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

RESULTS
- **Data & Results**

**RESULTS- Mean A1c**

![Graph showing mean A1c by diabetes technology use and age group]

**Table. Comparison of mean A1c (SD) and percent with A1c <7.0% by age and technology use.**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mean SD</th>
<th>MDI/BGM</th>
<th>Pump/BGM</th>
<th>Pump/CGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4 (n=432)</td>
<td>8.2 (%)</td>
<td>10.1(4)</td>
<td>9.2(4)</td>
<td>8.1(4)</td>
</tr>
<tr>
<td>4 - 12 (n=129)</td>
<td>8.2 (1.4)</td>
<td>10.1 (4.2)</td>
<td>9.2 (4.1)</td>
<td>8.1 (4.4)</td>
</tr>
<tr>
<td>13 - 18 (n=89)</td>
<td>9.0 (2.1)</td>
<td>10.2 (4.3)</td>
<td>9.4 (4.9)</td>
<td>8.1 (4.6)</td>
</tr>
<tr>
<td>18 - 22 (n=98)</td>
<td>9.2 (3.4)</td>
<td>10.2 (4.7)</td>
<td>9.2 (4.0)</td>
<td>8.2 (4.9)</td>
</tr>
</tbody>
</table>

**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.

**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 compared to those without HCL (7.6 vs 8.3, p<0.001).

**REFERENCES:**
- Wadwa LG, Beck RW, et al. Safety Evaluation of the MiniMed 670G System in Children 7-<22 years of age, where use of HCL more than doubled the likelihood of achieving A1c <7%.

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