Oxford University Hospitals NHS
NHS Foundation Trust

CGM – does 70% Time in Range mean the same thing on all systems?

Dr Alistair Lumb

06.02.2026

Disclosures

- Payments for Speaking and Advisory boards
  - Abbott Diabetes Care, Dexcom, Insulet, Lilly Diabetes, Medtronic, Menarini, Novo Nordisk, Sanofi
- Institutional Research Support
  - Abbott Diabetes Care, Novo Nordisk
- Positions held
  - Chair, Diabetes Technology Network-UK
  - Member of EXTOD executive

Plan

- Why is understanding CGM accuracy important? How might it impact your day to day practice?

- The importance of assessing CGM accuracy
  - CE marking
  - MARD
  - Consensus error grids
  - Study design

- The importance of benchmarking/calibration

Oxford University Hospitals NHS
NHS Foundation Trust

Why is understanding CGM accuracy important?

Scenario

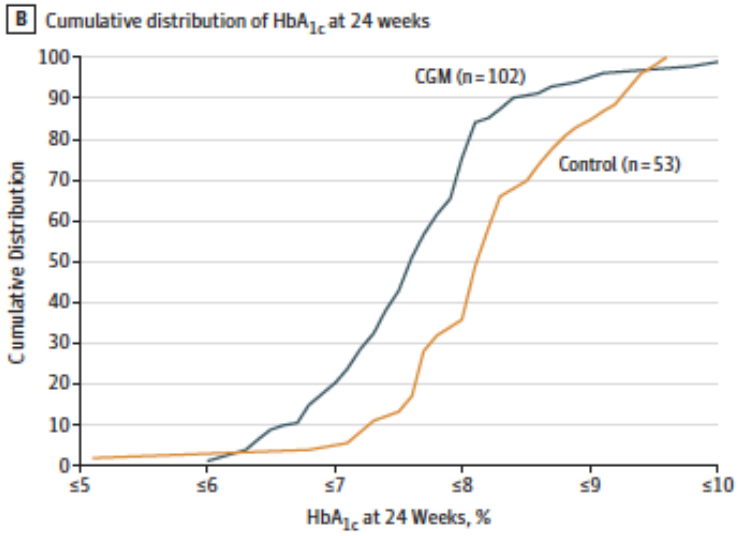
- Bill comes to see you in clinic to discuss his diabetes management
- He has bought a CGM device that was advertised to him online, and tells you that he finds it really helpful
- The device has a CE mark, MARD is reported as 9.1%
- He checks the readings it gives him against fingerprick readings, and in his experience they are usually pretty close.
- The device is cheaper to buy than Freestyle Libre 2, so Bill suggests that the NHS could save money by switching to this device and says that you should make it available to your population
- What do you do?

Oxford University Hospitals NHS
NHS Foundation Trust

Benefits of CGM

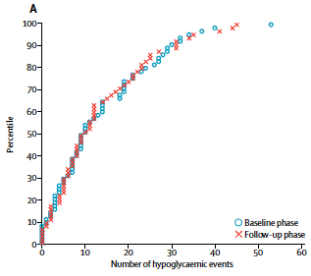
Type 1 diabetes is challenging to manage

CGM benefits HbA1c and hypoglycaemia

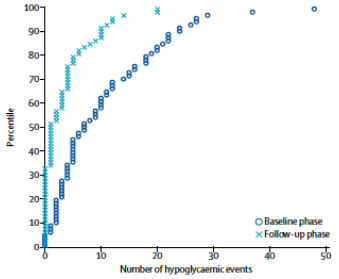


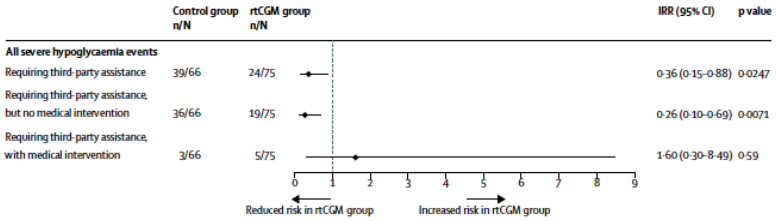
JAMA 2017;317(4):371-378

Control group



CGM group





Lancet 2018;391:1367-1377

Works both for MDI and those using pumps

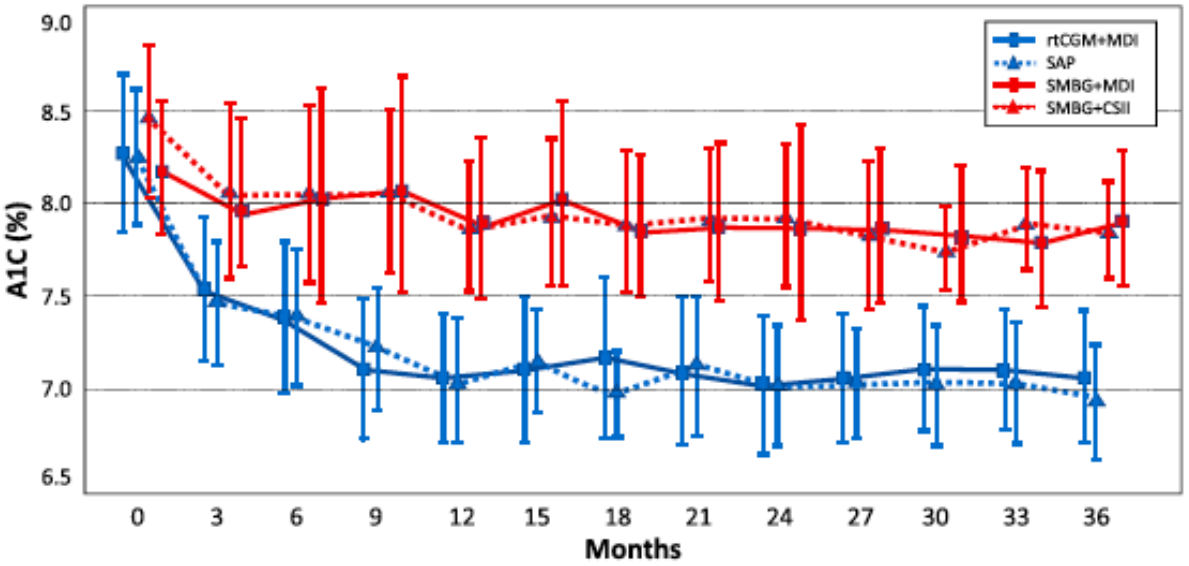


Figure 1—Change in A1C from baseline by study group. SAP, sensor-augmented pump.

