



Tecnologia nel diabete di tipo 2: a chi e quando

Concetta Irace

Dipartimento di Scienze della Salute

Università degli Studi Magna Græcia di Catanzaro

Al cuore del diabete Roma 15-15 marzo 2025



Disclosures

- Concetta Irace dichiara di aver ricevuto negli ultimi due anni compensi o finanziamenti dalle seguenti Aziende Farmaceutiche e/o Diagnostiche:
 - Abbott
 - Medtronic
 - Novo Nordisk
 - Roche Diabetes Care Italia
 - Sanofi
- *Dichiara altresì il proprio impegno ad astenersi, nell'ambito dell'evento, dal nominare, in qualsivoglia modo o forma, aziende farmaceutiche e/o denominazione commerciale e di non fare pubblicità di qualsiasi tipo relativamente a specifici prodotti di interesse sanitario (farmaci, strumenti, dispositivi medico-chirurgici, etc.)*

DOMANDA 1

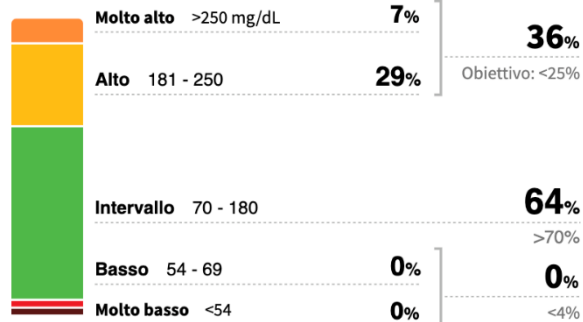
Con quale delle seguenti tecnologie ti senti più confidente nella gestione dei pazienti con diabete di tipo 2 ed in trattamento con insulina?

- A. CGM
- B. Smart pen/Cap
- C. Calcolatori di bolo
- D. Microinfusore

Monitoraggio in continuo del glucosio e diabete di tipo 2: quello che può vedere il diabetologo

Date selezionate: 1 mar 2025 – 14 mar 2025 (14 Giorni)

Tempo negli intervalli



Tempo in cui il sensore è attivo:

100%

Statistiche del glucosio

Valore medio del glucosio

173 mg/dL Obiettivo: ≤ 154 mg/dL

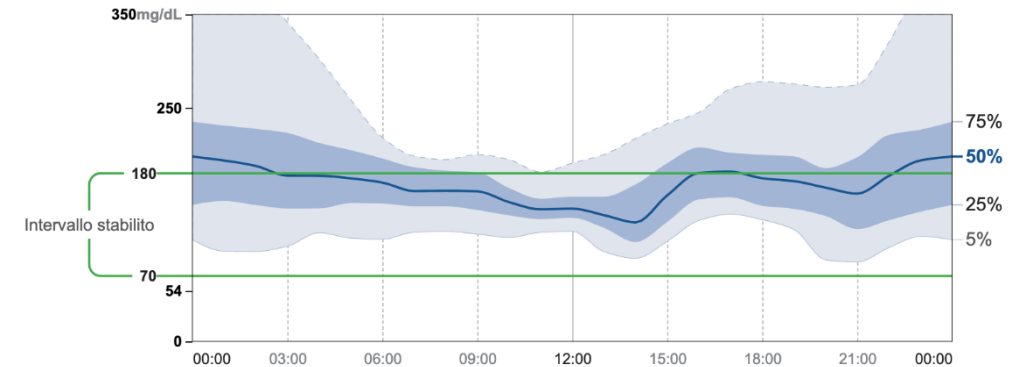
Indicatore di gestione del glucosio (GMI)

Livello approssimativo di A1C basato sul livello medio di glucosio CGM.

7,4% Obiettivo: $\leq 7,0\%$ | 58 mmol/mol Obiettivo: ≤ 53 mmol/mol

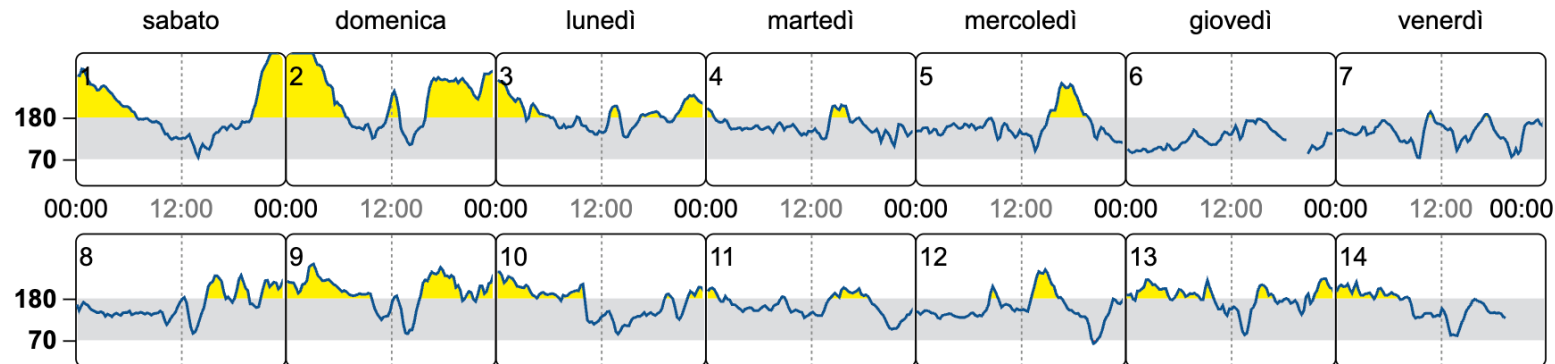
PROFILO DI GLUCOSIO AMBULATORIALE (AGP)

AGP è un riepilogo dei valori di glucosio del periodo di riferimento, con la mediana (50%) e gli altri percentili mostrati come se si fossero verificati in un solo giorno.

