ADULT TRACK

DIABETES TECHNOLOGIES IN ADULTS

Halis Kaan Akturk MD
Assistant Professor of Medicine and Pediatrics
Barbara Davis Center, Adult Clinic
University of Colorado

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Research grant through University of Colorado:
Senseonics, REMD Pharmaceuticals, Eli Lilly, Mannkind

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HISTORY OF INSULIN PUMP TECHNOLOGY

1960s/70s  1970s/80s  1990s  2000s  2009 to present
MEDTRONIC 670 G- FIRST HYBRID CLOSED LOOP

- Target BG: 120 mg/dl
- Temporary target: 150 mg/dl
- Auto mode driven control
- Calibration required
- BDC has highest 670 G user volume

OMNIPOD DASH

- Bluetooth-enabled Pod
- Mirroring to phone app
- Calorie King app integration
- Connectivity to glucose meter
- Side by side Dexcom CGM monitoring on app (No direct integration)
TANDEM X2 BASAL IQ

- Predictive low glucose suspend
- Integration with Dexcom G6
- No calibration

BEYOND HBA1C- TIME IN RANGE

The Many Faces of a 7% A1c

The image shows a graph with three time periods labeled 1, 2, and 3, each with different percentages representing time spent in high, in range, and low glucose levels.
CURRENT CGM TECHNOLOGIES

DEXCOM G6
- 10 day use
- No calibration
- Simplified insertion
- High/low alarms
- Sharing with loved ones

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CURRENT CGM TECHNOLOGIES

FREESTYLE LIBRE
- 10 or 14-day wear options
- No calibration
- No high/low alarms
- 14-day version can use IPhone as a reader

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CURRENT CGM TECHNOLOGIES

MEDTRONIC GUARDIAN SENSOR 3 AND GUARDIAN CONNECT

- 7-day wear
- 2 calibration per day (3-4 calibration can optimize accuracy)
- High/low alarms
- Sharing with loved ones
- Works with Sugar IQ Diabetes Assistant

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CURRENT CGM TECHNOLOGIES

SENSEONICS EVERSENSE

- Implantable CGM- insertion in clinic visit
- 3-month wear*
- Wearable, rechargeable transmitter
- 2 calibration per day
- High/low alarms on phone/ on-body vibration alerts

*Current ongoing multi-center study (PROMISE) including BDC assesses 6-month use (Europe approval is 6 months)

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DECISION MAKING TECHNOLOGIES
SUGAR IQ DIABETES ASSISTANT APP

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SMART PENS- INPEN

- Pen is paired with app via Bluetooth
- Novolog or Humalog cartridges
- Insulin carb ratio, correction, insulin on board calculator (like using a pump)
- Insulin dose tracking/reminders
- Data sharing with others
- Integration with Dexcom G6 and some glucometers via smart phone health app (not a direct communication)
SMART PEN ADD ON- GOCAP

- Add on is paired with app via Bluetooth
- Works with all insulin pens
- Insulin dose tracking/reminders
- Temperature monitoring
- Data sharing with others
- USD rechargeable

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FUTURE CLOSED-LOOP SYSTEMS

**INSULIN ONLY**
- Medtronic 780G*
- Tandem X2 Control IQ- Second half of 2019
- Omnipod Horizon
- Omnipod Tidepool Loop
- University of Cambridge*
- University of Virginia /Padova (TypeZero)*
- Bigfoot
- Illinois Institute of Technology
- Renssealer Polytechnic Institute

**DUAL (INSULIN AND GLUCAGON)**
- Boston University-let (Beta Bionics)*
- University of Montreal (Exercise management focused)**
- University of Oregon (Exercise management focused)*

Some systems use insulin-amylin dual pump


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CHALLENGES IN AP DEVELOPMENT

**INSULIN ONLY**
- Exercise
- Concomitant medications (SGLT 1-2, inhaled insulin)
- New faster insulins
- Meal input (or not)
- Cost

**DUAL (INSULIN AND GLUCAGON)**
- Same problems of insulin only systems PLUS
- Nausea*
- Adverse skin reactions
- Pump compatibility (Glucagon stabilization) → Dasiglucagon (A new aqueous stable glucagon for pumps)*

*Teletb, Diabetologia, 2016; +Castle, DTT 2019

DIY AP

- NightScout #wearenotwaiting, x-Drip
- LOOP (Uses Medtronic and recently Omnipod)
- Open APS
- Android APS
- HAPP

Not FDA approved/regulated products
PUMP AND CGM DISCONTINUATION RESULTS

<table>
<thead>
<tr>
<th>Most Common Reasons for Pump Discontinuation</th>
<th>Most Common Reasons for CGM Discontinuation</th>
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<tbody>
<tr>
<td>Problem with insulin, injection</td>
<td>Problems with CGM working properly</td>
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<td>Most common reason to discontinue CGM</td>
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Courtesy of Dr. Shah, T1D Exchange Data

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SUMMARY

- Diabetes Technology moves fast
- Individualizing the technology (Fits patient’s lifestyle)
- Patient-centered approach with shared decision-making
- Close monitoring/ trouble shooting after introduction of a new technology
THANK YOU

Barbara Davis Center is working for a better life for people with diabetes