Most Youth With Type 1 Diabetes in the T1D Exchange Clinic Registry Do Not Meet American Diabetes Association or International Society for Pediatric and Adolescent Diabetes Clinical Guidelines

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OBJECTIVE—To assess the proportion of youth with type 1 diabetes under the care of pediatric endocrinologists in the United States meeting targets for HbA1c, blood pressure (BP), BMI, and lipids.

RESULTS—American Diabetes Association HbA1c targets of <8.5% for those younger than 6 years, <8.0% for those 6 to younger than 13 years old, and <7.5% for those 13 to younger than 20 years old were met by 64, 43, and 21% of participants, respectively. The majority met targets for BP and lipids, and two-thirds met the BMI goal of <85th percentile.

CONCLUSIONS—Most children with type 1 diabetes have HbA1c values above target levels. Achieving American Diabetes Association goals remains a significant challenge for the majority of youth in the T1D Exchange registry.

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>1.1 mmol/L) and triglycerides <150 mg/dL (<1.7 mmol/L).

The proportion of participants meeting ISPAD and ADA targets for HbA1c, BP, lipids, and BMI were tabulated according to age group. Differences in the characteristics of participants meeting HbA1c targets were evaluated through logistic regression models adjusted for potential confounders. In view of the large sample size only \( P < 0.01 \) was considered statistically significant.

RESULTS—Among the 13,316 pediatric participants, 677 (5%) were 1 to younger than 6 years of age, 5,336 (40%) were 6 to younger than 13 years of age, and 7,303 (55%) were 13 to younger than 20 years of age (mean age, 12.7 years; mean diabetes duration, 5.6 years; 48% female; 78% non-Hispanic white). An insulin pump was used by 55% of participants and a continuous glucose monitor was used by 3%. The median (25th and 75th percentile) number of self-reported self-monitoring of blood glucose per day was 5 (4,7).

The ISPAD and ADA targets for HbA1c, BP, BMI, and lipids are shown according to age in Fig. 1. Mean \( \pm \text{SD} \) for HbA1c was 8.2 \( \pm \) 1.1% in those 1 to younger than 6 years old, 8.3 \( \pm \) 1.2% in those 6 to younger than 13 years old, and 8.8 \( \pm \) 1.7% in those 13 to younger than 20 years old. The age-specific ADA HbA1c target was met by 32% of participants and the ISPAD HbA1c target of \( \leq 7.5\% \) was met by 25% of participants. The percentage meeting ADA and ISPAD HbA1c targets was higher in the younger age groups compared with the group 13 to younger than 20 years old (\( P < 0.001 \) for ADA and ISPAD). Among pump users 1 to younger than 6 years old, the proportions of participants meeting the ADA and ISPAD HbA1c targets were 79 and 37% compared with 50 and 17% among injection users (\( P < 0.001 \), adjusted for diabetes duration, race/ethnicity, household income, insurance, and self-monitoring of blood glucose per day). In those 6 to younger than 13 years old, 50 and 32% of insulin pump users met the ADA and ISPAD HbA1c targets compared with 34 and 20% of injection users (\( P < 0.001 \)). There was not a significant difference in the percentage meeting HbA1c targets between insulin pump users and injection users among the group 13 to younger than 20 years old (24 and 27% of

![Figure 1](#)
pump users vs. 18 and 20% of injection users; \( P = 0.11 \) and 0.02). Only 14% of non-Hispanic black participants met the ADA HbA1c target compared with 34 and 28% in non-Hispanic white and Hispanic participants (adjusted \( P < 0.001 \)). Among participants with available data, 95 and 86% met ADA and ISPAD targets; 78, 63, 65, and 90% met BP, BMI, LDL, and triglycerides targets.

**CONCLUSIONS**—These data from the T1D Exchange describe how frequently ADA and ISPAD targets are met in the largest reported sample (\( N = 13,316 \)) of youth with type 1 diabetes in the United States. Only approximately one-third of participants met the age-specific ADA and ISPAD targets for HbA1c. Although the majority of participants did meet BP, lipid, and BMI targets, the frequency of abnormalities for these vascular disease risk factors is concerning (13).

Because the clinic registry is not a population-based study, these results may not be representative of all youth with type 1 diabetes. However, participant characteristics were similar to those of patients not enrolled into the registry at the 67 clinics and when compared with the SEARCH for Diabetes in Youth Study (12). Comparisons with DPV German registry are difficult because of differences in target definitions (14). Another limitation is the number of participants missing fasting lipid results and with HbA1c results obtained from point of care.

Despite advances in technologies and strategies for care, achieving HbA1c targets remains a significant challenge for the majority of youth in the T1D Exchange registry. Moreover, a large number of youth with diabetes already have additional vascular disease risk factors at a young age. This analysis suggests further transformations to improve pediatric diabetes care are needed to prevent future complications of diabetes.

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J.R.W. initiated the idea, wrote the manuscript, contributed to discussion, and reviewed and edited the manuscript. K.M.M. performed statistical analysis, wrote the manuscript, contributed to discussion, and reviewed and edited the manuscript. D.M.M. initiated the idea, wrote the manuscript, contributed to discussion, and reviewed and edited the manuscript. R.W.B. wrote the manuscript, contributed to discussion, and reviewed and edited the manuscript. L.A.D. contributed to discussion and reviewed and edited the manuscript. S.E.W. contributed to discussion and reviewed and edited the manuscript. W.V.T. contributed to discussion and reviewed and edited the manuscript. M.Q. contributed to discussion and reviewed and edited the manuscript. R.W.B. is the guarantor of this work and, as such, had full access to all the data in the integrity of the data and the accuracy of the data analysis.

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