

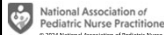
In-person
March 13-16, 2024

Virtual
May - July 31, 2024

45th National Conference on Pediatric Health Care

408: Digital Innovations in Type 1 Diabetes Treatment: Empowering Primary Care Providers

Sally Humphrey, DNP, APRN, CPNP-PC
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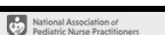
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Experts in pediatrics, Advocates for children.

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Speaker Disclosure

- The speaker has no financial disclosures.




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Learning Objectives

- Identify common insulin pumps and continuous glucose monitoring systems (CGMS) used in the treatment of pediatric diabetes.
- Recognize the impact of diabetes technology on the lives of children and families with diabetes.
- Describe approaches to support children wearing diabetes technology in the classroom and at home.
- Critically evaluate key data produced by common diabetes technology.





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Lecture Outline

- Basal/bolus insulin basics
- Pump basics: basal rates/bolus settings
- What pumping looks like
- CGMS
- Types of insulin pumps
- Benefits of pump therapy
- Complications/issues with pump use
- Pump candidate selection
- Pump initiation/follow up
- Management of pump patients
- Adult involvement

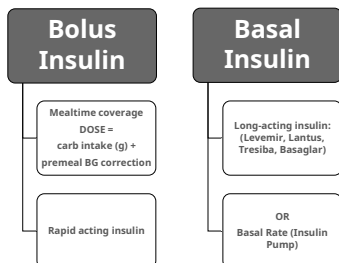




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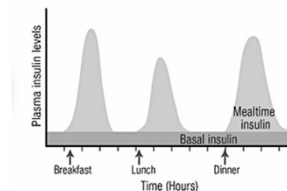
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Pump Basics: Basal/Bolus Insulin Therapy



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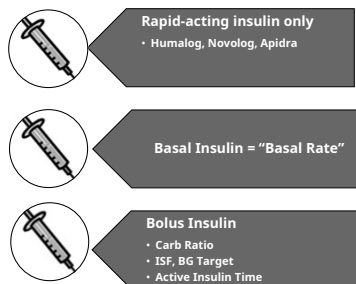
Pump Basics: Basal/Bolus Insulin Therapy



From Hirsch, I. B., Junek, R., Beale, L. M., Antalis, C. J., & Wright, E. E. (2020). The Evolution of Insulin and How It Informs Therapy and Treatment Choices. *Endocrine reviews*, 41(5), 753-755. <https://doi.org/10.1210/er.2020-00113>. Copyright 2021 by the Endocrine Society.

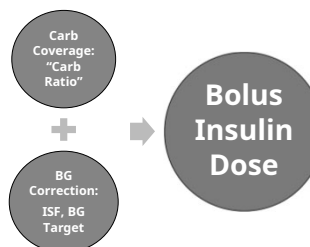
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Pump Basics



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Bolus Insulin Calculations

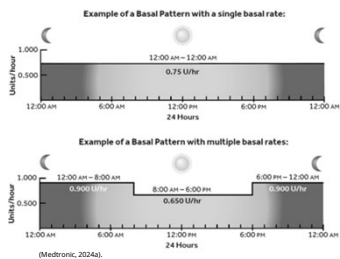


Terminology:

- Carb Ratio: 1 unit insulin for X amount CHO
- Insulin Sensitivity Factor (ISF): 1 unit will decrease BG by X mg/dL
- BG Target: Target glucose for correction

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Insulin Pump: Basal Rates



Common Sensors (CGMS)

- Dexcom
 - G7, G6
- Medtronic Guardian
- Freestyle Libre 3
- Eversense



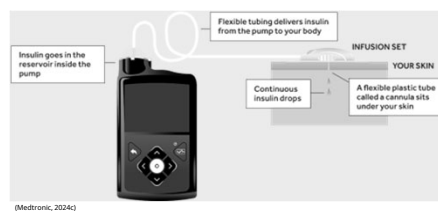
Common Insulin Pumps

- Medtronic
 - MiniMed 780G
- Insulet
 - Omnipod 5
- Tandem
 - t:slim X2
- Beta Bionics
 - iLet Bionic Pancreas



