A Beginner’s Guide to Continuous Glucose Monitoring (CGM)

Gary Scheiner MS, CDE
• Owner & Clinical Director, Integrated Diabetes Services LLC
• Author, “Practical CGM” (ADA)
• Lead Author: CGM AADE Best Practices White Paper
• CGM Trainer & User Since 2004

Learning Objectives
• Become familiar with the various options and components/function of CGM systems
• Discuss the clinical benefits and limitations of real-time continuous glucose monitoring
• Consider the implementation of professional-use CGM within one’s practice setting

Presenters
Patricia (Gaye) Knutsen, NP-C, BSN, RN, DE
2006: No CGM experience
2016: >100 Pts on personal CGM
Teaches patients CGM user optimization skills
Promotes CGM to virtually all insulin users at Wash U

Davida Kruger, MSN, APN-BC, BC-ADM
2006: No CGM Experience
2016: Oversees Largest Prof. CGM program in US
Performs >1000 CGM data analyses annually

What does “CGM” really mean?

Chief Green Mountain
Certified Grease Monkey
Cool Groovy Mom
Colon Goo Monster

Getting Comfy... with Technology?
Patricia Gaye Knutsen, Nurse-RN, ACNS-BC
Program Coordinator, Diabetes Center, Washington University Medical School

Disclosure to Participants
Conflict of Interest (COI) and Financial Relationship Disclosures:
Presenter: Ascensia, Dexcom, Insulet, Nino Nordisk
Trainer: Animas, Medtronic, Tandem, Roche, Insulet
Advisory Boards: BD, Convatec, Ossur, InSpark Technologies
Consultant: Byram Healthcare, Dexcom

What does “CGM” really mean?
Continuous Glucose Monitoring

My four daughters… When I told them I was talking on Technology
Disclosure to Participants
Conflict of Interest (COI) and Financial Relationship Disclosures:
Speaker: Animas, Sanofi
Consultant: Dexcom
I really don’t weigh what’s listed on my driver’s license
I keep a stash of peanut M&M’s under my desk

Answer This!
What are the THREE components of a CGM?
A. Sensor, Transmitter and Receiver
B. Sensor, Pump and Infusion Set
C. Paper Clips, Duct Tape, and a Software Engineer

Part 1: The Sensor
Sensor uses the same enzyme to measure glucose levels as a test strip: glucose oxidase

Key Point!
This is the money piece

All Current CGM Consists of Three Parts

Part 1: The Sensor
- Medtronic approved to wear 6 days... 7-10 days
- Dexcom approved to wear 7 days... 2-3 weeks

Part 2: The Transmitter
The transmitter hooks into the sensor and streams glucose information over radio waves to the receiver/monitor

Part 3: The Receiver
The receiver/monitor has a screen where you can check your current glucose level, look at historical data, and get trends about whether glucose is likely to go up or down, and how fast.

Medtronic
- G4 lasts 6 months
- Insurance is paying for 2 yr
- Does not need to be charged
- Works with Medtronic’s receiver, iPhone, T-Slim, and Animas pumps

Dexcom
- Enlite lasts 12 months
- Insurance is paying for 1 yr
- Needs to be charged 20 min. every 2-3 days
- Works with Medtronic pump
In terms of timing, CGM glucose values are:

- A. A little bit ahead of fingerstick values
- B. In perfect sync with fingerstick values
- C. A little bit behind fingerstick values

Key Point!
- Glucose from vascular bed to interstitial fluid = 5-6 minutes
- CGM collects data over 5 minutes
- Throws out outliers and averages values
data display and alarms are

Trends
- Perhaps more valuable than the immediate glucose value is the direction it is headed.
CGM Value:
Helping People Live "Between the Lines"

- A.R. type 1 DM for > 45 years
- First 48h Avg Gluc – 143 mg/dL / SD 36
- Last 48h Avg Gluc – 116 mg/dL / SD 18

Day 1           Day 2 Day 3 Day 4

Courtesy of Tomas C. Walker, MSN, APRN, BC-ADM, CDE.

Alerts and Alarms:
Minimize as much as possible

Low Alert: We leave set at 80+
High Alert: We are generous... 250+

Initially, I suggest turning everything else off.

Alarm

Threshold Suspend: A 2-Hour / 4-Hour Cycle

After insulin has been suspended for 2 hours, the basal insulin delivery will automatically resume for 4 hours, regardless of the glucose level.

Day 1

Day 2

Day 3

Day 4

Notes: Alarm sounds throughout cycle until alarm is cleared.
- Alarm cycles in intervals of siren, silence, vibrate, silence.

Initially, I suggest turning everything else off.

Use appropriate CGM application based on patient and HCP's needs:

Device Ownership

Professional CGM: HCP or Healthcare Institution
Personal CGM: Patient

Application or Purpose

Access and/or share glucose values or patterns to make appropriate therapy adjustments.

Empower patients to make appropriate therapy adjustments.

