Diabetes Technology Overview (State of the Art)

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Objectives

• Identify and discuss currently available diabetes technology
• Discuss 2020 ADA recommendations related to technology for children with diabetes
• Discuss benefits and limitations of currently available diabetes technology
Disclosures

• No Financial Conflicts of Interest
• We will only discuss therapies that are currently FDA approved
Current Diabetes Technology

Glucose Monitoring
- Continuous Glucose Monitors (CGMs)
- Glucometers

Combined Pump + Sensor Systems
- Hybrid-Closed Loop Systems
- Suspend on or before low

Insulin Delivery
- Insulin Pumps
- Syringes and Vials
- Smart Insulin Pens
- Insulin Pens
Glucose Monitoring
Continuous Glucose Monitor Basics

• CGM systems consist of 3 components:
  • Sensor
  • Transmitter
  • Receiver

• System provides:
  • Glucose value every 5 minutes
  • Direction of glucose change
  • Recent glucose trends
CGM vs. Blood Glucose

<table>
<thead>
<tr>
<th>Time</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Supper</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mg/dL)</td>
<td>50</td>
<td>70</td>
<td>180</td>
<td>250</td>
</tr>
</tbody>
</table>

Blood Glucose Checks
CGM
ADA 2020 Guidance on CGM Use

Continuous glucose monitoring (CGM) should be considered in all children and adolescents with type 1 diabetes, whether using injections or continuous subcutaneous insulin infusion, as an additional tool to help improve glucose control. Benefits of CGM correlate with adherence to ongoing use of the device.
Insulin Delivery
Smart Pens

• Look like basic insulin pen
• Communicate with app on smart device to track insulin doses, insulin on board
  • Rapid-acting insulin only
• Dosing in 0.5 unit increments
• Little demand from patients in our practice
Insulin Pumps

- Pump delivers only rapid-acting insulin (lispro, aspart, or glulisine)
- Provides basal and bolus dosing
- Insulin is delivered through a cannula into the subcutaneous tissue
In this section, we will discuss the ADA 2020 Guidance on Insulin Pump Use. Insulin pump therapy may be considered as an option for all adults, children, and adolescents with type 1 diabetes who are able to safely manage the device.
Combined Pump + Sensor Systems
Combined Pump + Sensor Systems

• To automate insulin delivery the system requires:
  • an insulin pump
  • a continuous glucose monitor
  • an algorithm to determine insulin delivery.

• Suspend on or before low
  • Alters basal insulin delivery in response to low or falling glucose

• Hybrid-Closed Loop Systems
  • Sensor relays data to pump every 5 minutes
  • Alters basal insulin to prevent low, or try to address elevated or rising glucose
  • Medtronic (2017), Tandem (late 2019)
Technology Considerations

**Potential Benefits**
- Improved glucose control
- Reduction in hypoglycemia
- Ability to identify patterns and modify behavior
- Parental and child satisfaction
- Fewer injections/finger pokes
- Reduced disruption of normal daily activities

**Potential Barriers/Complications**
- Cost/Insurance coverage
- Wearing device on body
- Data overload
- Alarm Fatigue
- Negotiating boundaries/managing data
- Risk for DKA (insulin pump)
Technology Limitations

“Simply having a device or application does not change outcomes unless the human being engages with it to create positive health benefits. “

“Expectations must be tempered by reality—we do not yet have technology that completely eliminates the self-care tasks necessary for treating diabetes...”

-ADA Standards of Medical Care in Diabetes 2020
References

American Diabetes Association (ADA) (2020). Diabetes Technology. In Standards of Medical Care in Diabetes (Chapter 7). Diabetes Care, 43(S1), PP S77-S88.

American Diabetes Association (ADA) (2020). Children and Adolescents. In Standards of Medical Care in Diabetes (Chapter 11). Diabetes Care, 43(S1), PP S163-S182.