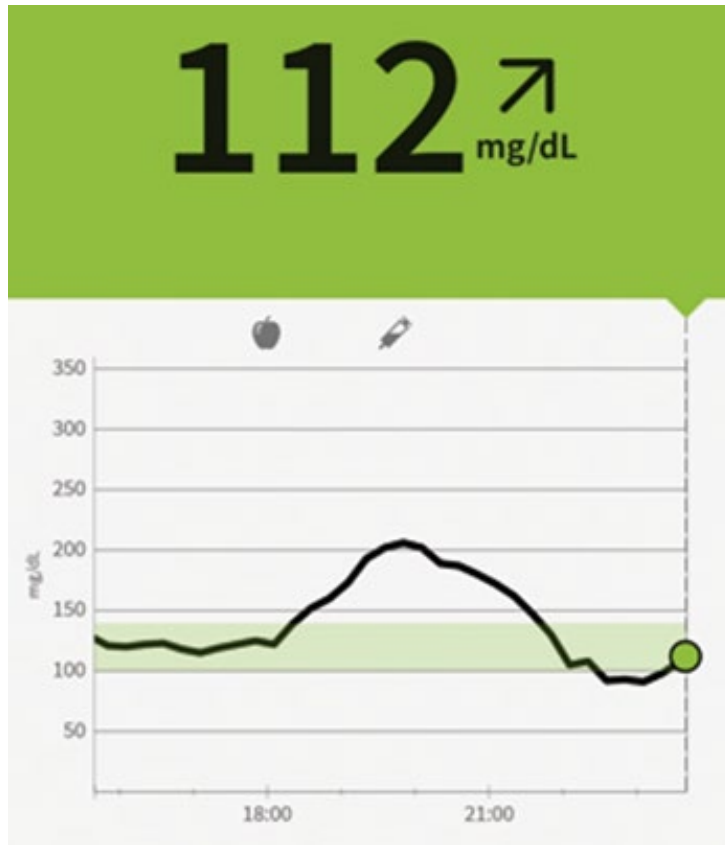


PROFILI GIORNALIERI DI GLUCOSIO

Ogni profilo giornaliero rappresenta un periodo da mezzanotte a mezzanotte con la data visualizzata nell'angolo in alto a sinistra.



Monitoraggio in continuo del glucosio e diabete di tipo 2: quello che può vedere la persona con diabete



- Glicemia puntuale
- ROC o freccia di Tendenza
- Grafico di tendenza
- Allarme per Ipoglicemia
- Allarme per Iperglicemia
- Altri allarmi

A chi la tecnologia nel diabete di tipo 2?

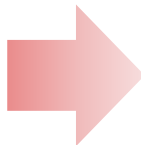


Diabetes Technology: Standards of Care in Diabetes - 2025

- Recommend real-time **CGM (rtCGM)** [A] or intermittently scanned CGM (**isCGM**) for diabetes management to youth [C] and adults [B] with diabetes on any type of **insulin therapy**.
- Consider using rtCGM and isCGM in adults with **type 2 diabetes** treated with **glucose-lowering medications** other than insulin to achieve and maintain individualized glycemic goals [B].
- Offer **connected insulin pens** for people with diabetes taking multiple daily insulin injections. [B]
- FDA-approved insulin **dose calculators/decision support systems** may be helpful for calculating insulin doses. [B]
- Traditional **insulin pumps** can be considered for the treatment of people with **type 2 diabetes** who are on MDI as well as those who have other types of diabetes resulting in insulin deficiency, for instance, those who have had a pancreatectomy and/or individuals with cystic fibrosis [C].

DCRM 2.0: Multispecialty practice recommendations for the management of diabetes, cardiorenal, and metabolic diseases

Technology and Digital Care



	Technology	Recommendation
General	Validated apps, wearables	Track weight, calorie intake, nutritional quality, physical activity, BP, heart rate, sleep quality, etc
	Arrhythmia detector app	Persons at risk of atrial fibrillation
	Fitness tracker	All persons wishing to monitor cardiometabolic fitness
	Ambulatory BP monitor	Patients with known or suspected hypertension
Diabetes	CGM	All persons on insulin ^a Consider for persons using SUs Persons with hypoglycemia regardless of etiology ^a Consider: • Episodic CGM as an audit of glycemic patterns in any person with diabetes taking any antihyperglycemic medication • Episodic or ongoing CGM for persons desiring information on impact of diet and physical activity
	Structured ^b SMBG	All persons using insulin or oral agents who lack access to CGM
	AID	All patients on intensive insulin regimens
	Smart pens	All persons on intensive insulin regimens based on personal preference or lack of access to AID

^a Ongoing CGM preferred over episodic CGM.

^b SMBG that is recorded and used for clinical decision making.

AID = automated insulin delivery; BP = blood pressure; CGM = continuous glucose monitor; SMBG = self-monitored blood glucose; SU = sulfonylurea.