Diabetes Care 2020;43(1):37-43

Improvements in both TIR and TBR

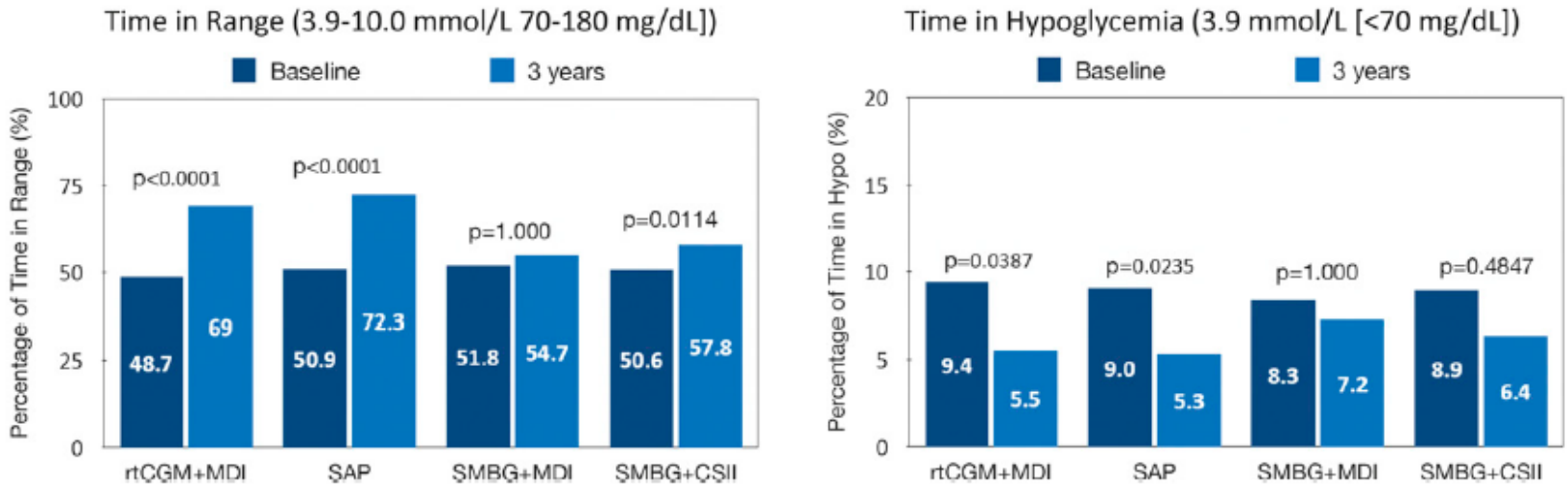
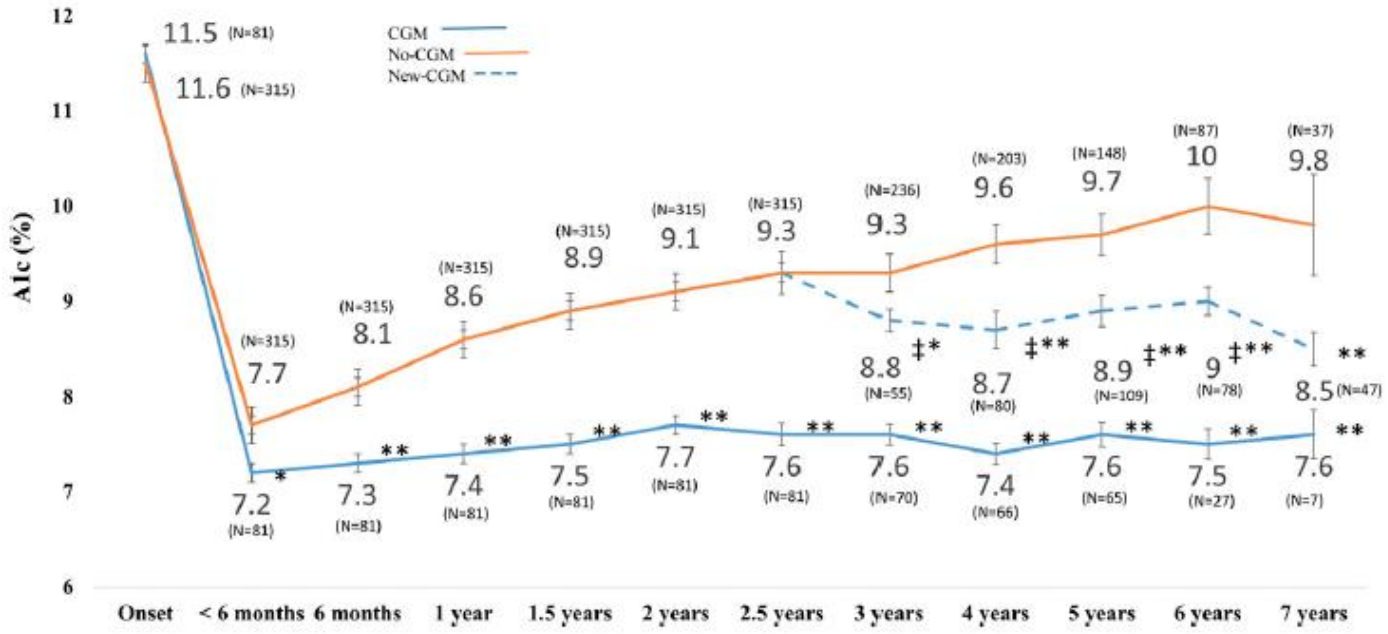


Figure 2—Changes in percentage of time in range and time in hypoglycemia. SAP, sensor-augmented pump.

Diabetes Care 2020;43(1):37-43

Benefit of CGM from diagnosis



Diabetes Care 2022;45(3):750-753

So we want people to have access to CGM devices.
How can we know if a device is any good?

Received: 5 December 2025 | Revised: 30 December 2025 | Accepted: 2 January 2026
DOI: 10.1111/dom.70460

REVIEW ARTICLE

WILEY

International clinical opinion on transparency, standardisation, and calibration alignment in the performance evaluation of systems for continuous glucose monitoring

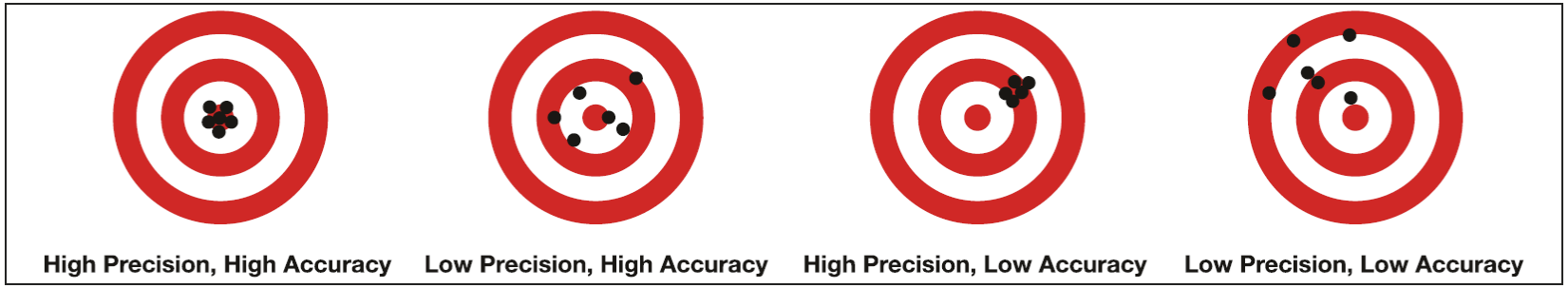
John S. Pemberton BSc[1] | Robert C. Andrews MD[2,3] | Katharine Barnard-Kelly PhD[4] | Tadej Battelino MD[5,6] | Thomas Danne MD[7] | Lutz Heinemann PhD[8] | Partha Kar MD[9,10] | Alistair Lumb MD[11,12] | David M. Maahs MD[13,14] | Julia K. Mader MD[15] | Chantal Mathieu MD[16] | Viswanathan Mohan MD[17,18] | Helen R. Murphy MD[19,20,21] | Eleanor M. Scott MD[22] | Jennifer L. Sherr MD[23] | Carmel E. Smart PhD[24] | Martin Tauschmann MD[25,26] | Amanda Williams MSc[27] | Emma G. Wilmot MD[28,29] | Dessi P. Zaharieva PhD[13,14] | Othmar Moser MD[30,31]

What about CE marking?

- Any device with a CE mark can be marketed in the UK and Europe
- What are the issues with CE marking?
- There does not need to be **transparency** about the data used to assess a submission
  - Data *may* be publicly available but this is not a requirement
  - If data are not publicly available then they cannot be independently assessed, which means that **CE marking alone is not sufficient to guarantee accuracy**

What about MARD?

- **Accuracy** – how close is the reading to the reference standard?
- **Precision** – how close are sensor readings to each other?



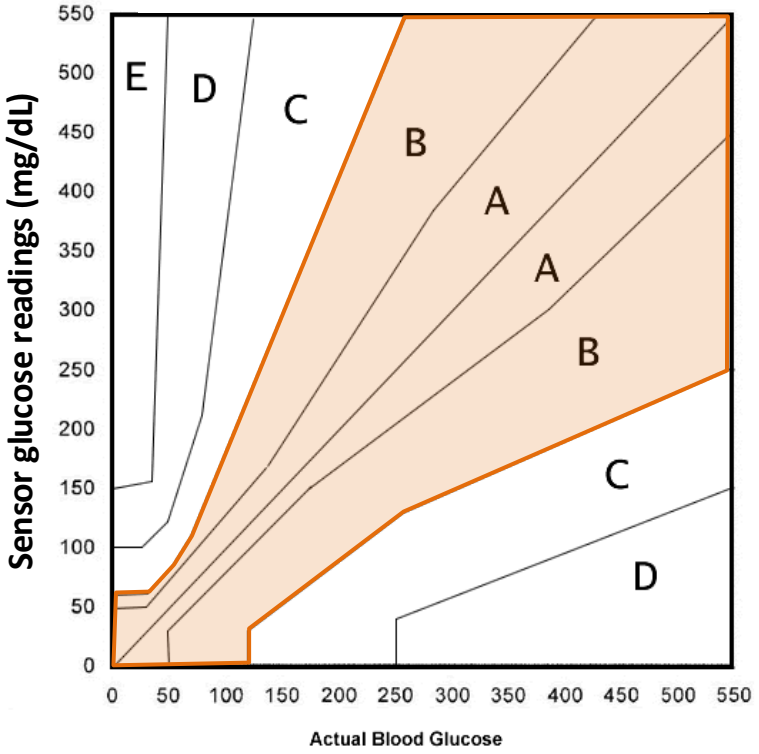
- **MARD** – measures average accuracy but not precision
- A consensus error grid allows visualization of precision as well

