GLYCEMIC CONTROL IN RELATION TO TECHNOLOGY USE IN A SINGLE CENTER COHORT OF CHILDREN WITH TYPE 1 DIABETES (T1D)

Marisa Sobczak[1], Alexandra Sawyer[2], G. Todd Alonso[3], Gregory P. Forlenza[3]

1. University of Colorado School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO
2. Department of Pediatrics, University of Colorado Anschutz Medical Campus, Aurora, CO
3. Barbara Davis Center, University of Colorado Anschutz Medical Campus, Aurora, CO

Background: Diabetes technology, including continuous glucose monitoring (CGM) and insulin pumps are improving and being used more commonly. The use of insulin pumps, CGM, and hybrid closed loop (HCL; combining pumps and CGM with algorithms that automatically adjust insulin delivery), are associated with lower A1c trends.

Objective: To evaluate the use of pump, CGM, and HCL technology and their impact on glycemic control among pediatric patients with T1D.

Method: Medical records at the Barbara Davis Center (BDC) were examined to identify patients with T1D between 1/2018 and 12/2020 who at their last visit were <22 years old; had diabetes duration >3 months; and had available A1c, pump usage, and CGM data. Data were analyzed by age group and technology-use group: multiple daily injection with blood glucose meter (MDI/BGM), pump with BGM (pump/BGM), MDI with CGM (MDI/CGM), and pump with CGM (pump/CGM). Glycemic control (A1c) was compared using ANCOVA and controlling for diabetes duration, race, and insurance.

Results: Among 4003 eligible patients, Table 1 shows comparisons of mean A1c and percent of patients with A1c <7.0% by technology use group and age group. Patients in the pump/CGM group had the lowest A1c in each of the age categories. In patients without CGM, pump/BGM users had similar A1c to MDI/BGM users (10.0 vs 10.0, $p<0.001$). The pump/CGM users had a significantly lower A1c than MDI/CGM users (8.1 vs 8.6, $p<0.001$). MDI/CGM users had lower A1c than pump/BGM users (8.6 vs 10.0, $p<0.001$). Patients who used HCL had significantly lower A1c compared to those who used pump/CGM without HCL (7.6 vs 8.3, $p<0.001$; Table 2).

Conclusion: Approximately half of patients are using both CGM and pump, which is associated with lower A1c. While CGM use is associated with a lower A1c regardless of pump use, pump use is only associated with a lower A1c if used with CGM. HCL technology was associated with the lowest A1c.

Table 1. Comparison of mean A1c [SD] and percent with A1c <7.0% by age and technology use.[a,b]					
	Total n = 4003	MDI/BGM n = 817 (20.4%)	Pump/BGM n = 577 (14.4%)	MDI/CGM n = 616 (15.4%)	Pump/CGM n = 1993 (49.8%)
Age Group (n) Mean [SD] Met Goal A1c %	8.8 [2.2] 17.6	10.0 [2.6] 8.9	10.0 [2.3] 4.9	8.6 [2.2]**** 22.9***	8.1 [1.6]**** 23.1***
< 6 (185)	7.8 [1.4] 25.4	9.0 [1.8] 7.4	8.9 [0.8] 0.0	7.7 [1.5]* 23.4	7.4 [1.1]**** 32.1
6 - < 12 (921)	8.2 [1.7] 20.2%	9.3 [2.2] 12.2	9.2 [1.7] 4.6	8.2 [1.8]**** 21.1	7.8 [1.3]**** 23.6*
12 - <18 (1897)	9.0 [2.3] 16.5	10.2 [2.7] 9.7	10.4 [2.4] 2.9	8.7 [2.3]**** 25.0***	8.2 [1.7]**** 20.9***
18 - < 22 (1000)	9.2 [2.5] 15.7	10.2 [2.7] 6.3	9.8 [2.3] 7.3	9.2 [2.8]* 20.3**	8.2 [2.0]**** 25.4***

a. Controlling for diabetes duration, race, insurance (Medicaid vs other)
b. Significantly different from the reference group (MDI/BGM) at a P-value of <0.05*, <0.01**, <0.001***, or < 0.0001****

Table 2. Comparison of A1c Between non-HCL users and HCL users among pump and CGM combined users[a,b], Mean [SD], Percent with A1c <7%		
	Pump + CGM without HCL n = 1287	Pump + CGM with HCL n = 706
Age Group (n) Mean [SD] Met Goal A1c %	8.3 [1.8] 19.4	7.6 [1.2]**** 29.9***
< 6 (106)	7.5 [1.2] 30.2	7.1 [0.7] 40.0
6 - <12 (554)	8.0 [1.4] 20.4	7.5 [0.9]**** 30.5**
12 - <18 (939)	8.5 [1.9] 17.6	7.8 [1.3]**** 25.9***
18 - < 22 (394)	8.6 [2.1] 18.4	7.4 [1.2]**** 38.4***

a. Controlling for diabetes duration, race, insurance (Medicaid vs other)
b. Significantly different from the reference group (MDI/BGM) at a P-value of <0.05*, <0.01**, <0.001***, or < 0.0001****