Connected Insulin Pens and Caps: Spanish Endocrinology and Nutrition Society

PATIENT PROFILES THAT CAN BENEFIT FROM USING CONNECTED PENS AND CAPS

- **Difficulty of metabolic control**
 - Suboptimal glycaemic control
 - Hypoglycaemia
 - Glycaemic variability
- **Poor adherence**
 - Missed doses of insulin (basal/bolus)
 - Mistimed bolus
 - Insulin overcorrections
- **Difficulty in adjusting treatment**
 - Need for more precise adjustment of insulin ratios
 - Bolus calculator
- **Social determinants**
 - Dependents with caregivers who administer insulin

Linee Guida Italiane



CGM in Italy

- **Terapia insulinica** (intensiva, non intensive, microinfusore) nel T1 e T2;
- Individui con **Ipoglicemie** gravi o asintomatiche;
- **Gravidanza**;
- Individui con particolari **esigenze lavorative**;
- Diabete in **ipovedenti**;
- **Ipoglicemia** non associata a diabete;
- **Fibrosi cistica**, sospetto **gastroparesi diabetica**;
- Diabete T2 in **età pediatrica**;
- Paziente **ospedalizzato**;
- Terapia non insulinica per tre mesi in **condizioni particolari** (rischio ipoglicemia, modifica terapia, scompenso glicemico, educazione alla gestione della malattia);
- Diabete di T2 con alto **rischio cardiovascolare** trattato con GLP-1 e/o gliflozine (1 mese per anno);
- Individui con **età >65 anni** e valore di HbA1c >8,5% in più occasioni.



DOMANDA 2

Quale ritieni sia la barriera che maggiormente limita il raggiungimento di un buon controllo glicemico nel diabete di tipo 2?

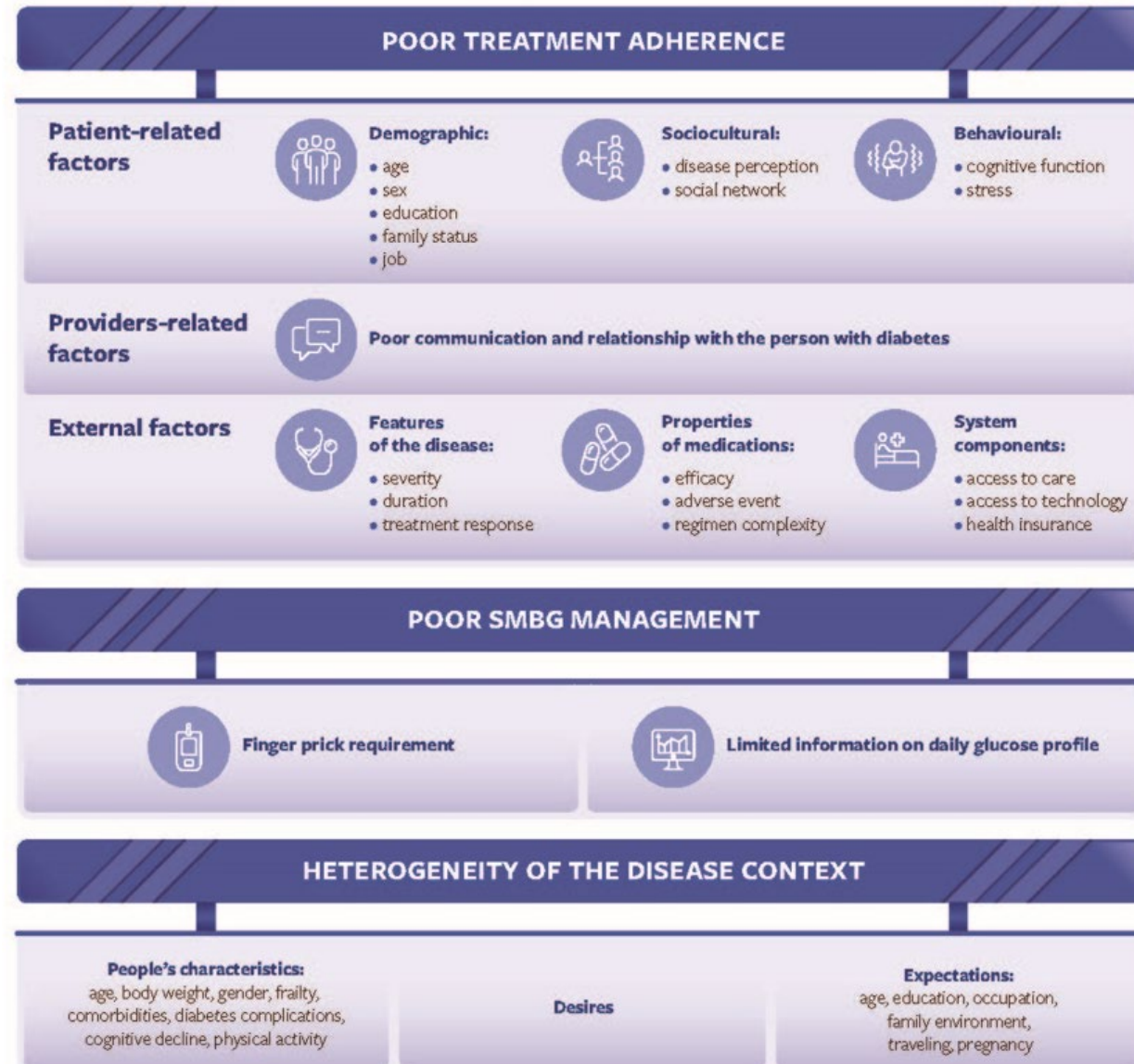
- A. Scarsa aderenza al trattamento farmacologico
- B. Limitato utilizzo del SMBG
- C. Intervalli troppo lunghi tra le visite
- D. Caratteristiche della patologia

Enhancing Type 2 Diabetes Care with CGM Integration: Insights from an Italian Expert Group