Ajjan RA, Wilmot EG et al. *Diab Vasc Dis Res.* 2018;15(3):175-184

Consensus error grid

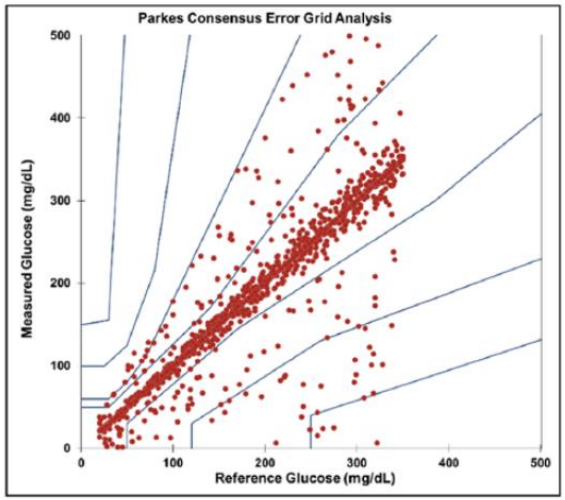
- 5 zones which reflect clinical relevance:

- **Zone A**: no effect on clinical action
- **Zone B**: altered clinical action but little/no effect on clinical outcome
- **Zone C**: altered action, likely to affect outcome
- **Zone D**: significant medical risk
- **Zone E**: erroneous treatment, could have dangerous consequences



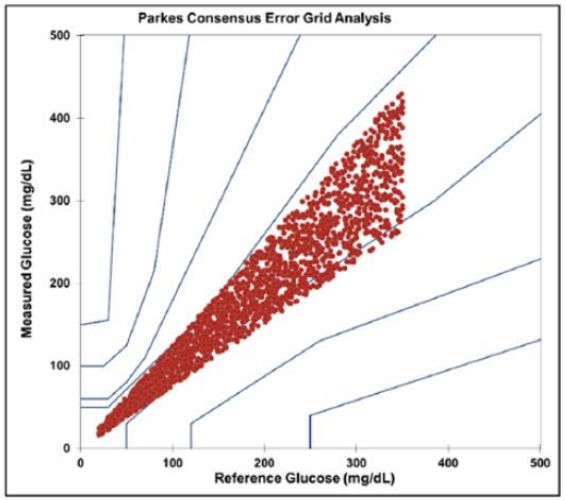
Parkes JL et al. *Diabetes Care* 2000;23:1143-1148

Limitations of MARD



Simulation A	Total number of paired readings = 2000 points
MARD	8.0%

Parkes Consensus Error Grid Analysis					
	A	B	C	D	E
Points	1825	129	35	11	0
%	91.3%	6.5%	1.8%	0.6%	0.0%
% A+B	97.7%				



Simulation B	Total number of paired readings = 2000 points
MARD	12.0%

Parkes Consensus Error Grid Analysis					
	A	B	C	D	E
Points	1819	181	0	0	0
%	91.0%	9.1%	0.0%	0.0%	0.0%
% A+B	100.0%				

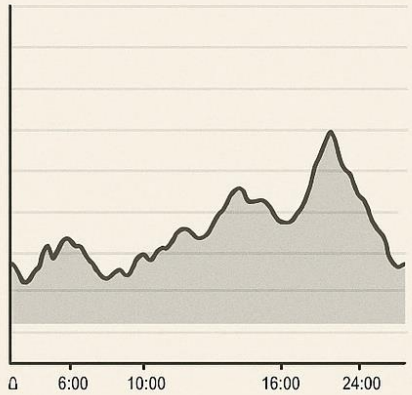
Figure 5. Comparisons of simulated test and reference glucose samples. The MARD and CEG plots of 2000 paired readings can be modelled to illustrate that different methods of analysis may generate different assessments of 'accuracy'.

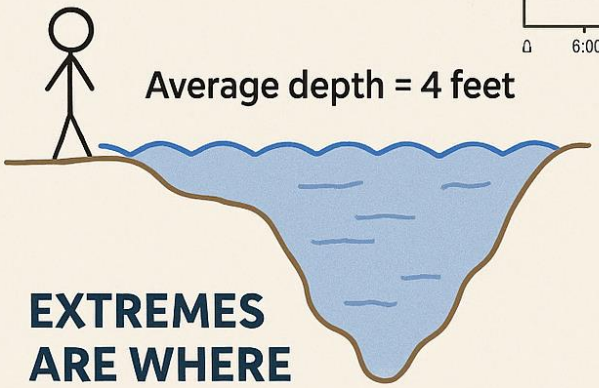
Ajjan RA, Wilmot EG et al. *Diab Vasc Dis Res.* 2018;15(3):175-184

LIMITATIONS OF MARD

MARD does not account for risks at extreme glucose levels.

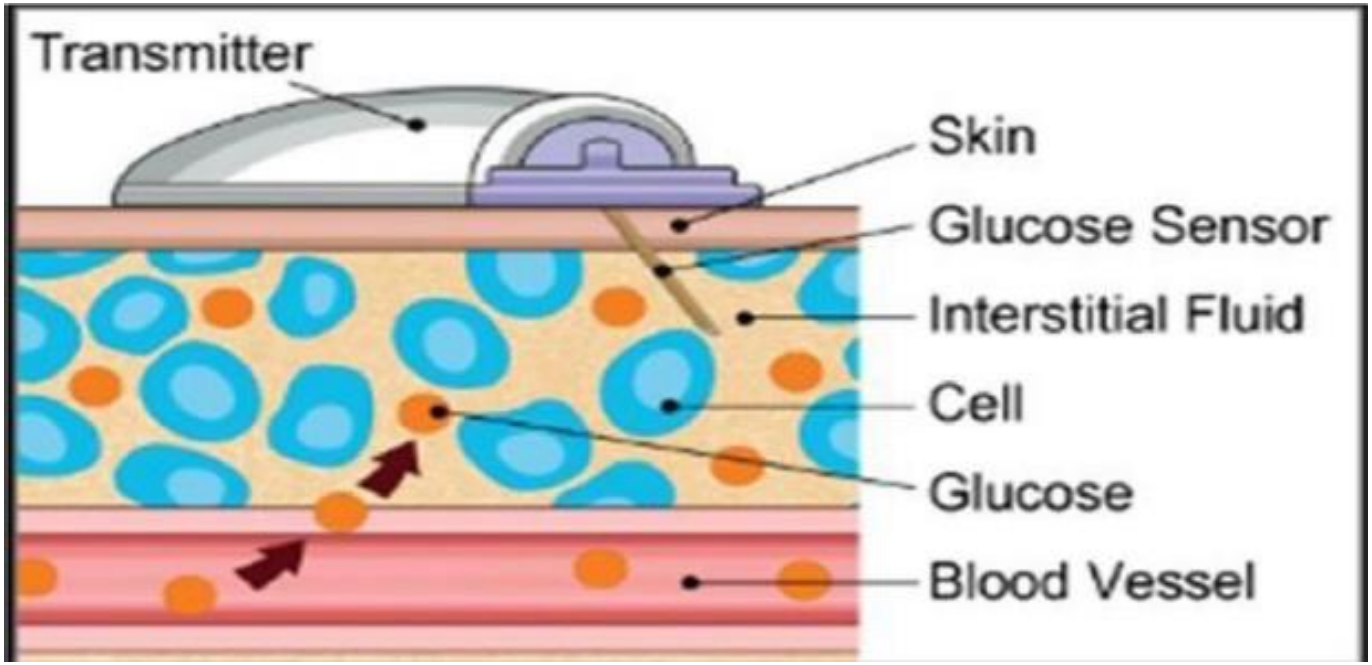
"Would you cross a river if its average depth were 4 feet even if you couldn't swim?



