, access to insulin pump therapy, including automated insulin delivery systems, typically requires private health insurance, self-funding or manufacturer-supported compassionate access programs. This funding disparity represents a major contributor to inequities in technology access, particularly for individuals in regional areas or with lower socioeconomic status. Furthermore, while the impact of diabetes is known to be disproportionately high in regional and First Nations populations, the real-world utility of AID technologies in these communities remains largely unexplored.[8,9] Regional and rural communities often face structural barriers such as geographical isolation, socioeconomic disadvantage and lack of culturally appropriate care, which limit their access to appropriate healthcare services. As such, introducing and evaluating the use of cutting-edge technology such as AID therapy represent a pivotal opportunity to improve diabetes health outcomes and improve health equity in these marginalized populations.[10–12]

In this retrospective cohort study, we therefore aim to evaluate the real-world impact of advanced AID therapy on glycaemic outcomes in regional and metropolitan patients in Australia who are living with T1DM. This study also endeavours to identify any predictors for successful AID implementation, provide insight into regional diabetes management and ultimately help guide decisions regarding policy and resource allocation.

2 | METHODS

2.1 | Study design & data collection

A retrospective observational cohort study was conducted across three Australian public hospital sites (two regional and one metropolitan) in order to evaluate the impact of AID therapy on glycaemic outcomes in patients with T1DM. The three participating hospital sites—Logan, Mackay and Townsville—serve geographically and socioeconomically diverse populations. Based on the Socioeconomic Indexes for Areas (SEIFA), Logan Hospital's catchment includes several postcodes in the lowest quintile (most disadvantaged), while Mackay and Townsville include a mix of lower- and middle-quintile areas. Mackay and Townsville are also classified as 'outer regional' according to the Australian Statistical Geography Standard (ASGS) Remoteness Structure, whereas Logan is considered 'major city'. During the study period (2020–2024), each site had access to public specialist diabetes services, although the number of endocrinologists and credentialled diabetes educators was markedly lower in the regional sites compared to metropolitan centres, consistent with national workforce distribution trends.

De-identified patient data were extracted from the hospital's electronic medical records and stored in a secure database. CGM and insulin pump data were extracted from manufacturer-specific web-based platforms: CareLink Personal/Professional (Medtronic systems),

t:connect (Tandem t:slim X2 systems) and Diasend/Glooko (Ypsomed CamAPS FX systems), which contained information linked from patient sensors/devices.

Baseline information including demographics (age, sex, First Nations status), comorbidities, AID system type and CGM data were recorded. The primary objective was to assess the change in HbA1c and CGM matrices over a follow-up period of up to 12 months. We included the most recent HbA1c value and CGM data within 6 months prior to automated insulin delivery system initiation as the baseline measure, and the earliest available HbA1c value and CGM data within 12 months after initiation as the follow-up measure. Secondary outcomes included changes in body weight and estimated glomerular filtration rate (eGFR). STROBE guidelines were adhered to when reporting the results.

2.2 | Patient selection

The study included all patients with a confirmed diagnosis of T1DM who commenced AID therapy from January 2020 to December 2024. The study included patients who were commenced on any type of AID system (including Medtronic 670G/770G/780G systems, Tandem t:slim X2 with Control-IQ and YpsoPump with CamAPS FX). Participants were excluded if their CGM/pump data was not linked to online servers, if they were pregnant or if they ceased their AID therapy within 1 month of commencement.

2.3 | Statistical analysis

Descriptive statistics were used to summarize the baseline characteristics of the study population. Continuous variables were expressed as means with standard deviations, and categorical variables were presented as frequencies and percentages. Changes in clinical outcomes following intervention were analysed using paired t-tests. Multivariate linear regression analysis was performed to adjust for potential confounders such as age, sex, baseline HbA1c and to identify any predictors of successful reduction in HbA1c. Statistical significance was set at a p-value of < 0.05. All statistical analyses were conducted using R (4.0.3).

2.4 | Ethical approval

This study was registered as an audit within all local hospitals where the patient data were collected from. Additionally, the project received ethics exemption approval from the Central Queensland Hospital and Health Service Human Research Ethics Committee (HREC) on the basis that the study involved a retrospective audit of de-identified patient data, and did not involve direct patient interaction or interventions. Collected data were de-identified prior to analysis, and access was restricted to authorized research personnel.