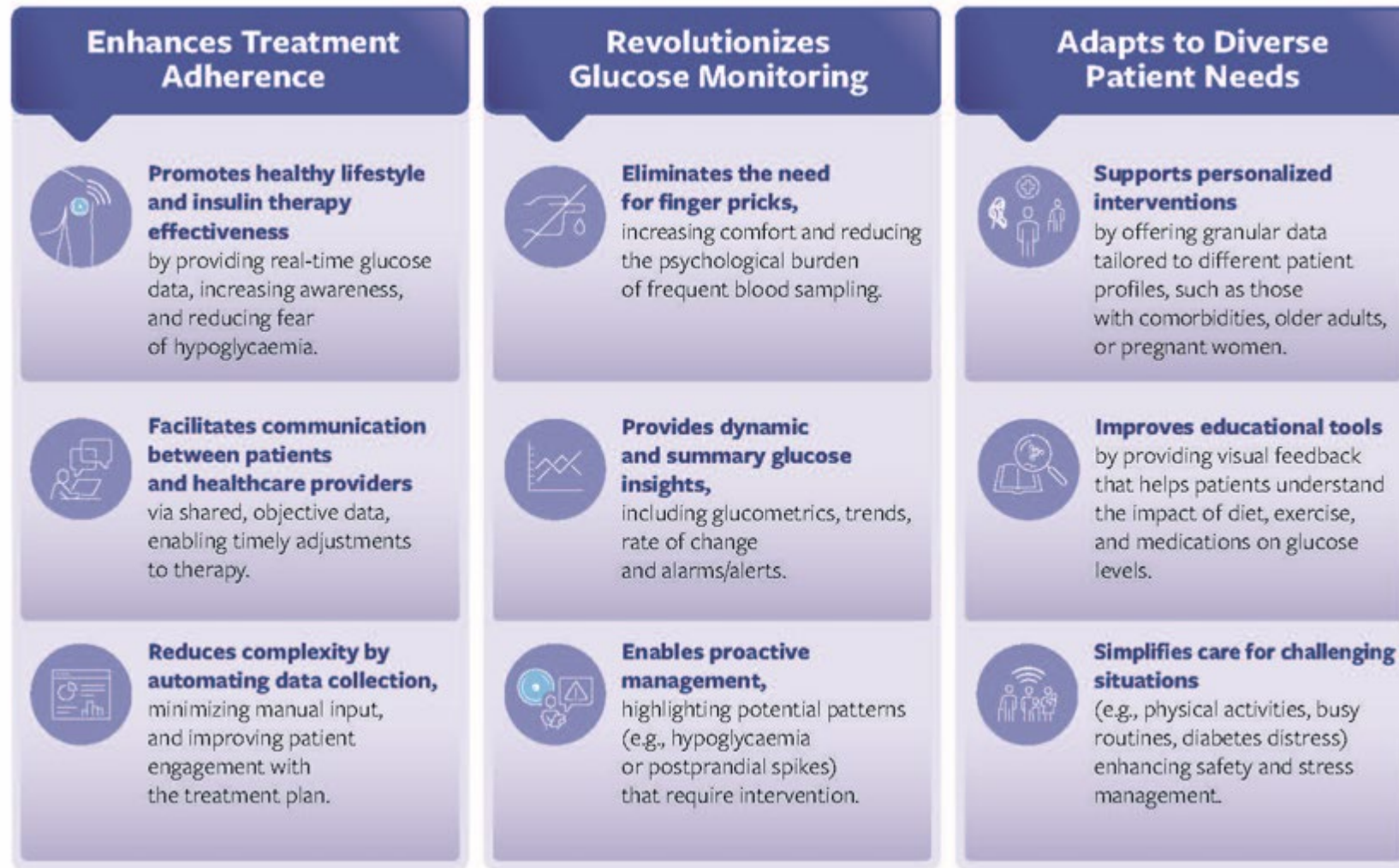
Concetta Irace, Angelo Avogaro, Federico Bertuzzi, Raffaella Buzzetti, Riccardo Candido, Stefano Del Prato, Paolo Di Bartolo, Paolo Fiorina, Carlo Bruno Giorda, Francesco Giorgino

Diabetes/Metabolism Research and Reviews
Revision Submitted

Barriers in the control of type 2 diabetes



How CGM can overcome the barriers to glycaemic control



Quando prescrivere la tecnologia nel diabete di tipo 2?



DOMANDA 3

Quando ritieni sia utile prescrivere il CGM nel diabete di tipo 2?