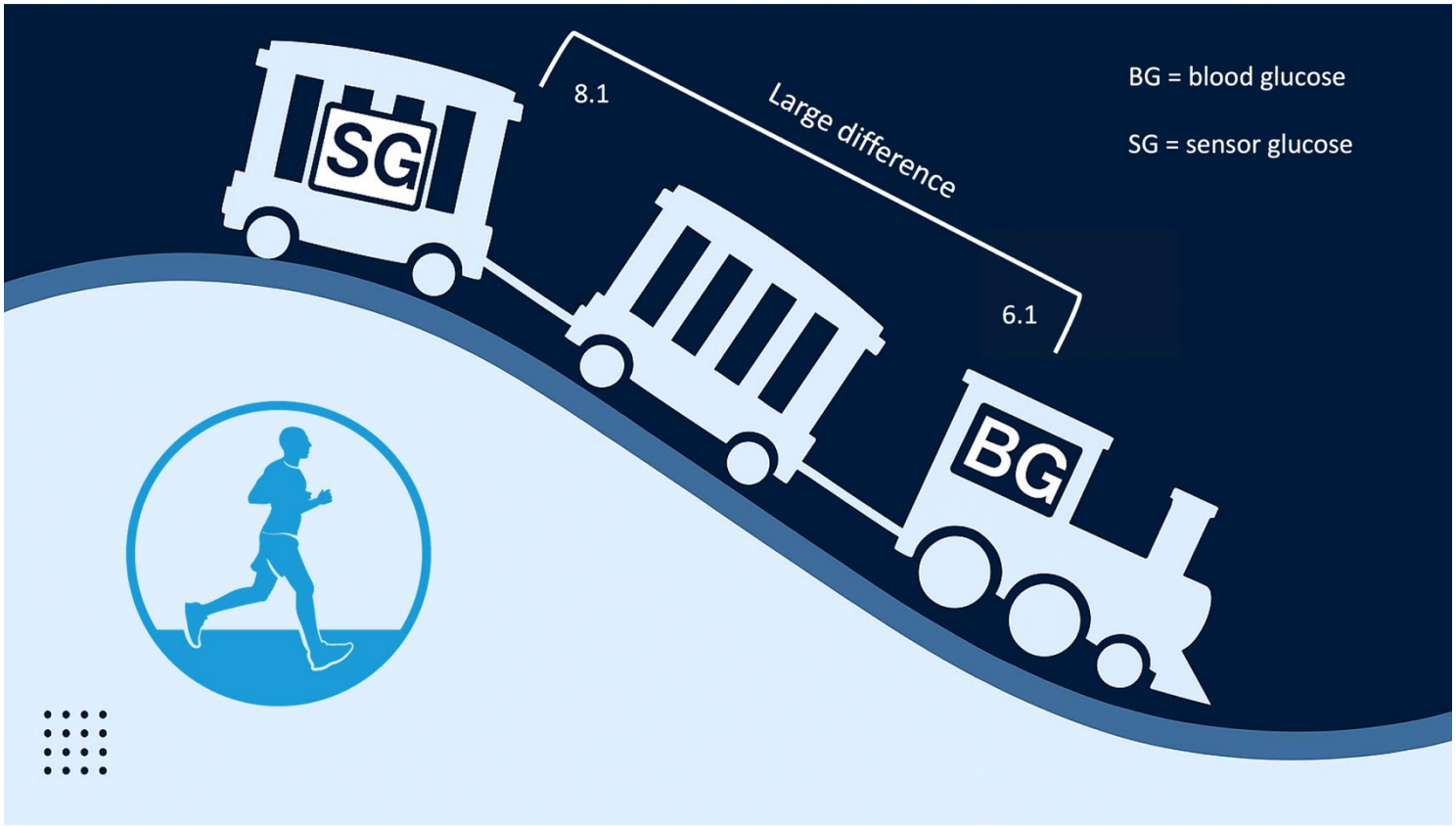


EXTREMES ARE WHERE CRITICAL DECISIONS OCCUR!

CGM measures interstitial glucose



Arch Dis Child Educ Pract Ed 2022;107:188-193


SG
8.1
Large difference
6.1
BG
BG = blood glucose
SG = sensor glucose

Oxford University Hospitals NHS
NHS Foundation Trust

Studies to assess accuracy

Received: 24 October 2024 | Revised: 9 December 2024 | Accepted: 12 December 2024

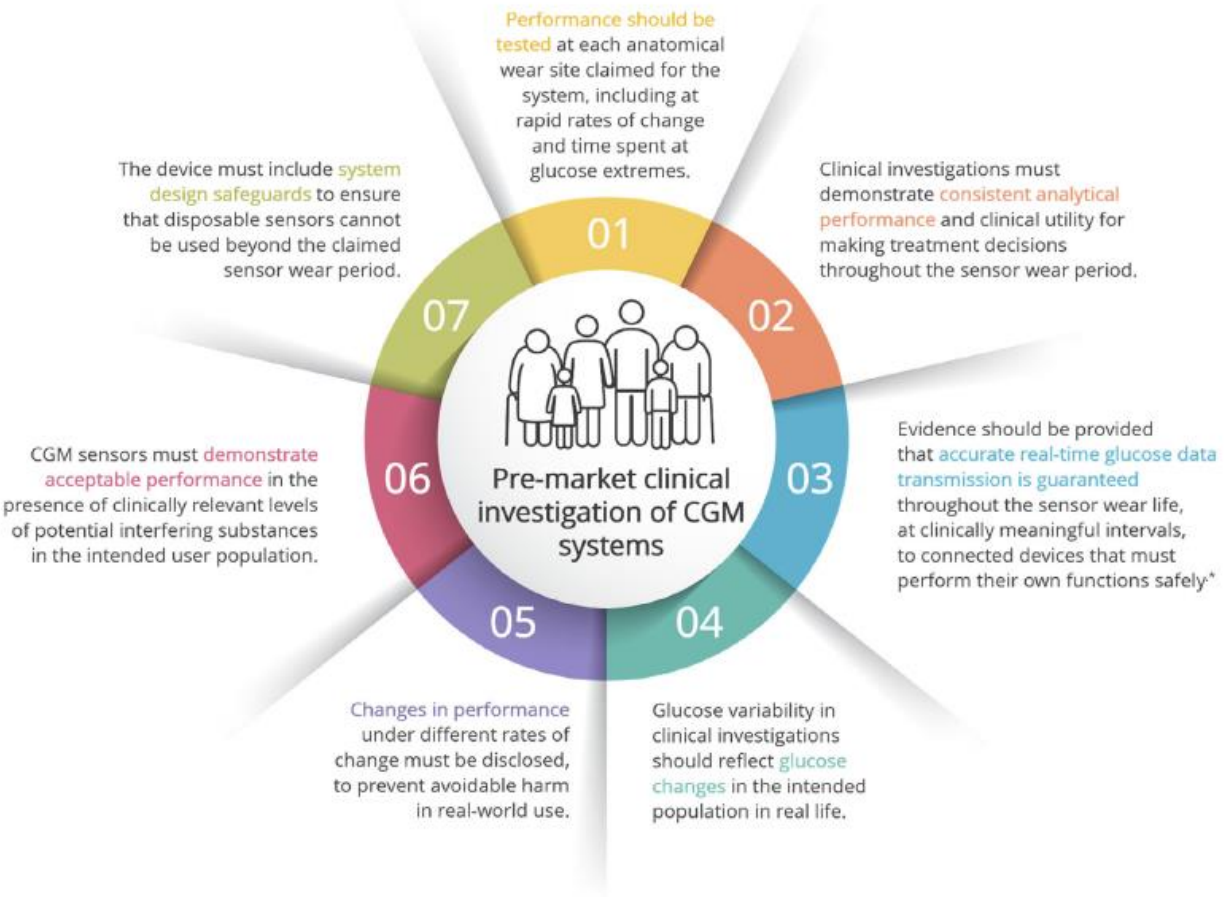
DOI: 10.1111/dom.16153

WILEY

COMMENTARY

Minimum expectations for market authorization of continuous glucose monitoring devices in Europe—'eCGM' compliance status

