What is the impact of automated insulin delivery systems on weight control among people with type 1 diabetes?: a real-world cohort study

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Background

- Obesity is a growing global health problem, also among persons with type 1 diabetes (PWDs).[1,2]
- Weight management in PWDs is becoming an increasing concern due to the elevated risks of complications.[3,4]
- New technologies in the treatment of type 1 diabetes, including automated insulin delivery (AID) systems, have shown improvement in glycemic outcomes and quality of life in PWDs.[5]
- AID use may support weight management; however, not much is known about the effects of AID on weight.
  - In several publications the effects of AID use on weight seem to be neutral for entire study groups.[6]
  - However, some studies indicate a weight increase, and our clinical observation of individuals who gained weight using AID prompted us to examine 486 AID users in more detail.[7]
- This study aimed to evaluate:
  - The course of body mass index (BMI) in PWDs of all ages who started using the MiniMed 780G (MM780G) AID system.
  - The prevalence of increases in BMI z-score or BMI after starting treatment with the MM780G system.
  - Possible associations between and risk factors for changes in BMI and clinical, glucometrics, and AID system parameters.

Methods

- A single-center real-world retrospective cohort study was conducted in PWDs of all ages with ≥1 year of diabetes duration who began using the MM780G AID system at the Diabeter Clinic from April 2022.
- Primary outcome: the difference in BMI z-score[8] (age <21 y) or BMI (kg/m2) (age ≥21 y) between baseline and post-automode.
  - Baseline: at or before the start of automode, from <6 months before to 14 days after the start of automode.
  - Post-automode: >3 to 12 months after the start of automode.
- Binary logistic regression analysis was used to assess the impact of various parameters on the risk (odds ratios and 95% confidence intervals) of an increase in BMI z-score or BMI.
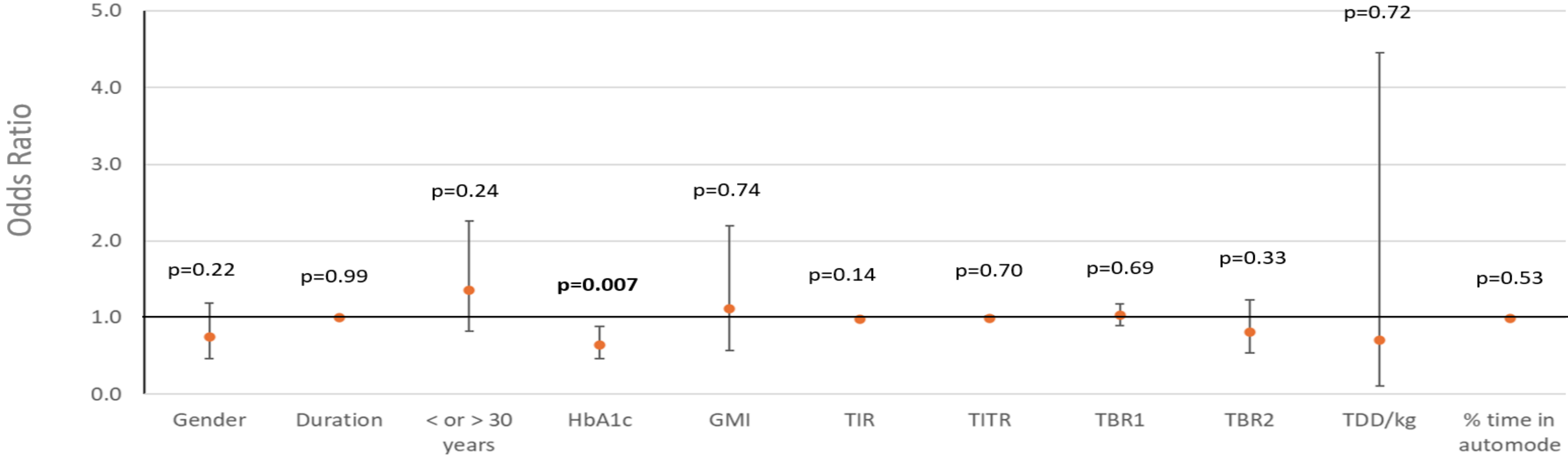
Table 1. Age groups stratified for decreased/stable and increased BMI z-score and BMI after the initiation of MM780G AID auto-mode.

	Overall total	Young			Old		
		Total	Decreased/Stable BMI z-score[9] (≤0.05)	Increased BMI z-score[9] (>0.05)	Total	Decreased/Stable BMI[10] (≤0.2 kg/m^2)	Increased BMI[10] (>0.2 kg/m^2)
n (%)	496	210	72 (34)	138 (66)	286	136 (48)	150 (52)
Age, years	21.1 (16.1–25.7)	15.5 (12.3–17.5)	15.3 (11.8–17.5)	15.6 (12.6–17.6)	24.6 (22.0–31.1)	24.3 (21.8–31.3)	24.6 (22.5–30.2)
Sex, % female	53	50	54	48	55	52	59
Diabetes duration, years	11.7 (5.9–17.2)	6.7 (4.3–10.6)	5.8 (4.3–9.5)	7.2 (4.3–10.8)	16.1 (11.6–20.5)	16.3 (9.8–21.2)	16.0 (11.9–19.9)
HbA1c, mmol/mol %	n=428 60 (52–68) 7.6 (6.9–8.4)	n=192 63 (55–77) 7.9 (7.2–9.2)	n=67 61 (54–72) 7.7 (7.1–8.7)	n=125 65 (56–78) 8.1 (7.3–9.3)	n=236 56 (50–65) 7.3 (6.7–8.1)	n=114 54 (49–63) 7.1 (6.6–7.9)	n=122 57 (52–67) 7.4 (6.9–8.3)
BMI, kg/m^2	NA	NA	NA	NA	25.7 (23.1–28.5)	25.4 (22.8–28.7)	25.8 (23.6–28.3)
BMI z-score, SD	NA	0.57 (-0.03–1.04)	0.78 (0.24–1.10)	0.48 (-0.19–1.01)	NA	NA	NA