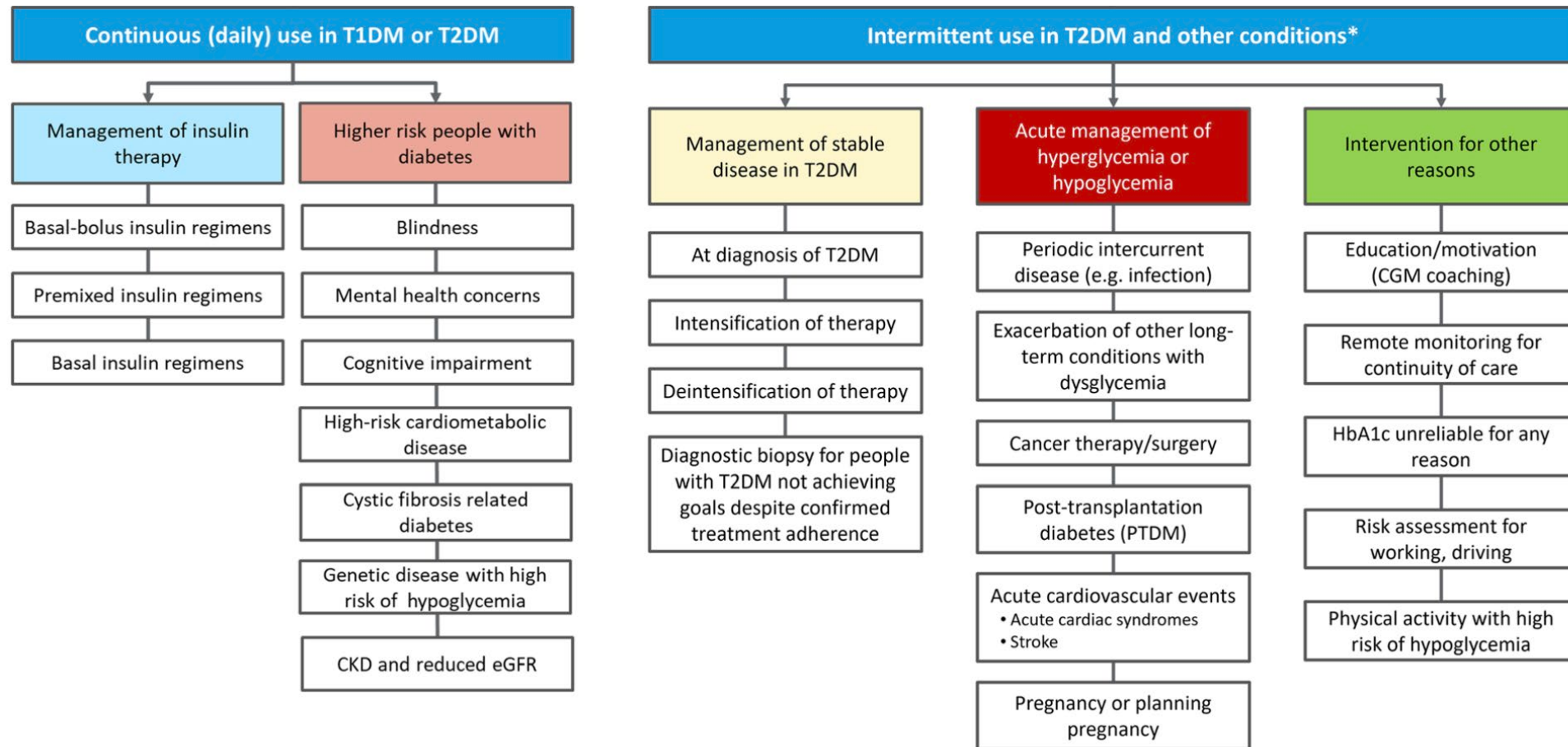
- A. Sempre
- B. Ad intervalli di tempo
- C. Alla diagnosi
- D. In situazioni critiche

Proposed use of CGM throughout the natural history of T2DM

Group	At diagnosis and early disease	Management of stable disease	Long duration of disease ^a
All people with T2DM	Utilize CGM for 14 days after T2DM diagnosis Establish a baseline glucometric profile Provide education on the glycaemic response to diet and exercise in T2DM Decide on the initial treatment plan and therapy Evaluate the patient's early (14-day) response to T2DM treatment	Predict risk of microvascular complications Adjust therapy Manage glycaemic goals for time in range, time below range, time above range, glycaemic variability and glucose management indicator (CGM-defined HbA _{1c} correlate)	Facilitate T2DM therapy de-escalation in older and/or frail people with T2DM Prevent hypoglycaemia Reduce risk of cardiorenal complications (for example, chronic kidney disease) Reduce incidence and progression of microvascular disease Allow care workers to more effectively manage the care of people with T2DM
People with T2DM on: Multiple daily injections Basal insulin Premixed insulin Insulinotropic drugs ^b	Continuous access to CGM for daily use Prevent hypoglycaemia Manage hyperglycaemia Support self-management	Prevention of hypoglycaemia Manage hyperglycaemia Facilitate periods of therapy escalation or de-escalation Support self-management	
People with T2DM on non-insulin therapy ^c	Intermittent use of CGM at least every 3 months, with HCP review Reinforce education on glucose profiles, diet, physical activity and the effects of medication	Can be combined with a coincident HbA _{1c} test HCP can make decisions on whether to change therapy or not Predict changes in risk of microvascular complications People with T2DM can re-establish the behaviours of good self-management with support from CGM	

CGM, continuous glucose monitoring; HCP, health-care professional; T2DM, type 2 diabetes mellitus. ^aPeople with long-standing T2DM, with risk of consequent comorbid microvascular and macrovascular disease. ^bPeople with T2DM at increased risk of frequent hypoglycaemia confirmed during a CGM-led medical review. ^cCan include people on insulinotropic oral drugs with low risk of hypoglycaemia confirmed during a CGM-led medical review.

Using CGM in modern diabetes management



Multicenter Randomized Trial of Intermittently Scanned Continuous Glucose Monitoring Versus Self-Monitoring of Blood Glucose in Individuals With Type 2 Diabetes and Recent-Onset Acute Myocardial Infarction: Results of the LIBERATES Trial

Ramzi A. Ajjan, Simon R. Heller, Colin C. Everett, Armando Vargas-Palacios, Ruchi Higham, Linda Sharples, Diana A. Gorog, Alice Rogers, Catherine Reynolds, Catherine Fernandez, Pedro Rodrigues, Thozhukat Sathyapalan, Robert F. Storey, and Deborah D. Stocken

Diabetes Care 2023;46(2):441–449 | <https://doi.org/10.2337/dc22-1219>

Hyperglycemia in individuals with type 2 diabetes and recent myocardial infarction is common and associated with adverse outcome

LIBERATES RCT evaluated isCGM vs. SMBG for glycemic management in 141 individuals with type 2 diabetes and recent myocardial infarction

Primary and secondary outcomes were compared at 3 months; exploratory outcomes collected up to 12 months

Primary end point

TIR: marginal increase in isCGM arm compared with SMBG

Secondary end points

Hypoglycemia: significant reduction in isCGM arm compared with SMBG

HbA_{1c}: similar reduction in study arms

Quality of life measures: Largely similar improvements in study arms but some measures favored isCGM

Exploratory end points (numbers in isCGM & SMBG)