3 | RESULTS

3.1 | Participant characteristics

A total of 158 individuals using AID systems were included in this multicentre audit across three sites in regional and metropolitan Australia (Logan, Mackay and Townsville). The mean age of participants differed significantly across sites, ranging from 27.4 years in Logan to 37.7 years in Townsville ($p = 0.002$). The majority were female (65.0%–67.8%) and of White ethnicity (90%–94.7%). Pump system type varied substantially by site ($p < 0.001$), with the Medtronic system more common in Mackay, while T:Slim was the most frequently used in Townsville. Most participants from Logan had previously been on multiple daily injections (MDI), whereas pump therapy was more common in Mackay and Townsville (Table 1). Comorbid conditions were evenly distributed among the regional and metropolitan cohorts ($p > 0.05$). Missing data rates were low across the included baseline variables (Table S1), and only individuals with complete data were included in the multivariate linear regression model.

3.2 | Changes in glycaemic metrics

The median follow-up period after the start of AID in our study was 3.2 months. While the study's inclusion window allowed for follow-up data to be collected up to 12 months following AID commencement, most participants had HbA1c assessments at approximately 3 months postinitiation, consistent with routine clinical follow-up practices for new device starters. The mean time spent in the closed loop was 89.78% (SD 13.32).

At the follow-up, significant improvements were observed in glycaemic control. Time in target range (3.9–10 mmol/L) increased from a baseline mean of 53.4%–70.0% at follow-up ($p < 0.0001$), while time spent in hyperglycaemia (>13.9 mmol/L) decreased markedly from 18.7% to 8.4% ($p < 0.0001$). Similarly, time in the intermediate hyperglycaemic range (10.1–13.9 mmol/L) reduced from 25.9% to 20.5% ($p < 0.0001$). The percentage of time spent in hypoglycaemic ranges (<3 mmol/L and 3–3.8 mmol/L) remained low at both time points, with only a slight but statistically significant reduction in time <3 mmol/L ($p = 0.0152$) (Table 2). The overall change in glycaemic parameters at follow-up in the total population is depicted in Figure 1. Glycaemic variability also improved slightly, as indicated by a modest reduction in the coefficient of variation (CV) from 34.7% to 33.2% ($p = 0.0011$). The glucose management indicator (GMI) decreased significantly from 7.8% to 7.1% ($p < 0.0001$), consistent with reductions in HbA1c.

At follow-up, 42.7% of participants achieved an HbA1c level <7.0%, and 64.1% met the broader target of <7.5%. In terms of continuous glucose monitoring (CGM) outcomes, 50.4% of individuals achieved a time-in-range (TIR; 3.9–10 mmol/L) above 70%, while 82.1% exceeded 60% TIR. These results reflect meaningful improvements in glycaemic control and support the effectiveness of automated insulin delivery therapy in real-world regional and metropolitan Australian settings.

TABLE 1 Baseline characteristics of participants by study site.