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Pump Components



Slide 9

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Slide 10

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Automated Insulin Delivery (AID) Algorithms

Medtronic SmartGuard Tech (MiniMed 780G)

(Medtronic, 2024c)

Tandem Control IQ (t:slim X2)

(Tandem, 2024)

Insulet SmartAdjust (Omnipod 5)

(Insulet, 2024b)

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What Pumping Looks Like

(Insulet, 2024c)

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(Medtronic, 2024e)

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Benefits of Insulin Pump Therapy

- Precise insulin dosing
 - Minimum: 0.05 u increments
- More insulin dosing variability
- Adaptability
- Convenience
- Improved glycemic control

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Complications & Issues with pump use

- Hypoglycemia
- Hyperglycemia
- Infusion delivery issues:
 - Kinked catheter
 - Bubbles in line
 - Pump technical issues
- Pump misuse

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Slide 13

SH0 Cite-medtronic, tandem???

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Slide 14

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Pump Candidate Selection



- Established patient
- Responsible/engaged patient and caregivers
 - Compliance with diabetes management
 - Keeps regular appointments
 - Open communication with provider
- Relatively good glycemic control
- Cognitively/physically able to handle pumping

Pump Initiation & Follow-Up

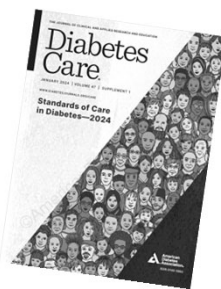
- Initiation:
 - Pretraining
 - 1-2 official training sessions
- Follow-Up:
 - Daily with pump trainer
 - 1-2 weeks in clinic



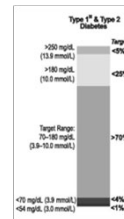
2024 ADA Standards of Care



American Diabetes Association (ADA) Standards of Care in Diabetes – 2024
(<https://professional.diabetes.org/standards-of-care>)



ADA Time in Range Target Guidelines



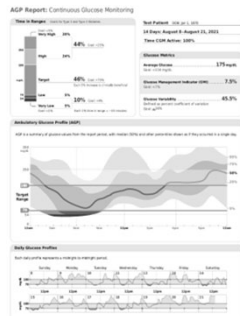
Metric	Interpretation	Goals
1. Number of days CGM device is worn		14-day wear for pattern management
2. Percentage of time CGM device is active		70% of data from 14 days
3. Mean glucose	Simple average of glucose values	*
4. Glucose management indicator	Calculated value approximating A1C (not always equivalent)	*
5. Glucose variability (GV) target	Spread of glucose values	<100%
6. TIR: % of readings and time >200 mg/dL (11.1 mmol/L)	Level 1 hypoglycemia	<5% (most adults); <3% (older adults)
7. TIR: % of readings and time 180–200 mg/dL (10.0–11.1 mmol/L)	Level 1 hypoglycemia	<25% (most adults); <10% (older adults)
8. TIR: % of readings and time 70–180 mg/dL (3.9–10.0 mmol/L)	In range	>70% (most adults); >50% (older adults)
9. TIR: % of readings and time 54–70 mg/dL (3.0–3.9 mmol/L)	Level 1 hypoglycemia	<4% (most adults); <2% (older adults)
10. TIR: % of readings and time <54 mg/dL (<3.0 mmol/L)	Level 2 hypoglycemia	<1%

CGM, continuous glucose monitoring; CV, coefficient of variation; TIR, time above range; TIR, time below range; TIR, time in range. *Goals for these values are not standardized. Some studies suggest that lower A1C targets (<7.0%) provide additional protection against hypoglycemia for those receiving insulin or sulfonylureas. Goals are for level 1 and level 2 hypoglycemia combined. Goals are for level 1 and level 2 hypoglycemia combined. Adapted from Battelino et al. (22).