Glycemic emergencies: 2 & 6

MACE: 18 & 11

Death: 2 & 3

Health economic analysis (based on HbA_{1c} & hypoglycemia)

isCGM is cost effective

Abbreviations

RCT: Randomized Controlled Trial

isCGM: intermittently scanned continuous glucose monitoring

SMBG: self-monitoring of blood glucose

TIR: Time in Range

HbA_{1c}: glycated hemoglobin

MACE: Major Adverse Cardiac Events

In-Hospital Diabetes Management by a Diabetes Team and Insulin Titration Algorithms Based on Continuous Glucose Monitoring or Point-of-Care Glucose Testing in Patients With Type 2 Diabetes (DIATEC): A Randomized Controlled Trial

Mikkel T. Olsen, Carina K. Klarskov, Signe H. Jensen, Louise M. Rasmussen, Birgitte Lindegaard, Jonas A. Andersen, Hans Gottlieb, Suzanne Lunding, Ulrik Pedersen-Bjergaard, Katrine B. Hansen, and Peter L. Kristensen

Diabetes Care 2025;48(4):1–10 | <https://doi.org/10.2337/dc24-2222>

Objective

The DIATEC trial investigates the glycemic and clinical effects of inpatient continuous glucose monitoring (CGM)-guided insulin titration by diabetes teams.

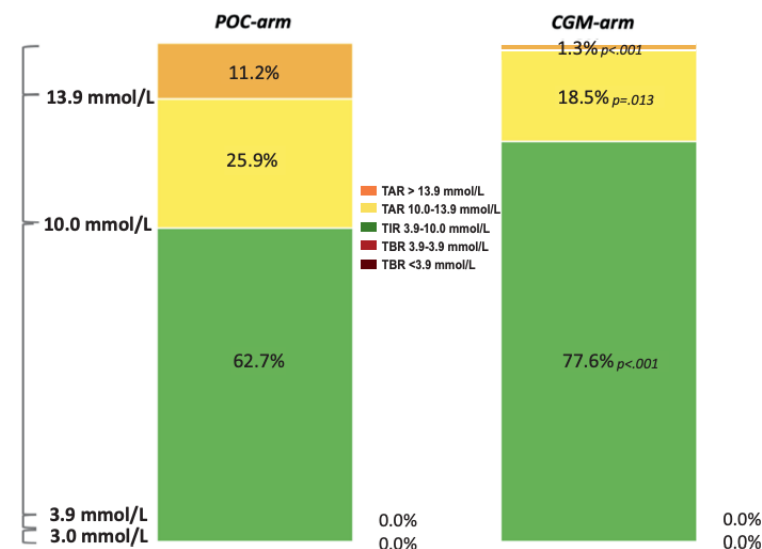
Methods

This two-center trial randomized 166 non-intensive care unit patients with type 2 diabetes. Diabetes management was performed by regular staff, guided by diabetes teams using insulin titration algorithms based on either point-of-care (POC) glucose testing or CGM. The primary outcome was the difference in time in range (TIR) (3.9–10.0 mmol/L) between the two arms

Conclusions

In-hospital CGM increased TIR by a clinically significant 15%-points, mainly by reducing time above range (TAR). CGM also lowered time below range (TBR), glycemic variability, prolonged hypoglycemic events, insulin usage, and in-hospital complications.

Results



ORIGINAL RESEARCH

Association of Changes in A1C Following Continuous Glucose Monitoring Acquisition in People with Sub-Optimally Treated Type 2 Diabetes Taking GLP-1 RA Therapy

Eden Miller · Joyce S. Chuang · Gregory J. Roberts · Yelena Nabutovsky · Naunihal Virdi · Eugene E. Wright Jr.

Received: April 26, 2024 / Accepted: June 28, 2024 / Published online: July 15, 2024
© The Author(s) 2024

