Continuous glucose monitor (CGM) use with or without insulin pump use is associated with lower A1c in pediatric patients with type 1 diabetes (T1D)

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BACKGROUND

- The recommended A1c goal is <7%. Fewer than 1 in 5 pediatric patients achieve this.
- Prolonged hyperglycemia leads to long-term microvascular and macrovascular complications.
- Continuous glucose monitoring (CGM), insulin pumps, and hybrid closed loop (HCL) systems are improving, being used more commonly in the pediatric population, and impact glycemic control.
- Few analyses have evaluated glycemic trends in US children following widespread rollout of these new technologies:
  - 2016: FDA approval of non-adjunctive use of Dexcom's G5 CGM
  - 2017: First hybrid closed loop system approved (Medtronic 670G)
  - 2018: FDA approval of factory calibrated CGMs
  - 2020: Second closed loop system approved (Tandem Control-IQ)

OBJECTIVES

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

METHODS

- Retrospective analysis of 4,003 patients from the Barbara Davis Center at the University of Colorado
- Inclusion Criteria:
  - T1D
  - <22 years old
  - diabetes duration >3 months
  - available A1c, pump usage, and CGM data
- A1c compared with ANCOVA (corrected for diabetes duration, race, and insurance)
- P values corrected by the Bonferroni method

DATA & RESULTS

RESULTS- Mean A1c

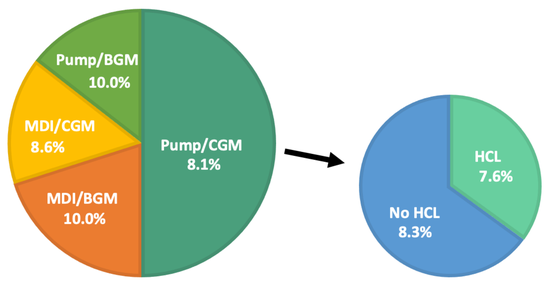
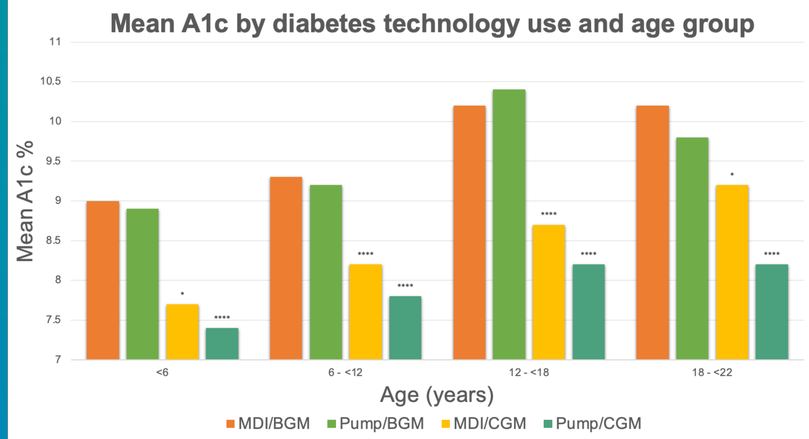


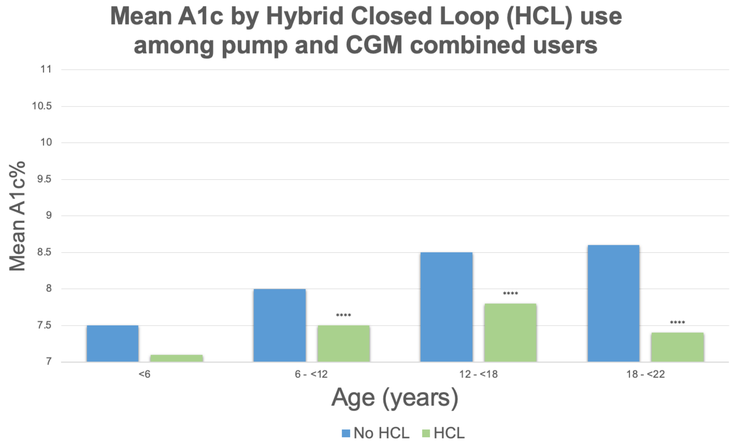
Table. Comparison of mean A1c [SD] and percent with A1c <7.0% by age and technology use. †,‡,§

	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***

†. % meeting goal defined as proportion of patients with current ISPAD A1c target of < 7.0%
‡. Controlling for diabetes duration, race, insurance (Medicaid/not)
§. Significantly different from the reference group (injections, no CGM) at a P-value of <0.05*, <0.01**, <0.001***, or < 0.0001****



Significantly different from the reference group (MDI/BGM) at a P-value of <0.05*, <0.01**, <0.001***, or < 0.0001****



Significantly different from the reference group (pump/CGM without HCL) at a P-value P-value of <0.0001****.

RESULTS

- Pump/CGM group had lowest A1c in each age category.
- Patients without CGM:
  - Pump/BGM users had similar A1c to MDI/BGM users across all age groups
- Single tech users:
  - MDI/CGM users had significantly lower A1c than pump/BGM users across all age groups
- Pump/CGM users had a significantly lower A1c than MDI/CGM users across all age groups

RESULTS

- Among Pump/CGM patients:
  - HCL users had significantly lower A1c compared to those without HCL (7.6 vs 8.3, p<0.001).

DISCUSSION

- One of the first large, real-world US cohorts of pediatric patients with T1D evaluating A1c trends in the current technology era.
- Disparities in technology use exist across insurance, race/ethnicity, and language.
- HCL users had A1c 0.7% lower than Pump/CGM without HCL
- 10% more HCL users achieved A1c of <7% = a 54% relative increase
- Differences in the small group of patients < 6 years of age (n=105) were not statistically significant, but the trend and magnitude were similar to the other groups
- Greatest difference in A1c with addition of HCL to pump and CGM use was in patients 18 - < 22 years of age, where use of HCL more than doubled the likelihood of achieving A1c <7%.

CONCLUSIONS

- ~1/2 of patients are using both pump and CGM. Combined pump and CGM use is associated with the lowest A1c
- CGM is associated with a lower A1c regardless of pump use
- Pump use is only associated with lower A1c when used with a CGM
- HCL users had 0.7% lower A1c than Pump/CGM users without HCL

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