Characteristic	Overall ($n = 158$)	Logan ($n = 39$)	Mackay ($n = 59$)	Townsville ($n = 60$)	*p*-value
Age (years), mean (SD)	31.94 (16.61)	27.36 (17.64)	29.17 (15.70)	37.65 (15.39)	0.002
Sex, *n* (%)					0.816
Female	103 (65.2)	24 (61.5)	40 (67.8)	39 (65.0)	
Male	55 (34.8)	15 (38.5)	19 (32.2)	21 (35.0)	
Baseline Weight (kg), mean (SD)	76.06 (20.02)	67.5 (8.8)	72.3 (21.5)	79.5 (18.6)	0.14
Diabetes duration (years), mean (SD)	17.01 (13.41)	11.53 (11.17)	16.25 (12.77)	21.24 (14.07)	0.002
Ethnicity, *n* (%)					0.662
First nations	14 (8.9)	2 (5.3)	6 (10.2)	6 (10.0)	
White	143 (91.1)	36 (94.7)	53 (89.8)	54 (90.0)	
Pump system type, *n* (%)					<0.001
Medtronic 670G/770G/780G	77 (49.4)	12 (32.4)	45 (76.3)	20 (33.3)	
Other	1 (0.6)	0 (0.0)	0 (0.0)	1 (1.7)	
Tandem t:slim X2 with Control-IQ	53 (34.0)	7 (18.9)	13 (22.0)	33 (55.0)	
Ypsopump with CamAPS FX	25 (16.0)	18 (48.6)	1 (1.7)	6 (10.0)	
Previous therapy, *n* (%)					<0.001
Multiple daily injections (MDI)	55 (36.9)	25 (80.6)	13 (22.4)	17 (28.3)	
Pump	94 (63.1)	6 (19.4)	45 (77.6)	43 (71.7)	
Baseline HbA1c (%), mean (SD)	8.70 (1.82)	9.20 (2.14)	8.78 (1.83)	8.32 (1.55)	0.072
Baseline eGFR (mL/min/1.73 m^2), mean (SD)	84.43 (14.66)	87.00 (8.71)	78.11 (21.56)	87.30 (9.36)	0.006
Comorbidities, *n* (%)					
Hypertension	24 (15.2)	4 (10.3)	8 (13.6)	12 (20.0)	0.38
Chronic kidney disease	10 (6.3)	3 (7.7)	5 (8.5)	2 (3.3)	0.475
Anxiety/Depression	28 (17.7)	4 (10.3)	7 (11.9)	17 (28.3)	0.023
Dyslipidaemia	39 (24.7)	10 (25.6)	13 (22.0)	16 (26.7)	0.832
Ischaemic Heart Disease/Coronary artery disease	10 (6.3)	3 (7.7)	4 (6.8)	3 (5.0)	0.852
Gastro-oesophageal reflux disease	9 (5.7)	3 (7.7)	5 (8.5)	1 (1.7)	0.229

Abbreviations: eGFR, estimated glomerular filtration rate; HbA1c, glycated haemoglobin; MDI, multiple daily injections.

TABLE 2 Glycaemic metrics at baseline (14-day data at baseline) and follow-up 14-day data at baseline.

Variable	Baseline Mean ± SD	Follow-up Mean ± SD	*p*-value
Time above range >13.9 mmol/L (%)	18.69 ± 19.4	8.43 ± 9.31	<0.0001
Time above range 10.1–13.9 mmol/L (%)	25.91 ± 10.56	20.48 ± 8.66	<0.0001
Time-in-range 3.9–10 mmol/L (%)	53.39 ± 21.18	69.97 ± 14.61	<0.0001
Time below range 3–3.8 mmol/L (%)	1.23 ± 1.71	1.16 ± 1.61	0.1026
Time below range <3 mmol/L (%)	0.3 ± 0.6	0.17 ± 0.48	0.0152
Coefficient of variation (CV) (%)	34.73 ± 6.25	33.19 ± 5.84	0.0011
Glucose management indicator (GMI) (%)	7.8 ± 1.29	7.1 ± 0.59	<0.0001

3.3 | HbA1c improvements by site

Significant reductions in HbA1c were observed across all three participating sites. The mean HbA1c significantly decreased from 8.62% (SD 1.70) at baseline to 7.34% (SD 1.31) at follow-up across the entire study cohort ($p < 0.0001$). In Logan, the mean HbA1c declined from 9.37% (SD 1.77) to 7.93% (SD 1.64; $p = 0.0017$). In Mackay, the mean HbA1c decreased from 8.74% to 7.73% ($p < 0.0001$), while Townsville demonstrated the most pronounced improvement, from 8.23% to 6.79% ($p < 0.0001$) (Figure 2).