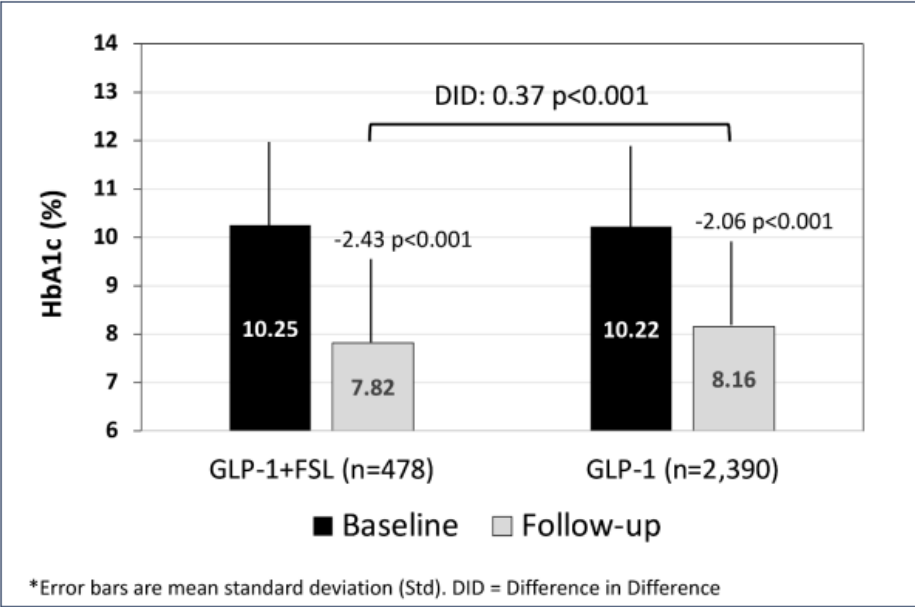


Figure 3. Change from Baseline HbA1c at Follow-up: Matched Cohort

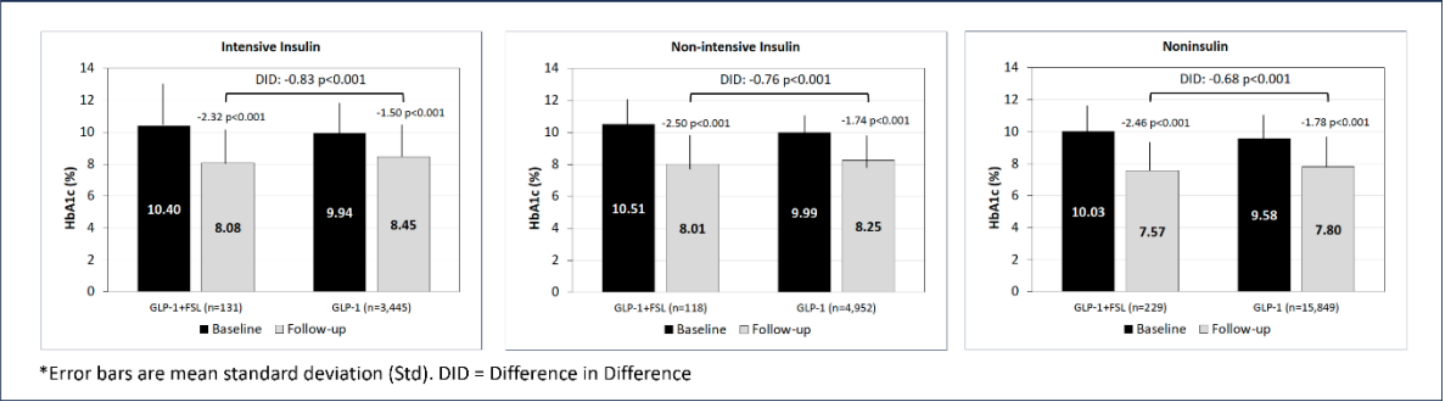
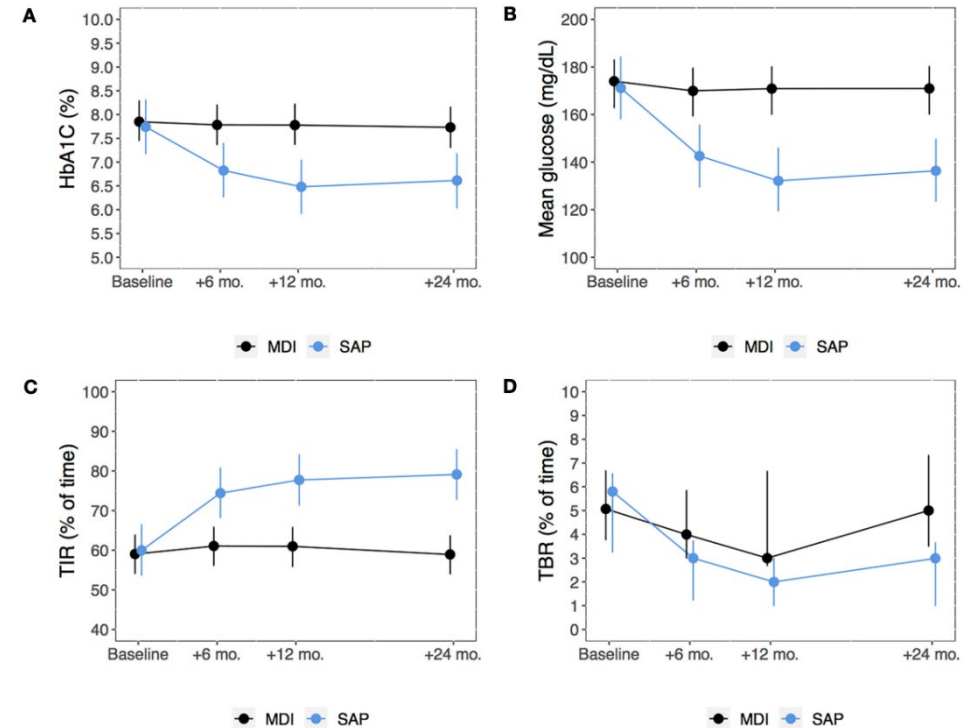
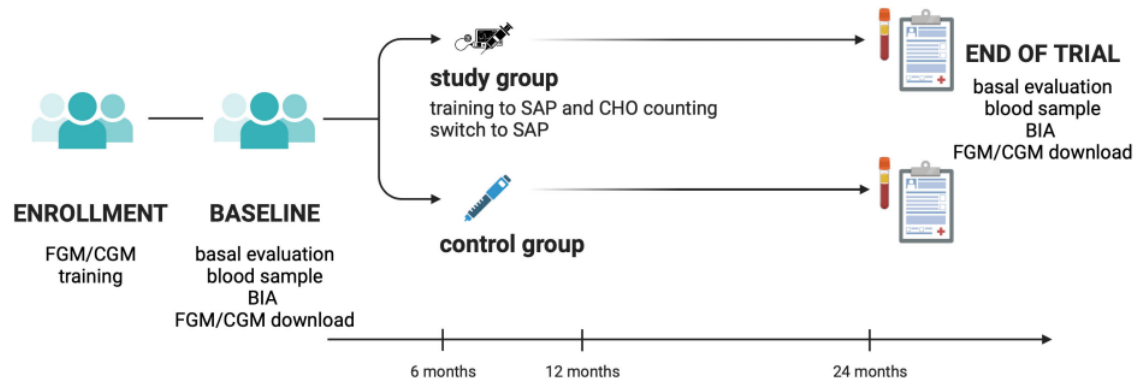
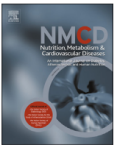