Figure 1. Associations between clinical, glucometrics and AID system parameters and BMI z-score in children and adolescents age <21 y.
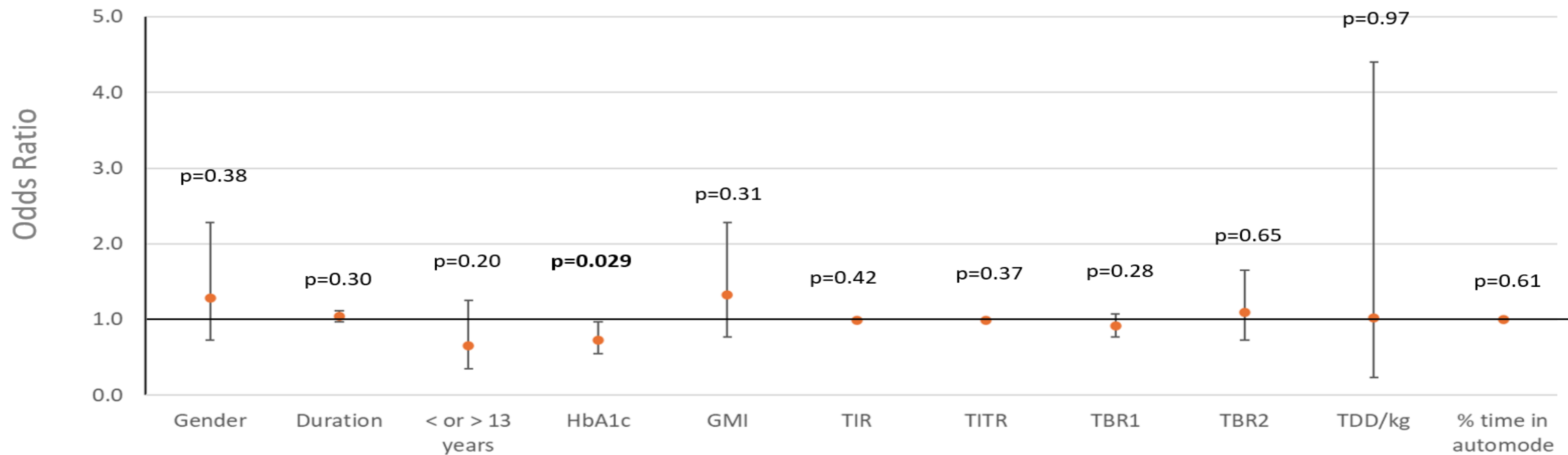
Figure 2. Associations between clinical, glucometrics and AID system parameters and changes BMI in adults age ≥21 y.

AID, automated insulin delivery; BMI, body mass index; PWD, person with type 1 diabetes; OR, oddsratio; CI, confidence interval; GMI, glucose management indicator; TIR, time in range; TITR, time in tight range TBR1, time below range < 54 mg/dl; TBR2, time below range < 70 mg/dl; TDD/kg, total daily dose.

Odds ratios (ORs) and corresponding 95% confidence interval (CI) and p-values for increased BMI Z-score compared with decreased/stable BMI Z-score. Reference group for gender: female. Reference group for </> 13 years: >13 year. Reference group for </> 30 years: >30 year.

Results

- A total of 496 PWDs were included (age <21 y n=210; age ≥21 y n=286), with a median age of 21.3 y and 53% female **(Table 1)**.
- More than half of PWDs increased in BMI after starting MM780G AID automode: young 66% and old 52%. However, many PWDs remained stable or decreased in BMI.
- In multivariable analysis **(Fig. 1 and 2)** HbA1c is the only parameter which is (inversely) associated with the increased weight, for both age groups (young OR: 0.73, CI 0.55– 0.97, p=0.029; old OR 0.64, CI 0.47– 0.89, p=0.070) .
- For both groups (young and old) there were no significant associations found in clinical, glucometrics and AID system parameters on the risk for an increase in BMI z-score or BMI. **(Fig. 1 and 2)**

Conclusions & Discussion

- In both age groups, more than half of the PWDs showed an increase in BMI z-score and BMI after starting MM780G AID automode.
- Of the various parameters assessed for their association with the risk of an increase in BMI z-score and BMI, only Hba1c was statistically significantly associated:
  - Smaller decrease/increased HbA1c was significantly associated with lower risk of weight increase.
- Since reduced hyperglycemia prevents loss of calories, future analyses should identify more risk factors associated with BMI increase, including food behavior, diets, education and the optimal settings associated with the therapy.

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Disclosures

Diabeter is a focused clinic, owned by Medtronic, but with independent prescription and in full accordance with Dutch Healthcare laws and regulations.