3.4 | Glycaemic outcomes across AID systems

In our cohort, participants utilized various AID systems, including Medtronic 670G/770G/780G, Tandem t:slim X2 with Control-IQ and

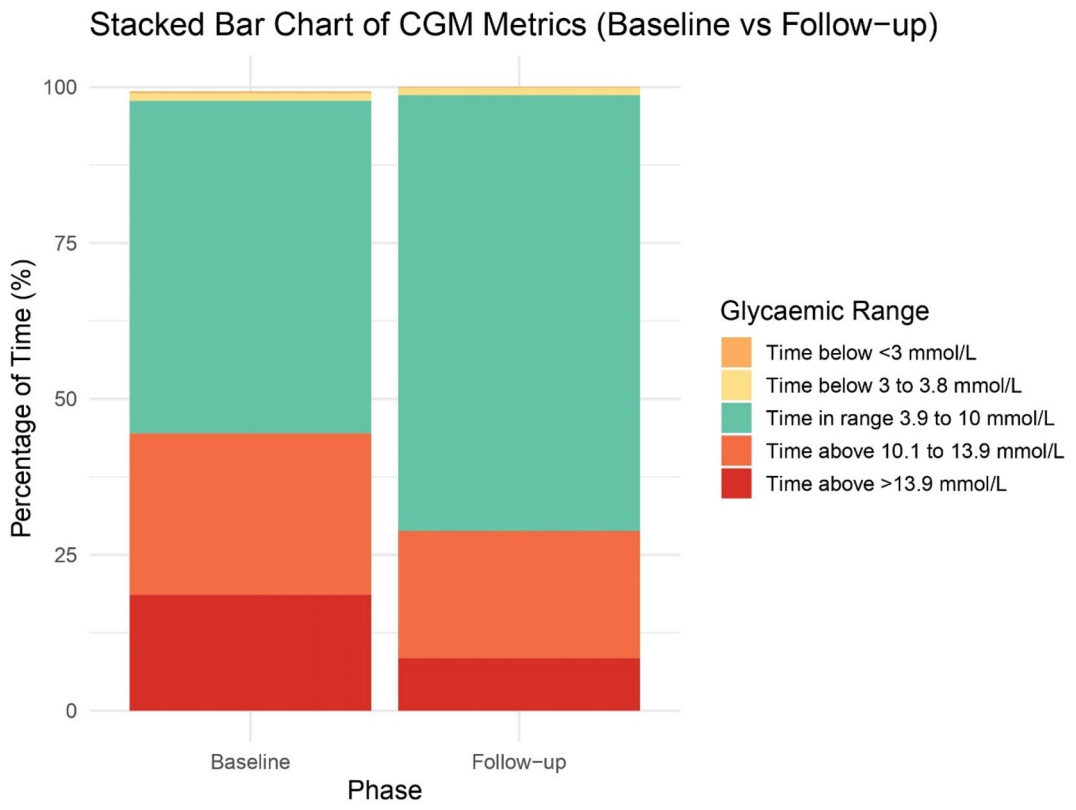

FIGURE 1 Change in glycaemic parameters at follow-up in total population.

