CGM Basics for Individuals with Type 1 Diabetes at FQHCs

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Key Case Study: Alejandro

Primary Benefits of CGM in Type 1 Diabetes

Real-Time Monitoring Advantages

- Shows glucose levels with trends in real time
- Removes barriers to glucose awareness
- Enables informed decision-making
- Provides current glucose, direction of change, and rate of change
- Helps prevent hyperglycemia and hypoglycemia
- Extra protection for overnight lows
- Ability to share data with family members

Clinical Visit Benefits

- Metrics show time in range (TIR), time above/below range, and glycemic variability
- Remote download capabilities
- Robust data for therapy intensification
- Potential to prevent hospitalizations through early trend recognition

CGM in Low-Income Adults with Type 1 Diabetes

Disparities and Challenges

- Low-income individuals with T1D experience:
    - Greater glucose instability
    - More complications (hypoglycemia, DKA)
    - Higher rates of ED visits, hospitalizations, and deaths
- **Medicaid patients least likely to receive CGM, especially people of color**

Barriers to CGM Access

- **Social Determinants of Health:**
    - Limited access to endocrinologists
    - Insurance coverage issues
    - Low-income constraints
- **Provider-Related Barriers:**
    - Primary care providers less confident in insulin titration
    - PCPs less confident in using/interpreting CGM data

BGM vs. CGM Comparison

Feature	**Blood Glucose Monitoring (BGM)**	**Continuous Glucose Monitoring (CGM)**
Accuracy	✓ Higher point-in-time accuracy	✓ Good overall accuracy
Discomfort/Hassle	✗ Requires fingersticks	✓ Minimal discomfort
Cost/Accessibility	✓ More accessible	✗ Higher cost, insurance barriers
Trending Information	✗ Point-in-time only	✓ Shows glucose trends
Safety Alerts	✗ None	✓ Real-time alarms
Detailed Data Reports	✗ Limited data	✓ Comprehensive reports
Safety/Peace of Mind	✗ Gaps in monitoring	✓ Continuous monitoring

What BGM Misses

- Unnoticed highs and lows between fingerstick tests
- Glucose trends and patterns
- Overnight glucose excursions
- Rapid glucose changes

Libre 2 and 3 CGM Components

Sensor Technology

- **Glucose sensor:** Inserted in subcutaneous tissue of upper arm
- **Built-in transmitter:** Integrated into sensor
- **Signal generation:** Creates minute current when in contact with interstitial glucose
- **Wireless transmission:** Sends data to smartphone or reader

System Features

- **Sensor duration:** 14-15 days (adhesive may not last full duration)
- **Calibration:** 0 fingerstick calibrations required daily
- **Data storage:** 90 days of glucose data
- **Scanning:** Through clothing within 1.5 inches
- **Water resistance:** Suitable for daily activities

Understanding CGM Accuracy

MARD (Mean Absolute Relative Difference)

- **Definition:** Average percent deviation from reference lab values
- **Lower MARD = Greater accuracy**
- **Libre 2 & 3 Performance:**
    - Overall MARD: 8.2%
    - Within ±20/20%: 93.7% (adult)

Low Glucose Accuracy

- <70 mg/dL: 98.9% (adult)
- 54-69 mg/dL: 99.0% (adult)
- <54 mg/dL: 98.3% (adult)

Lag Time Concepts

Physiological Basis

- **Interstitial fluid (ISF) glucose lags capillary glucose by 3-5 minutes**
- Longer lag with diminished subcutaneous blood flow (exercise, stress)

- Signals averaged every 1 minute to generate data points

Clinical Implications

- **Glucose Rising:** CGM likely reads lower than actual blood glucose
- **Glucose Falling:** CGM likely reads higher than actual blood glucose
- **Glucose Stable:** CGM in equilibrium with blood glucose

Libre 2 System Features

Display Components

- **Current glucose reading:** Numerical value
- **Trend arrow:** Direction glucose is heading
- **8-hour history graph:** Recent glucose patterns
- **Target range indicators:** Visual glucose zones
- **Alarm settings:** Customizable alerts

Alarm System

- **Low Glucose Alarm:** Setting range 60-100 mg/dL
- **High Glucose Alarm:** Setting range 120-400 mg/dL
- **Signal Loss Alarm:** No connection >20 minutes between reader and sensor
- **Important:** Libre 2 alarms require scanning to see glucose value and take action

Clinical Decision-Making

When to Check Fingerstick Blood Glucose

- First 24 hours after sensor insertion (accuracy concerns)
- When symptoms don't match CGM reading
- Before making insulin dose adjustments if uncertain
- During rapid glucose changes
- When glucose is falling quickly

Case Study Application

Scenario: First day of new sensor, CGM shows 280 mg/dL before lunch with upward trending arrow, patient feels fine.

Recommended Action: Check fingerstick blood glucose (FSBG) to confirm reading before adjusting insulin dose.

Summary Points

- **CGM plays crucial role** in safety and well-being of people with diabetes
- **Low-income adults with T1D are underrepresented** in those benefiting from CGM
- **CGM represents state-of-the-art** in glucose monitoring
- **Multiple benefits over traditional BGM** with improved clinical outcomes across lifespan
- **Addressing access barriers** is essential for health equity

Key Metrics for Clinical Monitoring

(Preview for advanced CGM data interpretation)

Metric	Target	Clinical Significance
GMI (Glucose Management Indicator)	<7.0%	Estimated A1c from CGM data
Time in Range (70-180 mg/dL)	>70%	Primary outcome measure
Time Below Range (<70 mg/dL)	<4%	Hypoglycemia safety measure
Very Low (<54 mg/dL)	<1%	Severe hypoglycemia prevention
Time Above Range (>180 mg/dL)	<25%	Hyperglycemia management
Very High (>250 mg/dL)	<5%	DKA prevention
Glucose Variability (%CV)	≤36%	Glucose stability measure