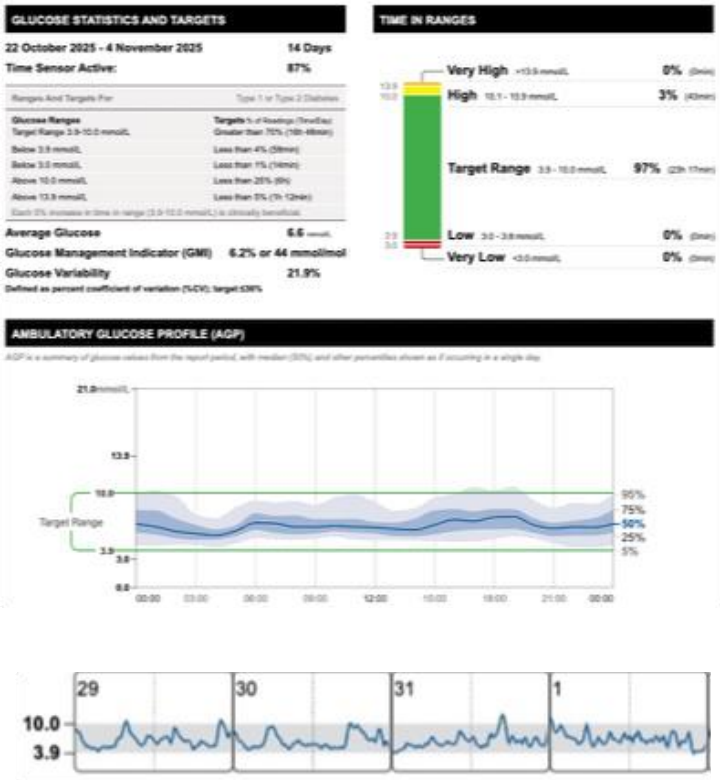
Chantal Mathieu MD[1] | Concetta Irace MD[2] | Emma G. Wilmot MD[3,4] | Bassil Akra PhD[5] | Stefano Del Prato MD[6] | Martin Cuesta MD[7] | Peter Adolfsson MD[8,9] | Tomasz Klupa MD[10] | Eric Renard MD[11] | Tadej Battelino MD[12,13]

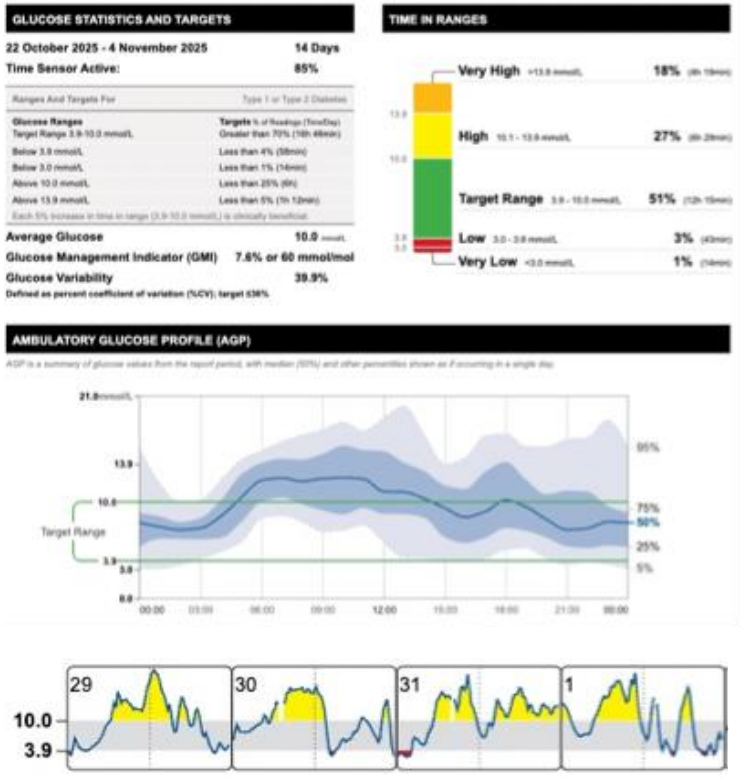

Performance should be tested at each anatomical wear site claimed for the system, including at rapid rates of change and time spent at glucose extremes.
01
Clinical investigations must demonstrate consistent analytical performance and clinical utility for making treatment decisions throughout the sensor wear period.
02
Evidence should be provided that accurate real-time glucose data transmission is guaranteed throughout the sensor wear life, at clinically meaningful intervals, to connected devices that must perform their own functions safely.*
03
Glucose variability in clinical investigations should reflect glucose changes in the intended population in real life.
04
Changes in performance under different rates of change must be disclosed, to prevent avoidable harm in real-world use.
05
CGM sensors must demonstrate acceptable performance in the presence of clinically relevant levels of potential interfering substances in the intended user population.
06
The device must include system design safeguards to ensure that disposable sensors cannot be used beyond the claimed sensor wear period.
07
Pre-market clinical investigation of CGM systems

Key study criteria

- Should include at least 100 people, at least 70% with type 1 diabetes
- Tested throughout the sensor wear period
- Each anatomical site should be included
- At least 3 sensor lots
- Should include meal and insulin challenges
- At least 8% of readings less than 4.4 mmol/l
- At least 5% of readings over 16.7 mmol/l
- Data should be disclosed publicly for each intended population
- Minimum number of paired readings for each anatomical site
  - 2500 younger children
  - 10000 adults

Type 2 v type 1





Oxford University Hospitals NHS
NHS Foundation Trust

Technology Report

Multicenter Evaluation Study Comparing a New Factory-Calibrated Real-Time Continuous Glucose Monitoring System to Existing Flash Glucose Monitoring System

Journal of Diabetes Science and Technology
2023, Vol. 17(1) 208–213

DOI: 10.1177/19322968211037991
journals.sagepub.com/home/dst
SAGE

Linong Ji, MD[1], Lixin Guo, MD[2], Junqing Zhang, MD[3], Yufeng Li, MD[4], and Zhiyan Chen, PhD[5]

An example

- MARD reported as 9.08%
- Multicentre study with 120 participants
- **However**:
  - Only 14 people (11.3%) included with type 1 diabetes
  - Only 57 people (49.6%) using insulin
  - No sensor day 1 readings evaluated
  - No meal or insulin challenge

Oxford University Hospitals NHS
NHS Foundation Trust

Clinica Chimica Acta 580 (2026) 120728

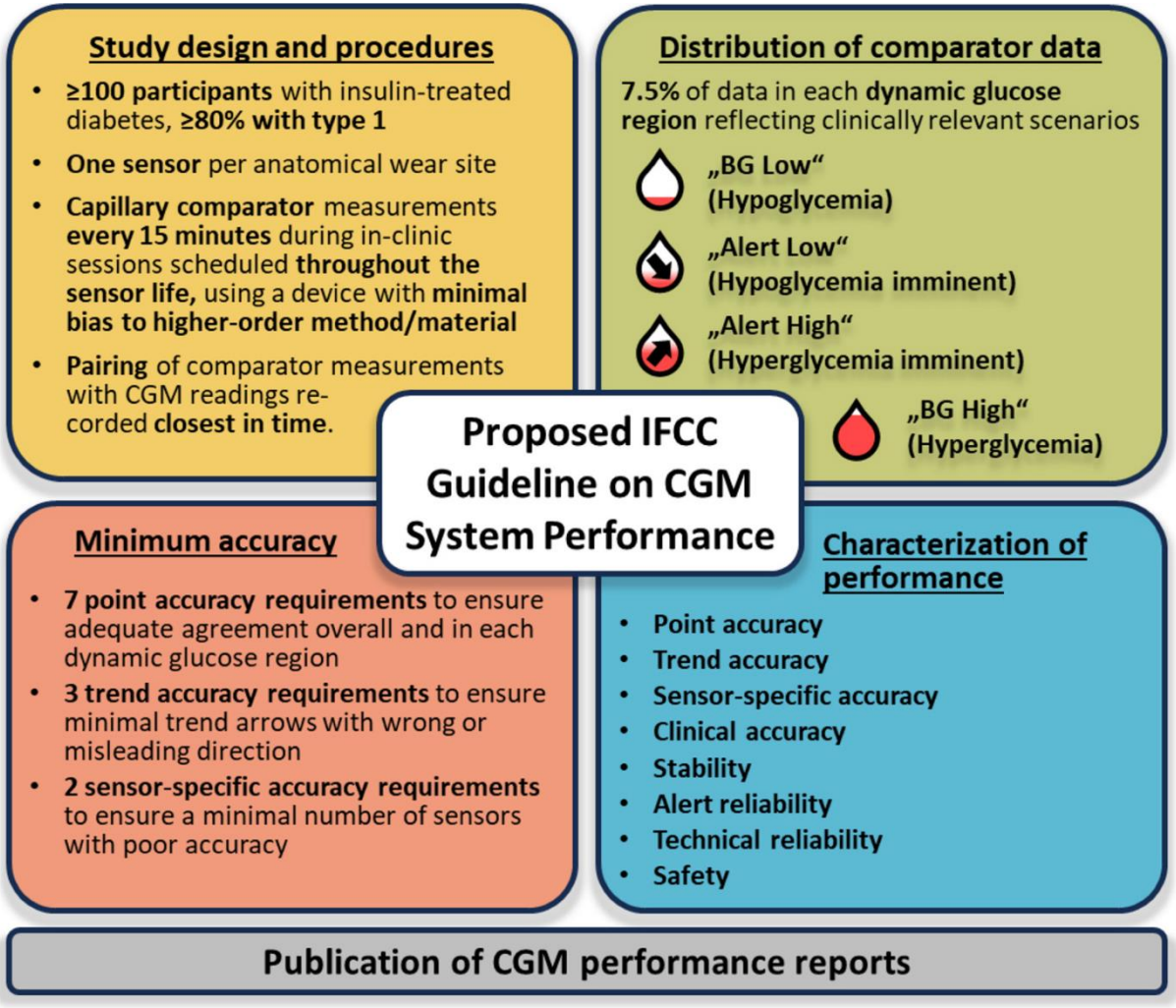
Contents lists available at ScienceDirect