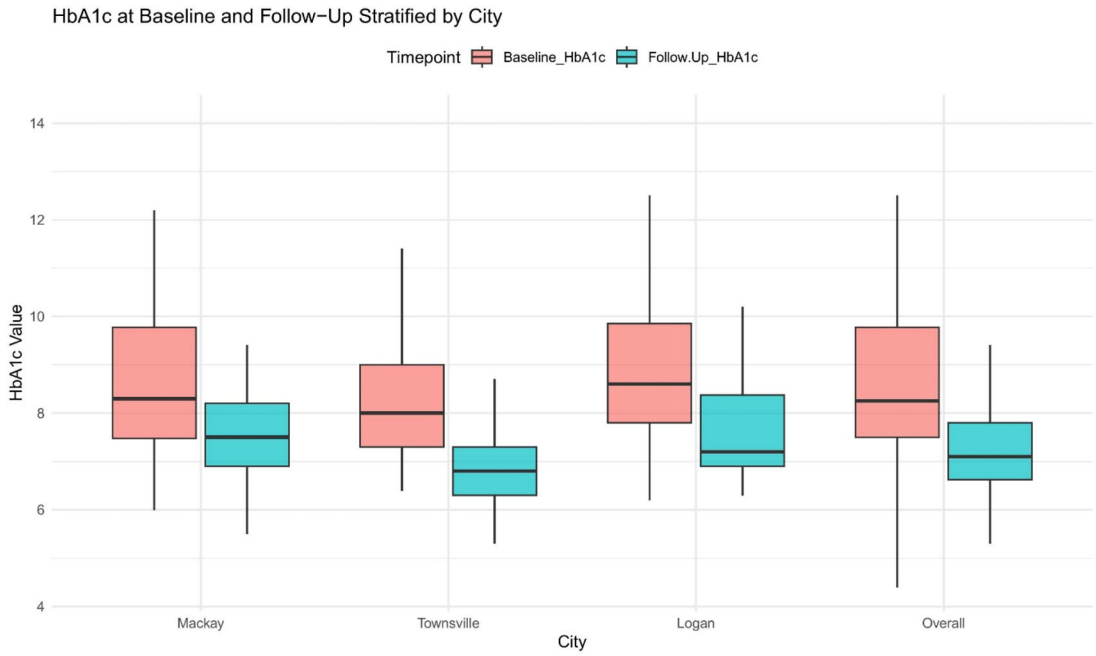

FIGURE 2 HbA1c at baseline and follow-up across regional and metropolitan Australia.

YpsoPump with CamAPS FX. Across all systems, significant improvements in glycaemic control were observed (Figure 3). In the overall total population, time-in-range (TIR; 3.9–10 mmol/L) increased from 53.4% to 70.0% ($p < 0.0001$), and time in hyperglycaemia (>13.9 mmol/L) decreased from 18.7% to 8.4% ($p < 0.0001$). These improvements were consistent across different AID systems, indicating the overall effectiveness of AID therapy in diverse settings. While Figure 3 illustrates glycaemic outcomes stratified by AID system, it is

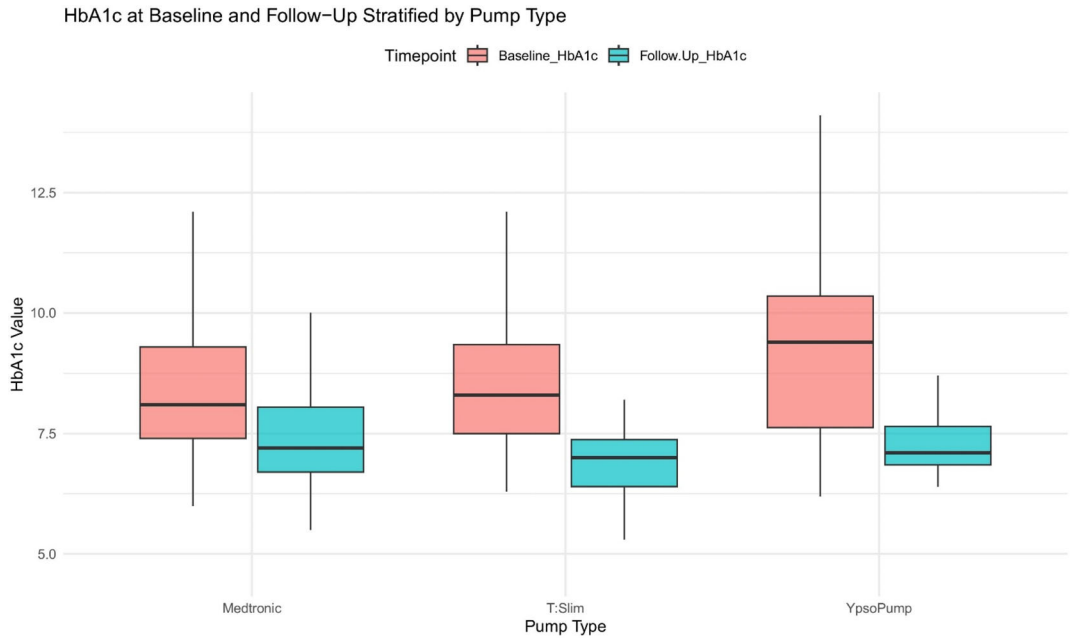

FIGURE 3 HbA1c at baseline and follow-up by distribution of AID system type. AID systems are: Medtronic 670G/770G/780G, Tandem t:Slim X2 with Control-IQ and YpsoPump with CamAPS FX.

intended for descriptive purposes only, without implying comparative efficacy.