Continuous glucose monitoring for healthcare providers
Continuous glucose monitoring for patients

Dexcom

This is a hard alarm and cannot be changed. If it registers below 55, the receiver will vibrate every 30 minutes until above 55.

AACE Consensus Statement

Calibration (by way of fingersticks):
A. Is not needed since the recent FDA labeling changes
B. Should be performed 2-4 times daily

Answer This!

Professional CGM

Personal CGM

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2015 AACE CGM Consensus Statement
Consistent with consensus statements on CGM issued by AACE and the Endocrine Society

Personal CGM may be appropriate for any person with diabetes who is willing to wear it regardless of age, type of diabetes or duration of diagnosis.


Make Your Expectations Clear

Don't forget to ask
What would you like to get out of the sensor?
Then talk about strategies to get there.

Never Assume

Talk about basal
Nirvana is getting the basal right
- a state of perfect tranquility
- freedom, highest happiness
- Overnight is always the easiest
- Skip breakfast = morning basal check
- Eat dinner late

Never Assume

Carb Ratio
- Go into the meal in target
- Eat something easy
- Low for < 20 gms
- Know the carbs
- Check 2 hours
- Adjust in small increments

Correction Factor
- Test in a reasonable situation
- Not when ill
- Under 200
- hasn't eaten for 3 hours
- Low fat

Professional CGM: Practice Pointers

Davida F. Kruger
MSN, APN-BC, BC-ADM
Certified Nurse Practitioner
Henry Ford Health System
Detroit, MI

Disclosure to Participants

Conflict of Interest (COI) and Financial Relationship Disclosures:
- Advisory Panel: Janssen Pharmaceuticals, Abbott, Eli Lilly, Novo Nordisk, Boehringer Ingelheim, Dexcom, Sanofi Aventis, Takeda
- Research Support: 40% of Salary NIH
- Research Support to HFHS: Bristol-Myers Squibb, Novo Nordisk, Eli Lilly, Helmsley Charitable Trust, NIH, Abbott, Calibra/J&J, Dexcom, IDC, Lexicon, TEVA
- Speakers Bureau: Janssen Pharmaceuticals, Sanofi Aventis, Squibb, Valentin, Sinfu, Novo Nordisk
- Stock: Dexcom
Professional Use CGM
- Devices owned by clinics approved for multiple use when cleaned and used according to the labeling
  - Dexcom G4
  - Real Time or Retrospective
  - 7 Days of Data
  - Medtronic, iPro2
  - Retrospective Data only
  - 3 to 5 Days of Data

Why use professional real-time CGM in your practice?
- Find patterns that otherwise could not be detected by finger stick alone
- Find patterns of undetected low BG in patients at treatment goal
- Allows to efficiently and effectively identify areas of clinical challenges and apply appropriate medical management to address specific clinical issue.
- And so much more...

Why use professional real-time CGM in your practice?
- Provides insight into trending information/pattern management
- Identifies insulin action (insulin dose effect) and potential need for additional adjustments/medications to control postprandial glucose
- Provides information about timing of food digestion and timing of meal administration
- Provides continuous data for overnight basal testing and assessment of nocturnal hypoglycemia

So how do we do CGM in Detroit?
- Last year did more than 750 Professional CGM
  - Average starts weekly 8-12 in two sites
- Own 50 CGM devices
- Team: MA's, RN's, RD's, NP's
- Dedicated resource
- Secretarial Support for supply orders

Our Program
- Referrals: Within Division, Within System
- Same day starts vs. scheduled starts
- Return users
- Changing, sign-out, down load, returns, cleaning, maintaining supplies and devices

Answer This!
Professional CGM can be an effective tool for:
- A. Evaluating post-meal glucose patterns
- B. Guarding against manipulation by the patient
- C. Avoiding the need to purchase a personal-use CGM

Many SMBG Meters - Too Many SMBG Reports
- Many SMBG Meters
- Too Many SMBG Reports
- Many SMBG Meters
- Too Many SMBG Reports

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Our Program
- Patient contract for lost equipment
- Electronic medical records: Templates, smart sets and copy/paste
- Nurse Practitioner develops care plan and manages follow up
- 7 day use of CGM to assess clinical patterns (weekends and weekdays): 3-5 day use
- Bill for both the technical training of CGM (95250) and interpretation (95251)

Just starting a program?
- Start small: 1-3 devices
- Set area devices will be stored/cleaned
- Keep track of transmitter & sensor expiration dates
- Sign devices in and out
- Decide if patient will drop off device for interpretation or have a follow up visit
- Bill correctly and watch generated income
- Document CGM data in medical record
- Grow as appropriate: team and devices

Enhancing the Professional CGM Experience
- Log lifestyle activities, events
- Test basal insulin doses
- “Experimentation” (with real-time CGM)
- Optimal calibration
- Minimize alarms/alerts (with real-time CGM)

Office Flow
- Same day start VS Scheduled start
- Return to see the NP/or drop off
- Medical Assistant downloads in exam room
- Each Exam room has ICON and Cord to download
- All supplies placed in box for cleaning and charging