Clinica Chimica Acta

journal homepage: www.elsevier.com/locate/cca

Clinical assessment and acceptance criteria for continuous glucose monitoring (CGM) system performance: A proposed guideline by the IFCC Working Group on CGM

Stefan Pleus [a,b,*], Manuel Eichenlaub [b], Pradeep Kumar Dabla [a,c], Peter Diem [a,d], Elisabet Eriksson Boija [a,e], Marion Fokkert [a,f], Rolf Hinzmann [a,g], Johan Jendle [a,h], David C. Klonoff [a,i], Jingyi Lu [a,j], Konstantinos Makris [a,k], Viswanathan Mohan [a,l], James H. Nichols [a,m], John S. Pemberton [a,n], Elizabeth Selvin [a,o], Robbert J. Slingerland [a,f], Andreas Thomas [a,p], Nam K. Tran [a,q], Lilian Witthauer [a,r,s], Guido Freckmann [a,b], on behalf of the Working Group on Continuous Glucose Monitoring of the IFCC Scientific Division


Study design and procedures
• ≥100 participants with insulin-treated diabetes, ≥80% with type 1
• One sensor per anatomical wear site
• Capillary comparator measurements every 15 minutes during in-clinic sessions scheduled throughout the sensor life, using a device with minimal bias to higher-order method/material
• Pairing of comparator measurements with CGM readings recorded closest in time.
Distribution of comparator data
7.5% of data in each dynamic glucose region reflecting clinically relevant scenarios
„BG Low“ (Hypoglycemia)
„Alert Low“ (Hypoglycemia imminent)
„Alert High“ (Hyperglycemia imminent)
„BG High“ (Hyperglycemia)
Proposed IFCC Guideline on CGM System Performance
Minimum accuracy
• 7 point accuracy requirements to ensure adequate agreement overall and in each dynamic glucose region
• 3 trend accuracy requirements to ensure minimal trend arrows with wrong or misleading direction
• 2 sensor-specific accuracy requirements to ensure a minimal number of sensors with poor accuracy
Characterization of performance
• Point accuracy
• Trend accuracy
• Sensor-specific accuracy
• Clinical accuracy
• Stability
• Alert reliability
• Technical reliability
• Safety
Publication of CGM performance reports

Key criteria – distilled down

1. Is the data publicly available?

2. Is the data sufficient?
   a. Are there sufficient participants?
   b. Do at least 70% have type 1 diabetes?
   c. Are there enough paired data points?

3. Does the study include meal and insulin challenges?

4. Are there sufficient low glucose data points?

5. Are there sufficient high glucose data points?

Oxford University Hospitals NHS
NHS Foundation Trust

Use the DSN forum comparison chart!

Study Design, Clinical Accuracy, and Regulatory Approval Status of CGM Systems Available in the UK

Diabetes Specialist Nurse Forum UK

	Study Design Assessment and Score The study design score (0 to 5, with higher scores = greater robustness, ordered by score then alphabet) reflects how thoroughly the CGM system has been tested across the full glucose range (typically 2.2–22.2 mmol/L or 40-400 mg/dL), including the rates of change commonly experienced by people with diabetes. This score provides insight into how likely the performance is to hold true in real-world conditions. The scoring criteria are based on testing recommendations for individuals aged 18 years and older from the 2020 Performance metrics for continuous interstitial glucose monitoring CLSI guideline (POCT05), reinforced by the IFCC Working Group on CGM & eCGM Clinician Consensus[a]						Accuracy Data & Regulatory Status The 20/20 and 40/40 metrics offers a better representation of the percentage of glucose readings that pose no risk and high risk to clinical decision-making, respectively. In contrast, the Mean Average Relative Difference (MARD) does not indicate the proportion of risk-free readings and is therefore not included. *20/20:* Percentage of CGM within ±20% of the comparator blood glucose levels ≥5.5 mmol/L and within ±1.1 mmol/L (20 mg/dL) for blood levels <5.5 mmol/L. *40/40:* Percentage of CGM within ±40% of the comparator blood glucose levels ≥5.5 mmol/L and within ±2.2 mmol/L (40 mg/dL) for blood levels <5.5 mmol/L.									
CGM Systems (Distributor in the UK)	**Peer-reviewed[a]**	**≥70% T1D**	**Meal & insulin challenge**	**≥8% of readings <4.4 mmol/L (80 mg/dL)**	**≥5% of readings >16.7 mmol/L (300 mg/dL)**	**Study design score[b]**	**Age range tested**	**N = adults**	**Adult 20/20[c]**	**Adult 40/40[c]**	**N = Paed**	**Paed 20/20[c]**	**Paed 40/40[c]**	**CE marking for non-adjunctive[e] (age indication)**	**iCGM for HCL[f]**	**GP via FP10**	**NHS Supply Chain**
Non-adjunctive use: Licensed for clinical decision-making including insulin dosing. Finger-prick blood glucose confirmation is not required for treatment decisions, unless symptoms do not match the CGM reading or the value and/or trend arrow is unavailable.																	
Accu-Chek SmartGuide® (ROCHE)[1]	✓	✓	✓	✓	✓	5	≥18yrs	48	91%	99%	[d]	[d]	[d]	✓[i] (18yrs)	x	✓	x
ALLYcgm (AgaMatrix)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	x	x
CareSens Air® (Spirit Healthcare)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	✓	x
Dexcom G6™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	✓[h]	x	✓
Dexcom G7™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	✓[i]	x	✓
Dexcom One™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	x	✓	x
Dexcom One+™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	x	✓	x
FreeStyle Libre® 2 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
FreeStyle Libre® 3 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
Simplera/Simplera Sync™ (Medtronic)[8]	✓	✓	✓	✓	✓	5	≥2yrs	160	89%	[d]	138	88%	[d]	✓ (≥2yrs)	x	x	✓
GlucoMen iCan (A. Menarini Diagnostics)[g]	x	✓	✓	✓	✓	4	≥2yrs	35	96%	>99.5%	60	95%	>99.5%	✓ (≥2yrs)	x	✓	x
Guardian™ 4 Sensor and Guardian™ 4 Link Transmitter (Medtronic)[g]	x	✓	✓	✓	✓	4	≥2yrs	153	88%	[d]	108	83%	[d]	✓ (≥2yrs)	x	x	✓
TouchCare® Nano A8 (Medtrum)[g]	x	x	✓	[d]	[d]	1	≥14yrs	63	89%	99%	[d]	[d]	[d]	✓ (≥2yrs)	x	x	✓
Linx (Microtech)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	91	>90%	99%	[d]	[d]	[d]	✓ (≥18yrs)	x	x	x
Adjunctive use: Not licensed for clinical decision-making. All clinical decisions must be confirmed with a finger-prick blood glucose test																	
Gluconovo® (Infinovo)[10]	✓	x	x	x	x	1	≥18yrs	78	90%	99%	[d]	[d]	[d]	x (2yrs)	x	x	x
GlucoRx Aidex™ (GlucoRx)[11]	✓	x	x	x	x	1	≥18yrs	114	96%	>99.5%	[d]	[d]	[d]	x (≥14yrs)	x	✓	x
Yuwell Anytime CT3 (Urathon)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥14yrs)	x	x	✓
Syai Tag (Syai Health Technology)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥18yrs)	x	x	x

Study design score

Study Design, Clinical Accuracy, and Regulatory Approval Status of CGM Systems Available in the UK