3.5 | Change in weight

Among participants with available weight data ($n = 94$), the mean baseline weight was 75.99 kg (SD 20.70), increasing to 78.03 kg (SD 20.47) at follow-up. This change was statistically significant (paired t-test $p = 0.0122$), suggesting a modest weight gain over the follow-up period, possibly related to improved glycaemic control and insulin dose titration.

3.6 | Change in renal function

The mean eGFR slightly declined from 84.43 (SD = 14.66) at baseline to 83.14 (SD = 15.74) at follow-up, which was not statistically significant ($p = 0.088$). These results suggest stable renal function during the follow-up period.

3.7 | Predictors of HbA1c reduction

In the multivariable linear regression analysis, higher baseline HbA1c remained the only significant predictor of HbA1c reduction ($\beta = 0.553$, $p < 0.001$). Among the other covariates—age, gender, diabetes duration, baseline therapy (MDI vs. pump), geographical centre and pump type—only use of the T:Slim pump compared to Medtronic showed a statistically significant association with HbA1c reduction ($\beta = 0.421$, $p = 0.029$). Baseline therapy type (MDI versus pump) was not a significant predictor of HbA1c reduction in the multivariable analysis ($p = 0.14$). No other variables were significant contributors in the model (Table 3). A total of 132 individuals (out of 158 participants) had complete data and were included in the multivariate regression model (Figure S1). The model explained approximately 59% of the variability in HbA1c reduction (Adjusted $R^2 = 0.59$; $p < 0.0001$).

4 | DISCUSSION

This study presents the first real-world outcomes of automated insulin delivery (AID) therapy across regional and metropolitan Australia. We identify significant regional differences in baseline clinical characteristics and demonstrate that AID use leads to substantial improvements in glycaemic control across all settings. Notably, individuals with higher baseline HbA1c experienced the greatest benefits, highlighting the potential of AID therapy to optimize diabetes management in those with the greatest clinical need.

AID therapy[7,13] is an advanced diabetes management system that combines continuous glucose monitoring (CGM) with an insulin pump, using algorithms to automatically adjust basal insulin delivery. While users still administer bolus doses for meals, AID systems significantly improve glycaemic control by maintaining glucose within target ranges. In clinical trial settings,[5,14,15] these systems have been shown to reduce HbA1c, increase time-in-range and lower the risk of hypoglycaemia in people with type 1 diabetes. Recent trials have also demonstrated sustained glycaemic benefits following the commencement of AID therapy in children/adolescents and adults with T1DM, highlighting its potential for long-term diabetes management. Significantly, these studies have

Predictor	Estimate	SE	*t*-value	*p*-value
Age (years)	0.004	0.008	0.511	0.611
Gender (Male vs. Female)	−0.127	0.175	−0.726	0.47
Baseline HbA1c (%)	0.553	0.055	10.15	<0.001
Diabetes duration (years)	−0.002	0.009	−0.217	0.829
Previous therapy (Pump vs. MDI)	−0.156	0.226	−0.69	0.492
City: Mackay (vs Logan)	−0.144	0.289	−0.497	0.62
City: Townsville (vs Logan)	0.348	0.273	1.274	0.205
Pump Type: Other (vs Medtronic)	0.805	0.89	0.904	0.368
Pump Type: T:Slim (vs Medtronic)	0.421	0.19	2.214	0.029
Pump Type: YpsoPump (vs Medtronic)	0.462	0.346	1.336	0.185

TABLE 3 Multivariable linear regression for associated with percentage reduction in HbA1c.

highlighted the particular efficacy of AID technology in individuals with higher baseline HbA1c, thereby emphasizing the opportunity to provide benefit to patients with increasing clinical need.[16,17] Furthermore, several recent studies have demonstrated the cost-effectiveness of AID systems in patients with T1DM on a global scale when compared to traditional diabetes management approaches, thus highlighting the growing role of AID therapy in underserved and disproportionately impacted communities.[18,19]

However, there is limited real-world evidence on the adoption and effectiveness of AID therapy in Australia, particularly among adults in regional areas compared to metropolitan settings. We identified only one real-world study[20] conducted in Australia, focusing on a young adult population. This single-centre study prospectively analysed 92 young adults initiated on the 670G AID system. This study showed a suboptimal engagement with AID, including limited use of automode and a high rate of discontinuation.