(American Diabetes Association [ADA], 2024, p. S111–S125.)

Ambulatory Glucose Profile (AGP)

(ADA, 2024, p. S111-S125)



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PCP Role



- Regular schedule of Well-Child checks
 - Monitor growth/puberty
 - Screening – depression
 - Regular immunization schedule
- Treatment of common childhood illnesses
- Basic understanding of:
 - Sick day/ketone treatment
 - Diabetes technology

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PCP Role



(Medtronic, 2024f)

- Support patient and family
 - Mental/behavioral health needs
 - Parenting resources
- School needs
 - School attendance
 - Sports
 - Diabetes Care Plan
 - Advocacy – 504 plan, IEP
 - Cell phone use!
- Communication with endocrine provider

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Sick Day Protocol



General Principles

- Identification & Treatment of underlying illness
- Supplementary insulin doses
 - Continue normal insulin regimen
- Frequent BG/urine ketone checks
 - BG q 2 hours
 - Urine ketones q 4-6 hours
- Increased fluids
- Communication with endocrinology provider

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Sick Day Protocol

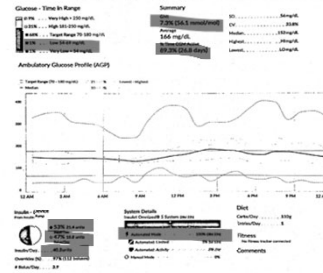


Pump-Specific Principles

- Troubleshoot pump issues
 - Change pump site/tubing/insulin
- Bolus via injections
 - Rapid-Acting insulin for blood sugar correction
- Pump failure plan
 - Always have long-acting insulin as backup!

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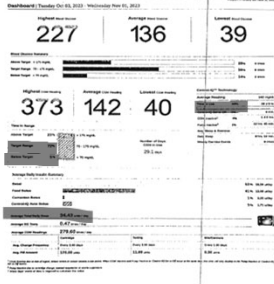
Omnipod 5 Patient Example



- Patient: JH
- 15-year old male
- T1D for many years
- New pumper as of December 2023
- Competitive baseball/soccer player
- AGP areas of focus:
 - PM hyperglycemia

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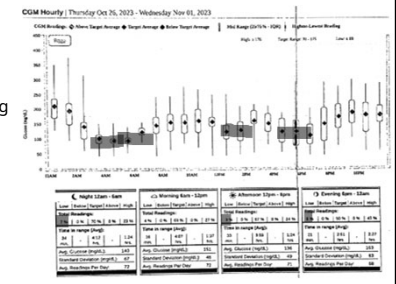
Tandem Control IQ Patient Example



- Patient: EE
- 15-year old male
- T1DM x 2 years
- Other dx: Autism Spectrum Disorder, Food Aversions
- Insulin pump x 1 year
- Mother very anxious

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Tandem Control IQ Patient Example (continued)



- AGP areas of focus:
 - AM hypoglycemia
 - Late afternoon/early evening hypoglycemia

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Technology

- Dexcom
- Freestyle Libre 3
- Medtronic Guardian Connect
- Eversense Implantable Sensor

Insulin Pump Systems:

- Medtronic
- Omnipod
- Tandem
- Beta Bionics Ilet Pump

Other Devices:

- InPen Smart Pen Device

- **Other Resources**

- Association of Diabetes Care & Education Specialists (ADCES)
- Danatech (Diabetes Tech Focus)
 - Pump Troubleshooting Resource
- Juvenile Diabetes Research Foundation (IDRF)
 - Preventing/Managing DKA
 - Using CGMS
 - Resource for School
- Children with Diabetes (great resource for families)
- American Diabetes Association (ADA)
- The Diabetes Link (great resource for teens and young adults)



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Questions?

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