Diabetes Specialist Nurse Forum UK

	Study Design Assessment and Score						Accuracy Data & Regulatory Status										
	The study design score (0 to 5, with higher scores = greater robustness, ordered by score then alphabet) reflects how thoroughly the CGM system has been tested across the full glucose range (typically 2.2–22.2 mmol/L or 40-400 mg/dL), including the rates of change commonly experienced by people with diabetes. This score provides insight into how likely the performance is to hold true in real-world conditions. The scoring criteria are based on testing recommendations for individuals aged 18 years and older from the 2020 Performance metrics for continuous interstitial glucose monitoring CLSI guideline (POCT05), reinforced by the IFCC Working Group on CGM & eCGM Clinician Consensus[a]						The 20/20 and 40/40 metrics offers a better representation of the percentage of glucose readings that pose no risk and high risk to clinical decision-making, respectively. In contrast, the Mean Average Relative Difference (MARD) does not indicate the proportion of risk-free readings and is therefore not included. *20/20:* Percentage of CGM within ±20% of the comparator blood glucose levels ≥5.5 mmol/L and within ±1.1 mmol/L (20 mg/dL) for blood levels <5.5 mmol/L. *40/40:* Percentage of CGM within ±40% of the comparator blood glucose levels ≥5.5 mmol/L and within ±2.2 mmol/L (40 mg/dL) for blood levels <5.5 mmol/L.									
CGM Systems (Distributor in the UK)	**Peer-reviewed[a]**	**≥70% T1D**	**Meal & insulin challenge**	**≥8% of readings <4.4 mmol/L (80 mg/dL)**	**≥5% of readings >16.7 mmol/L (300 mg/dL)**	**Study design score[b]**	**Age range tested**	**N = adults**	**Adult 20/20[c]**	**Adult 40/40[c]**	**N = Paed**	**Paed 20/20[c]**	**Paed 40/40[c]**	**CE marking for non-adjunctive[e] (age indication)**	**iCGM for HCL[f]**	**GP via FP10**	**NHS Supply Chain**
Non-adjunctive use: Licensed for clinical decision-making including insulin dosing. Finger-prick blood glucose confirmation is not required for treatment decisions, unless symptoms do not match the CGM reading or the value and/or trend arrow is unavailable.																	
Accu-Chek SmartGuide® (ROCHE)[1]	✓	✓	✓	✓	✓	5	≥18yrs	48	91%	99%	[d]	[d]	[d]	✓[1] (18yrs)	x	✓	x
ALLYcgm (AgaMatrix)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	x	x
CareSens Air® (Spirit Healthcare)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	✓	x
Dexcom G6™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	✓[h]	x	✓
Dexcom G7™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	✓[i]	x	✓
Dexcom One™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	x	✓	x
Dexcom One+™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	x	✓	x
FreeStyle Libre® 2 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
FreeStyle Libre® 3 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
Simplera/Simplera Sync™ (Medtronic)[8]	✓	✓	✓	✓	✓	5	≥2yrs	160	89%	[d]	138	88%	[d]	✓ (≥2yrs)	x	x	✓
GlucoMen iCan (A. Menarini Diagnostics)[g]	x	✓	✓	✓	✓	4	≥2yrs	35	96%	>99.5%	60	95%	>99.5%	✓ (≥2yrs)	x	✓	x
Guardian™ 4 Sensor and Guardian™ 4 Link Transmitter (Medtronic)[g]	x	✓	✓	✓	✓	4	≥2yrs	153	88%	[d]	108	83%	[d]	✓ (≥2yrs)	x	x	✓
TouchCare® Nano A8 (Medtrum)[g]	x	x	✓	[d]	[d]	1	≥14yrs	63	89%	99%	[d]	[d]	[d]	✓ (≥2yrs)	x	x	✓
Linx (Microtech)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	91	>90%	99%	[d]	[d]	[d]	✓ (≥18yrs)	x	x	x
Adjunctive use: Not licensed for clinical decision-making. All clinical decisions must be confirmed with a finger-prick blood glucose test																	
Gluconovo® (Infinovo)[10]	✓	x	x	x	x	1	≥18yrs	78	90%	99%	[d]	[d]	[d]	x (2yrs)	x	x	x
GlucoRx Aidex™ (GlucoRx)[11]	✓	x	x	x	x	1	≥18yrs	114	96%	>99.5%	[d]	[d]	[d]	x (≥14yrs)	x	✓	x
Yuwell Anytime CT3 (Urathon)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥14yrs)	x	x	✓
Syai Tag (Syai Health Technology)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥18yrs)	x	x	x

Fingerprick readings

- Fingerprick glucose is advised:
  - To confirm hypoglycaemia (and hyperglycaemia)
  - When sensor glucose does not match symptoms

- For some systems, fingerprick glucose is also *required* to support decisions about insulin dosing. Where this is **not** required, the device has a “non-adjunctive indication”

Study design score

Study Design, Clinical Accuracy, and Regulatory Approval Status of CGM Systems Available in the UK

Diabetes Specialist Nurse Forum UK

	Study Design Assessment and Score: The study design score (0 to 5, with higher scores = greater robustness, ordered by score then alphabet) reflects how thoroughly the CGM system has been tested across the full glucose range (typically 2.2–22.2 mmol/L or 40-400 mg/dL), including the rates of change commonly experienced by people with diabetes. This score provides insight into how likely the performance is to hold true in real-world conditions. The scoring criteria are based on testing recommendations for individuals aged 18 years and older from the 2020 Performance metrics for continuous interstitial glucose monitoring CLSI guideline (POCT05), reinforced by the IFCC Working Group on CGM & eCGM Clinician Consensus[b]						Accuracy Data & Regulatory Status: The 20/20 and 40/40 metrics offers a better representation of the percentage of glucose readings that pose no risk and high risk to clinical decision-making, respectively. In contrast, the Mean Average Relative Difference (MARD) does not indicate the proportion of risk-free readings and is therefore not included. *20/20:* Percentage of CGM within ±20% of the comparator blood glucose levels ≥5.5 mmol/L and within ±1.1 mmol/L (20 mg/dL) for blood levels <5.5 mmol/L. *40/40:* Percentage of CGM within ±40% of the comparator blood glucose levels ≥5.5 mmol/L and within ±2.2 mmol/L (40 mg/dL) for blood levels <5.5 m[illegible]								
CGM Systems (Distributor in the UK)	**Peer-reviewed[a]**	**≥70% T1D**	**Meal & insulin challenge**	**≥8% of readings <4.4 mmol/L (80 mg/dL)**	**≥5% of readings >16.7 mmol/L (300 mg/dL)**	**Study design score[b]**	**Age range tested**	**N = adults**	**Adult 20/20[c]**	**Adult 40/40[c]**	**N = Paed**	**Paed 20/20[c]**	**Paed 40/40[c]**	**CE marking for non-adjunctive[e] (age indication)**	**CGM for HCL[f]**	**GP via FP10**	**NHS Supply Chain**
Non-adjunctive use: Licensed for clinical decision-making including insulin dosing. Finger-prick blood glucose confirmation is not required for treatment decisions, unless symptoms do not match the CGM reading or the value and/or t[illegible]end arrow is u[illegible]available.																	
Accu-Chek SmartGuide® (ROCHE)[1]	✓	✓	✓	✓	✓	5	≥18yrs	48	91%	99%	[d]	[d]	[d]	✓[i] (18yrs)	x	✓	x
ALLYcgm (AgaMatrix)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	x	x
CareSens Air® (Spirit Healthcare)[9]	✓	✓	✓	✓	✓	5	≥18yrs	30	94%	>99.5%	[d]	[d]	[d]	✓ (18yrs)	x	✓	x
Dexcom G6™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	✓[h]	x	✓
Dexcom G7™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	✓[i]	x	✓
Dexcom One™ (Dexcom)[2-3]	✓	✓	✓	✓	✓	5	≥2yrs	159	93%	>99.5%	165	92%	>99.5%	✓ (≥2yrs)	x	✓	x
Dexcom One+™ (Dexcom)[4-5]	✓	✓	✓	✓	✓	5	≥2yrs	316	95%	>99.5%	127	95%	>99.5%	✓ (≥2yrs)	x	✓	x
FreeStyle Libre® 2 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
FreeStyle Libre® 3 Plus (Abbott)[6,7]	✓	✓	✓	✓	✓	5	≥2yrs	148	94%	>99.5%	127	94%	>99.5%	✓ (≥2yrs)	✓	✓	✓
Simplera/Simplera Sync™ (Medtronic)[8]	✓	✓	✓	✓	✓	5	≥2yrs	160	89%	[d]	138	88%	[d]	✓ (≥2yrs)	x	x	✓
GlucoMen iCan (A. Menarini Diagnostics)[g]	x	✓	✓	✓	✓	4	≥2yrs	35	96%	>99.5%	60	95%	>99.5%	✓ (≥2yrs)	x	✓	x
Guardian™ 4 Sensor and Guardian™ 4 Link Transmitter (Medtronic)[g]	x	✓	✓	✓	✓	4	≥2yrs	153	88%	[d]	108	83%	[d]	✓ (≥2yrs)	x	x	✓
TouchCare® Nano A8 (Medtrum)[g]	x	x	✓	[d]	[d]	1	≥14yrs	63	89%	99%	[d]	[d]	[d]	✓ (≥2yrs)	x	x	✓
Linx (Microtech)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	91	>90%	99%	[d]	[d]	[d]	✓ (≥18yrs)	x	x	x
Adjunctive use: Not licensed for clinical decision-making. All clinical decisions must be confirmed with a finger-prick blood glucose test																	
Gluconovo® (Infinovo)[10]	✓	x	x	x	x	1	≥18yrs	78	90%	99%	[d]	[d]	[d]	x (2yrs)	x	x	x
GlucoRx Aidex™ (GlucoRx)[11]	✓	x	x	x	x	1	≥18yrs	114	96%	>99.5%	[d]	[d]	[d]	x (≥14yrs)	x	✓	x
Yuwell Anytime CT3 (Urathon)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥14yrs)	x	x	✓
Syai Tag (Syai Health Technology)[g]	x	[d]	[d]	[d]	[d]	0	≥18yrs	72	93%	[d]	[d]	[d]	[d]	x (≥18yrs)	x	x	x