Concerns have been raised regarding limited access to healthcare services in regional settings, including shortages of diabetes educators, specialist nursing support and endocrinologists.[21] These barriers may affect both the uptake and the effectiveness of diabetes technologies such as AID systems. To address this gap, we evaluated the impact of AID use across regional and metropolitan settings. In this study, we show that the reduction in HbA1c achieved in regional areas is comparable to that seen in metropolitan centres and is also consistent with outcomes reported in national and international studies. Our findings align with those from systematic reviews and RCTs on AID systems. For example, systematic reviews[22,23] of commercial AID systems reported consistent improvements in TIR and HbA1c across various populations, including children, adolescents and adults. The landmark Australian RCT,[13] McAuley et al. demonstrated that AID therapy resulted in a 0.36% reduction in HbA1c and an 11% increase in TIR compared to manual insulin delivery. While our study observed a larger absolute reduction in HbA1c, this can be attributed to the higher baseline HbA1c in our study cohort as compared to the RCT population. Additionally, the impact of patient selection bias (wherein highly motivated patients who were more engaged in their diabetes management may have been more likely to be initiated on AID therapy in the real-world setting) and the provision of practical multidisciplinary support (through engagement with diabetes educators and telehealth consults) may have resulted in the larger HbA1c reduction seen in our study. Similarly, real-world studies have shown comparable benefits, with AID systems improving glycaemic control in diverse settings.[24,25]

We observed marked improvements in the proportion of participants achieving internationally recommended glycaemic targets following the initiation of AID therapy. At baseline, only 10.1% of individuals had an HbA1c level below 7%, and just 20.1% achieved a time-in-range (TIR; 3.9–10 mmol/L) greater than 70%. Following AID initiation, these proportions increased substantially, with 42.7% achieving an HbA1c <7% and 50.4% reaching a TIR >70%. Similarly, the proportion of participants maintaining a Time Below Range (TBR; <3.9 mmol/L) under 4% increased from 71% at baseline to 95% at follow-up. Given the established association between elevated TBR and the risk of severe hypoglycaemia,[26] these findings suggest that AID use may confer important protective benefits against hypoglycaemic episodes. As TIR[27] and TBR[26] have become internationally recognized standards for evaluating glycaemic control—complementing traditional HbA1c metrics—these improvements underscore the multifaceted benefits of AID therapy in achieving both efficacy and safety. Together, these results not only demonstrate the clinical effectiveness of AID systems in improving overall glycaemic profiles but also their potential to support a greater proportion of individuals in achieving optimal targets.[28] This is particularly relevant in populations with previously suboptimal control and may have long-term implications for reducing the burden of diabetes-related complications.

Interestingly, we found no significant differences in baseline HbA1c levels or comorbidity burden between participants from regional centres (Mackay and Townsville) and those from the metropolitan site (Logan). This suggests that individuals from regional areas were entering automated insulin delivery therapy with a similar level of glycaemic control and clinical complexity as their metropolitan counterparts. Importantly, this challenges the assumption that individuals in regional settings necessarily present with more advanced or poorly controlled diabetes and highlights the feasibility of implementing AID therapy beyond metropolitan centres. These results underscore the potential for expanding equitable access to diabetes technology in regional Australia, provided adequate education, clinical support and infrastructure are in place.

In this study, we observed significant improvements in HbA1c and glycaemic control among all the included AID systems, underscoring their collective clinical value. The consistent reductions in HbA1c and increases in TIR across various AID systems suggest that the benefits of AID therapy are not limited to a specific device. It is important to note that our study was not designed to compare the efficacy of different AID systems. Meaningful comparisons across AID platforms would require randomized controlled trials with standardized pump settings and adjustments for potential confounders. Furthermore, individual optimization of settings would be required as AID technologies often differ significantly in their operational algorithms and adjustable parameters. Therefore, any observed differences in outcomes between AID systems in our study should be interpreted with caution and not as evidence of superiority or inferiority. The primary aim of our study was to assess the real-world impact of AID therapy on glycaemic outcomes in diverse geographic settings. The observed improvements across all AID systems support the general effectiveness of this therapy in routine clinical practice.