Program Growth & Utilization
- Core to our Divisions financial business plan
  - 2015
  - 150 professional CGM technical services (95250 & 95251)
  - 100 additional CGM interpretations (95251) with personal CGM use
  - >250 patients were prescribed a personal CGM for ongoing use
  - >600 patients own CGM

Reimbursement
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<th>Modifier</th>
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Note: Bill E/M codes if office visit services were performed in addition to procedure codes

Answer This!
Good candidates for professional CGM include:
A. Patients who are resistant to checking their blood glucose
B. Patients who often fail to show for their appointments
C. Generally cooperative patients who are struggling to achieve consistent glucose control

Which Patients are Candidates for Professional CGM?
- Those who fear hypoglycemia but are consistently hyperglycemic
- New to the practice – establish baseline to help develop management plan
- Uncontrolled type 1 or type 2 diabetes
- Hypoglycemia unawareness
- Pregnancy or wants to become pregnant*
- Athletes struggling to manage this during exercise
- Patients starting new forms of treatment (or intensifying treatment)
- Anyone considering personal CGM but wanting a “test run”

Enhancing the Professional CGM Experience
- Log lifestyle activities, events
- Test basal insulin doses
- “Experimentation” (with real-time CGM)
- Optimal calibration
- Minimize alarms/alerts (with real-time CGM)

Initiation of CGM identified by: RN, Ma, NP, RD, PA, MD, DO, Pharmacist

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Reimbursement – Thyroid Procedures vs. CGM

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Provided by Stacey Brittain PA-C. Exempla DM and Endocrine Services. Denver, CO; based on her practice reimbursement in 2015.

Case Studies Using Professional CGM

Case Study: SB
- 76 year old African American
- T2 x 40 yrs, lives alone
- Hypoglycemia unawareness
- Stage III kidney disease
- A1C 9.3%, BMI 29, BP 112/78
- Morning BG sat
- Evening glargine (time varies), apart at first sign of fast TID
- HS snack, no insulin
- Medicare Sez: NO COVERAGE FOR PERSONAL CGM

Counseling & Education
- Take glargine at same time each night, increase dose 10%
- Avoid omitting Glargine Insulin, site rotation
- Take Aspart Insulin 10-15 minutes before meals, increase doses 10%
- Discussed foods that contain carbohydrates, snacks low in carbohydrates
- Prevention and treatment of low BG
- Return in 3 months to repeat professional CGM

Stepwise Approach to Interpreting CGM Reports
- Fix lows first
  – Overnight
  – Throughout the day
- Fix overnight hyperglycemia
- Look to dinner and/or bedtime control
- Fix pre-prandial hyperglycemia
- Fix post-prandial hyperglycemia
- Address lifestyle issues

Visit 1: Daytime & Nighttime Hyperglycemia, Asymptomatic / Untreated Hypoglycemia
- Blood sugars consistent day to day with small episodes of hypoglycemia and hyperglycemia
- Consistent blood glucose

Visit 1: Hourly Trend Graph Confirms Hyperglycemia Post Prandial Hyperglycemia and Nocturnal Hyperglycemia

Visit 2: Three months later
- Blood sugars consistent day to day with small episodes of hypoglycemia and hyperglycemia
- Consistent blood glucose at treatment goal without increase in hypoglycemia
Three months later, continued

- A1c 8.1%
- Taking insulin as prescribed
- Does her best to take insulin before meals, rarely misses glargine
- Periodic evening hypoglycemia

- Advised:
  - Continue glargine dose
  - Aspart: Increase breakfast dose 10%, decrease dinner dose 10%
  - Continue to monitor BG, report any low BG
  - Return 3 months for clinic visit

Professional CGM – Blinded
Case Study: JD

- Age 26, T1 X 10 years
- Pump User
- Basal rates:
  - 12am 0.9; 2am 0.95; Noon 0.9
- Carb Ratios: 12am 1:15
- Target BG: 100-100
- Sensitivity: 1:50
- Active Insulin Time: 4 hours
- Checks Blood Glucose 3-4x daily
- A1c 8.5%

Observations:
- Overall avg 196
- Consistent day-to-day pattern
- BG dropping overnight (without correction boluses)

MOVING FROM PROFESSIONAL TO PERSONAL USE

- Many “professional” CGM users opt for a personal system
- Candidates complete forms
- Secretaries email to manufacturer
- Patient trained in office by Dexcom or Medtronic rep (or web-based)
- Personal use downloaded each visit and in between as needed
  - Set appropriate expectations (trend vs. numbers)

Counseling and Education

- Insulin Dose Changes:
  - Reduce basal by 1% midnight to 6am
  - Increase breakfast and dinner bolus to 1u/12g carbs
  - Reduce sensitivity to 40
  - Take bolus 10-20 minutes before meals
  - Discuss prevention and treatment of low BG
  - Discuss Carb Counting Accuracy
  - BG testing at least 4x daily
  - Consider Personal CGM