Oxford University Hospitals NHS
NHS Foundation Trust

The importance of benchmarking

Time in range

- Time in range (3.9–10.0 mmol/l) is an increasingly important measure
- It is often used to assess glycaemia (and therefore diabetes management) both by people with diabetes and clinicians
- HbA1c is standardized and machines are calibrated
- Is TIR comparable between CGM systems?

Comparing different systems

Diabetes Care
American Diabetes Association

A Comparative Analysis of Glycemic Metrics Derived From Three Continuous Glucose Monitoring Systems

Guido Freckmann, Stephanie Wehrstedt, Manuel Eichenlaub, Stefan Pleus, Manuela Link, Nina Jendrike, Sükrü Öter, Derek Brandt, Cornelia Haug, and Delia Waldenmaier

Diabetes Care 2025;48(7):1213–1217 | https://doi.org/10.2337/dc25-0129

Oxford University Hospitals NHS
NHS Foundation Trust

Comparing different systems

Objective

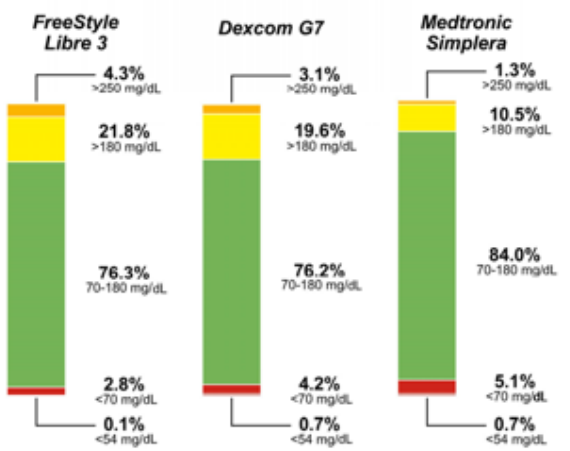
To analyze the **differences in continuous glucose monitoring (CGM)-derived metrics** among three current-generation systems and evaluate their **impact on therapeutic decision-making.**

Research Design & Methods

23 adult participants, 14 days
FreeStyle Libre 3
Dexcom G7
Medtronic Simplera

CGM metrics calculated for each participant and CGM system separately

Results



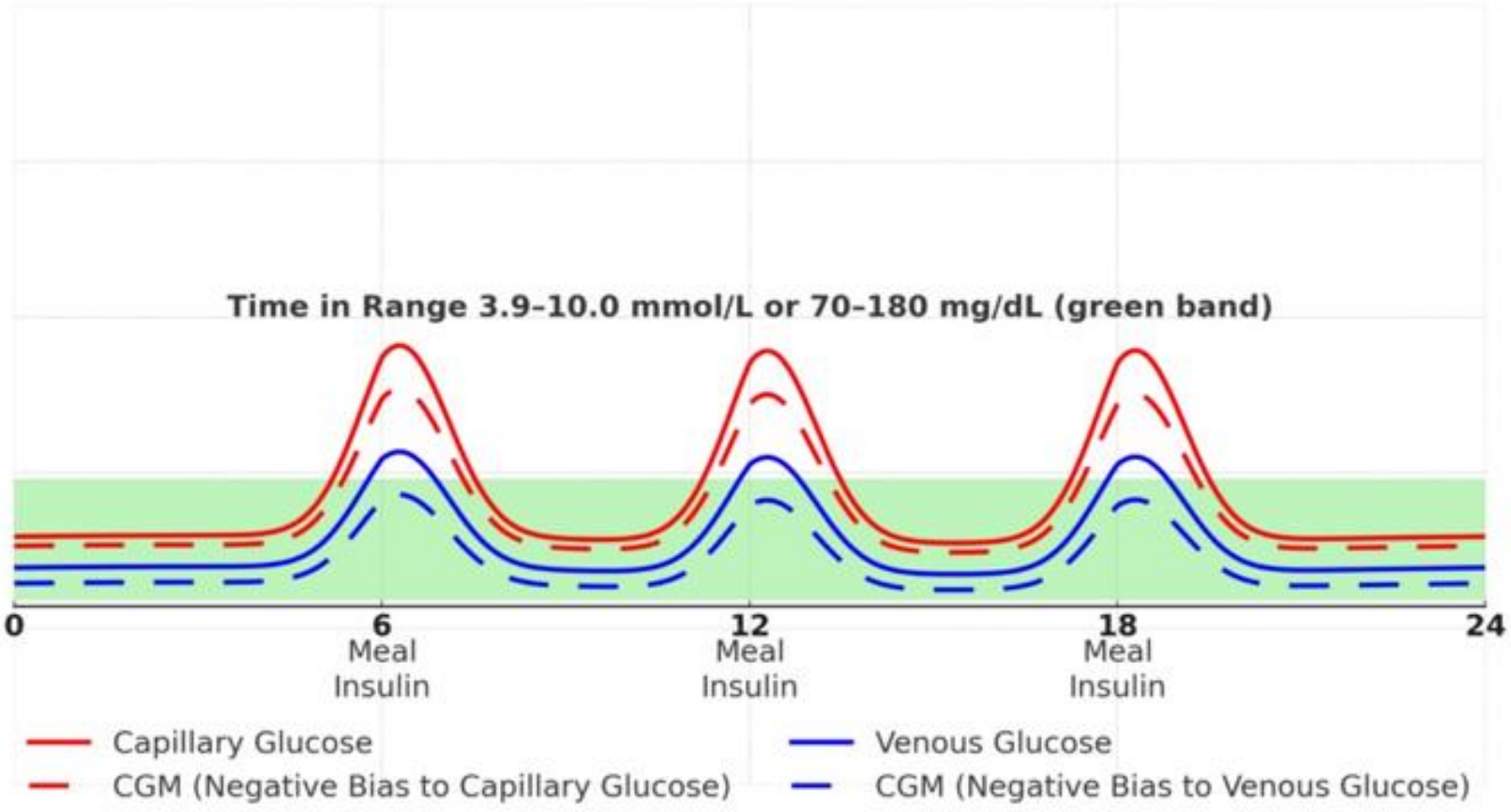
Median percentage of time in different glucose ranges across all study participants according to the different CGM systems.

- Differences in glucose profiles, resulting in **substantially different glycemic metrics** among the three systems.
- Marked intra-participant discrepancies that would have resulted in **different therapeutic recommendations**.

Conclusions

The CGM systems indicated discordant glycemic metrics that should be considered in diabetes the rapy. Different CGM systems should provide the same glucose readings and CGM-derived metrics when used by the same person.

Comparator is important



So, back to the beginning…

What are you going to say?

- Bill comes to see you in clinic to discuss his diabetes management
- He has bought a CGM device that was advertised to him online, and tells you that he finds it really helpful
- The device has a CE mark
- He checks the readings it gives him with his fingerprick readings, and in his experience they are usually pretty close.
- The device is cheaper to buy than Freestyle Libre 2, so Bill suggests that the NHS could save money by switching to this device and says that you should make it available to your population
- What do you do?

Summary

- Why is understanding CGM accuracy important? How might it impact your day to day practice?

- The importance of assessing CGM accuracy
  - CE marking
  - MARD
  - Consensus error grids
  - Study design

- The importance of benchmarking/calibration

Oxford University Hospitals NHS
NHS Foundation Trust

Thanks for your attention
Any questions?