Additionally, the majority of participants in the population utilized the same CGM sensor throughout the study period. However, variations in sensor accuracy and performance between different CGM technologies may have introduced a degree of measurement variability when comparing baseline and follow-up glycaemic metrics in patients who transitioned between different CGM sensors.

Furthermore, our regression analysis identified baseline HbA1c as the only significant predictor of HbA1c reduction, with no associations found for age, gender, BMI or diabetes duration. This suggests that AID therapy can be broadly applied across a wide range of patient subgroups to deliver benefit to individuals with varying clinical characteristics. The distribution of AID system type across the three sites varied, with certain sites predominantly utilizing specific pump systems. This can be attributed to several factors, including local device availability, funding mechanisms and clinician/patient preferences. These centre-specific factors influencing device type may have contributed to variability in the results and should be explored further in future prospective studies which are specifically designed for direct system comparisons.

Our study had several limitations. The audit's observational nature means causality cannot be inferred, and the relatively short follow-up period limits the ability to assess long-term sustainability of glycaemic improvements. The study population was predominantly Caucasian, which may affect generalizability to more ethnically diverse groups, and socioeconomically diverse group particularly in regional settings. Additionally, the audit did not directly measure psychosocial outcomes, and resource utilization which are critical for understanding the full impact of AID systems in regional areas where community support may vary. Furthermore, as only participants with linked continuous glucose monitoring (CGM) and insulin pump data were included in the analysis, there is a potential for selection bias. However, in clinical practice, the proportion of patients who decline data linkage due to privacy concerns is very low, suggesting that any impact on the generalizability of our findings is likely minimal. Given the structure of diabetes care in our study sites (wherein device education and technical support were routinely provided), it is unlikely that a lack of IT infrastructure access (e.g. internet access, smartphone availability) acted as a major barrier among individuals excluded in our study. However, limited access to digital infrastructure can certainly pose barriers to AID system access in real-world settings, particularly in rural and remote communities. This factor should therefore be carefully considered in future studies aiming to expand equitable access to diabetes technologies. Additionally, only summary metrics (including time-in-range, time in hyperglycaemia, coefficient of variation) generated by online CGM/insulin pump data platforms were analysed, rather than CGM trace data. While these platforms are validated and commonly used in clinical practice, reliance of summary data may limit the granularity of our glycaemic analyses.

Importantly, our study did not investigate the duration of manual operation in each individual AID system prior to transition to automatic delivery. The duration of manual mode can vary between system types and may have introduced a degree of variability in our results. Future prospective studies should therefore aim to collect these transition times systematically in order to highlight any correlations with glycaemic outcomes. Future research should also focus on longer-term evaluations to assess the durability of glycaemic improvements and their impact on complications such as retinopathy and nephropathy, particularly in regional Australia. Studies involving more diverse ethnic and age groups are needed to ensure equitable benefits, given the current study's demographic limitations. Further research could also explore optimizing AID system use, such as tailoring algorithms for different regional populations or integrating additional lifestyle data.

5 | CONCLUSIONS

This multicentre audit provides robust evidence supporting the effectiveness of AID systems in improving glycaemic control in real-world settings, including regional Australia. The findings reinforce the role of advanced diabetes technologies in enhancing diabetes management and highlight the need for continued research to optimize their use, accessibility and long-term impact. By addressing current limitations and expanding research scope, AID systems can potentially transform diabetes care, offering significant benefits for patients and healthcare systems alike, especially in regional areas in Australia.

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CONFLICT OF INTEREST STATEMENT

Dr. Harshal Deshmukh has received a travel award from Abbott diagnostics. He has also received speaker honoraria from Novo Nordisk, AstraZeneca and Boehringer Ingelheim. These relationships are unrelated to the submitted work. Dr. Deshmukh declares no other conflicts of interest. No other authors declare any relevant conflicts of interest.

PEER REVIEW

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/dom.16485.

DATA AVAILABILITY STATEMENT

The datasets generated and/or analysed during the current study are not publicly available due to patient confidentiality but may be made available from the corresponding author on reasonable request and subject to approval from the relevant Human Research Ethics Committee (HREC).

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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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