Figure 4. Change in HbA1c by Insulin Therapy Group

Effects of insulin therapy optimization with sensor augmented pumps on glycemic control and body composition in people with cystic fibrosis-related diabetes



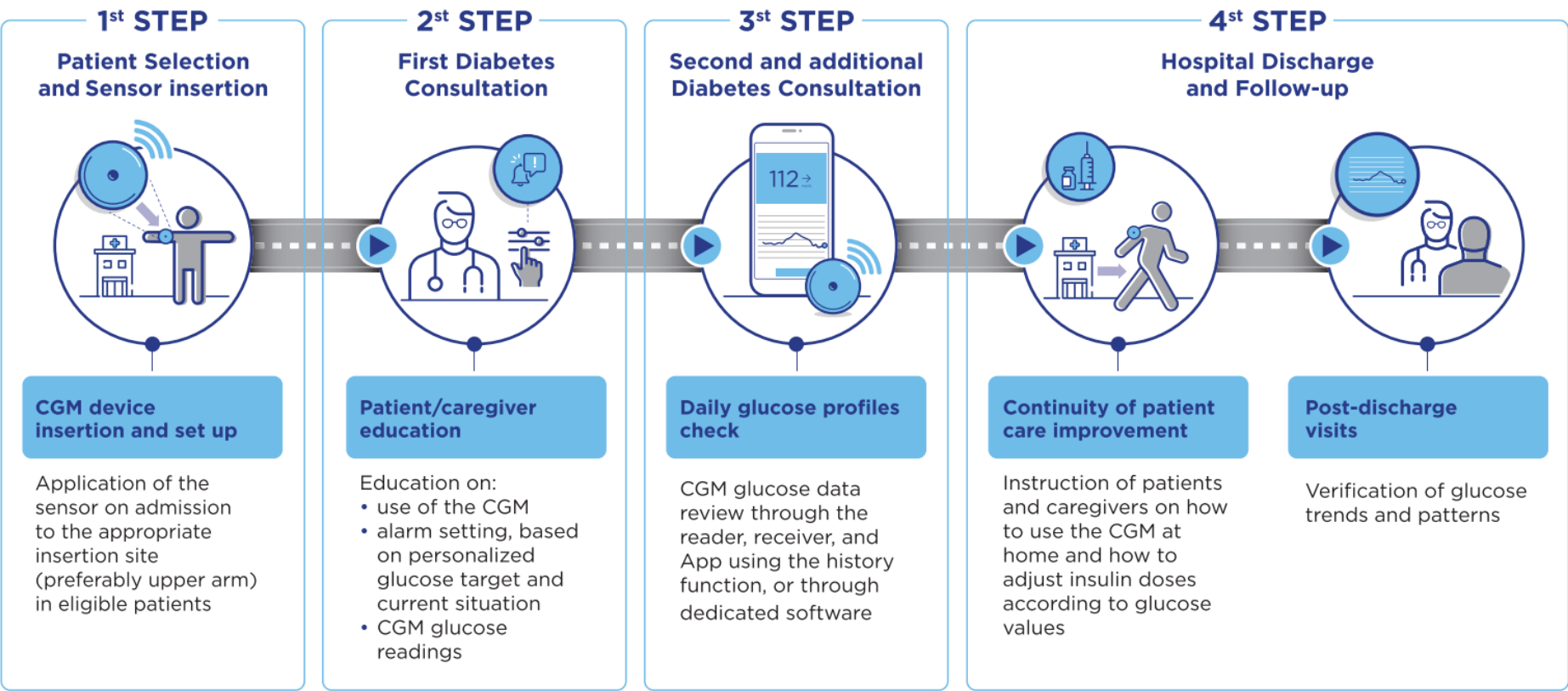


REVIEW

Continuous glucose monitoring (CGM) in a non-Icu hospital setting:
The patient’s journey



Concetta Irace ^{a,*}, Sara Coluzzi ^b, Graziano Di Cianni ^c, Elisa Forte ^d, Francesco Landi ^e,
Maria Rosaria Rizzo ^f, Giorgio Sesti ^g, Elena Succurro ^h, Agostino Consoli ^{b,i}



Alarm setting and CGM readings during hospitalization

Alarm setting



The alarms will be activated according to the individualized glucose target and current situation

The high alarm will be set at 180 - 200 mg/dL for patients who require strict glycemic control

The low alarm will always be activated, preferably at 75-80 mg/dL

The low alarm will always be activated, preferably at 85-90 mg/dL in elderly and frail patients or when using CGM without a predictive alarm

Repeated alarms or delayed alarms can also be set if available.

CGM readings



Before breakfast, lunch, and dinner to titrate insulin according to the diabetologist prescription

At bedtime for safety reasons

Every 15 min after the administration of carbohydrates to treat hypoglycemia until the resolution of the event

Every 2 h in case of skipped or delayed meal

Every 3-4 h during enteral and parenteral nutrition

Every 3-4 h during intravenous corticosteroid infusion

Conclusioni



- La Tecnologia migliora l'aderenza ed aumenta l'accettazione della terapia;
- La Tecnologia consente di superare quelle barriere che impediscono il raggiungimento di un buon compenso;
- Negli individui con T2D non insulino trattati preferire uso intermittente del CGM;
- Negli individui con T2D utilizzare il CGM in maniera continuativa appena si inizia la terapia con insulina;
- Negli individui con T2D insulino trattati i benefici sono sovrapponibili a quelli che si ottengono nel T1D;
- Le smart pen e smart cap sono una possibile strategia per migliorare outcome glicemici e l'aderenza al trattamento farmacologico;
- Il microinfusore nel diabete di tipo 2 al momento è suggerito per individui selezionati.