

MONITORAGGIO CONTINUO DELLA GLICEMIA – II FASE

CORSO SID

Gestione dei dati (scarico dati) e altri parametri utilizzabili nell'ottimizzazione della terapia

Sergio Di Molfetta

Medicina Interna, Endocrinologia, Andrologia e Malattie Metaboliche
Dipartimento dell'Emergenza e dei Trapianti di Organi



6 Novembre 2020

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Il dr. Sergio Di Molfetta dichiara di aver ricevuto negli ultimi due anni compensi o finanziamenti dalle seguenti Aziende Farmaceutiche e/o Diagnostiche:

Roche Diabetes Care Italia

Alpha Pharma Service

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, ecc.).

Continuous Glucose Monitoring

From personal use...



... to retrospective review

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

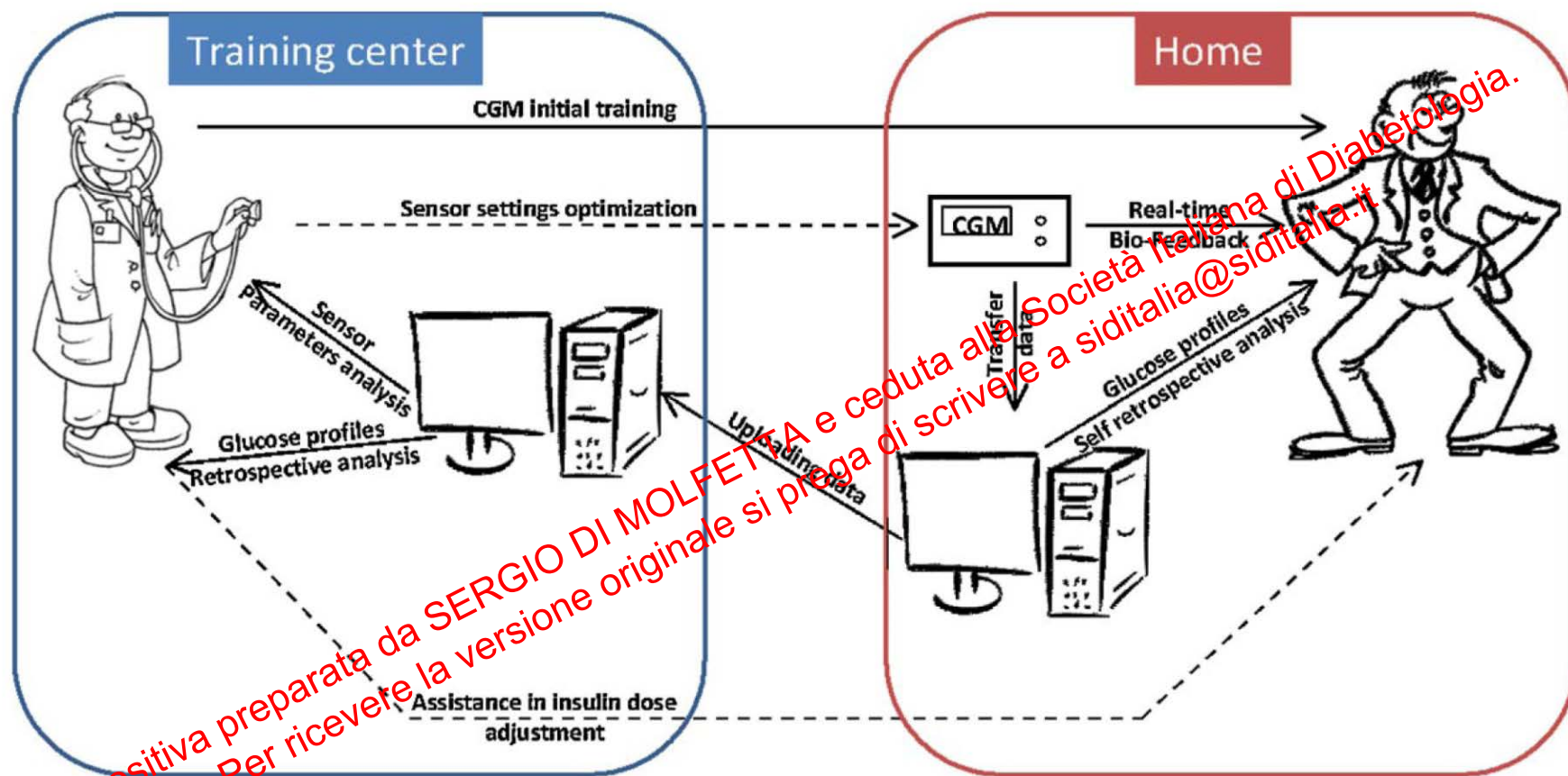
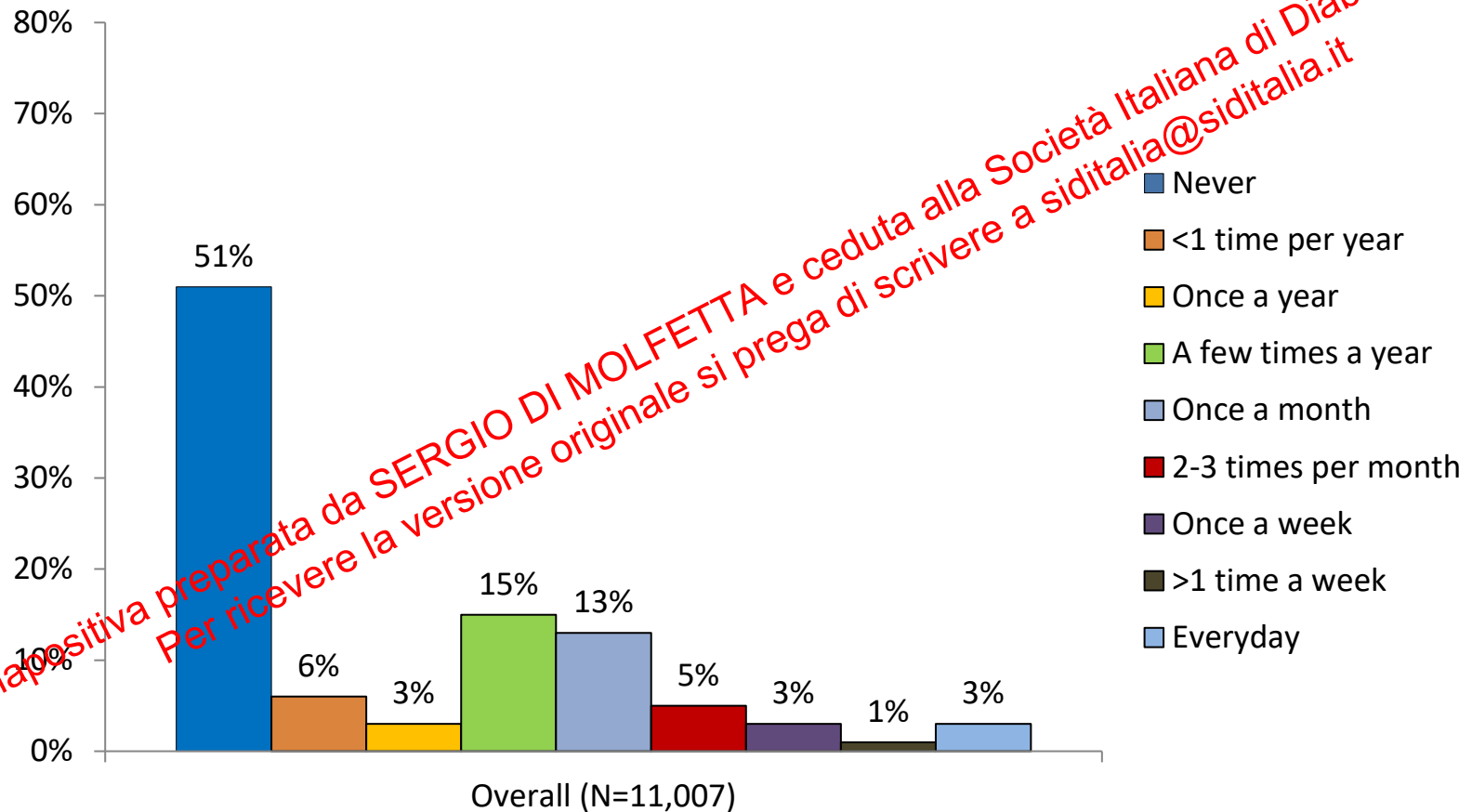


Fig. 1 – Example of possible use of CGM data when patient and doctor are equipped with software to analyze these data. Dotted arrows indicate actions achievable through telemedicine.

Frequency Of Downloading CGM Data Outside Doctor's Office



A Minority of Patients with Type 1 Diabetes Routinely Downloads and Retrospectively Reviews Device Data

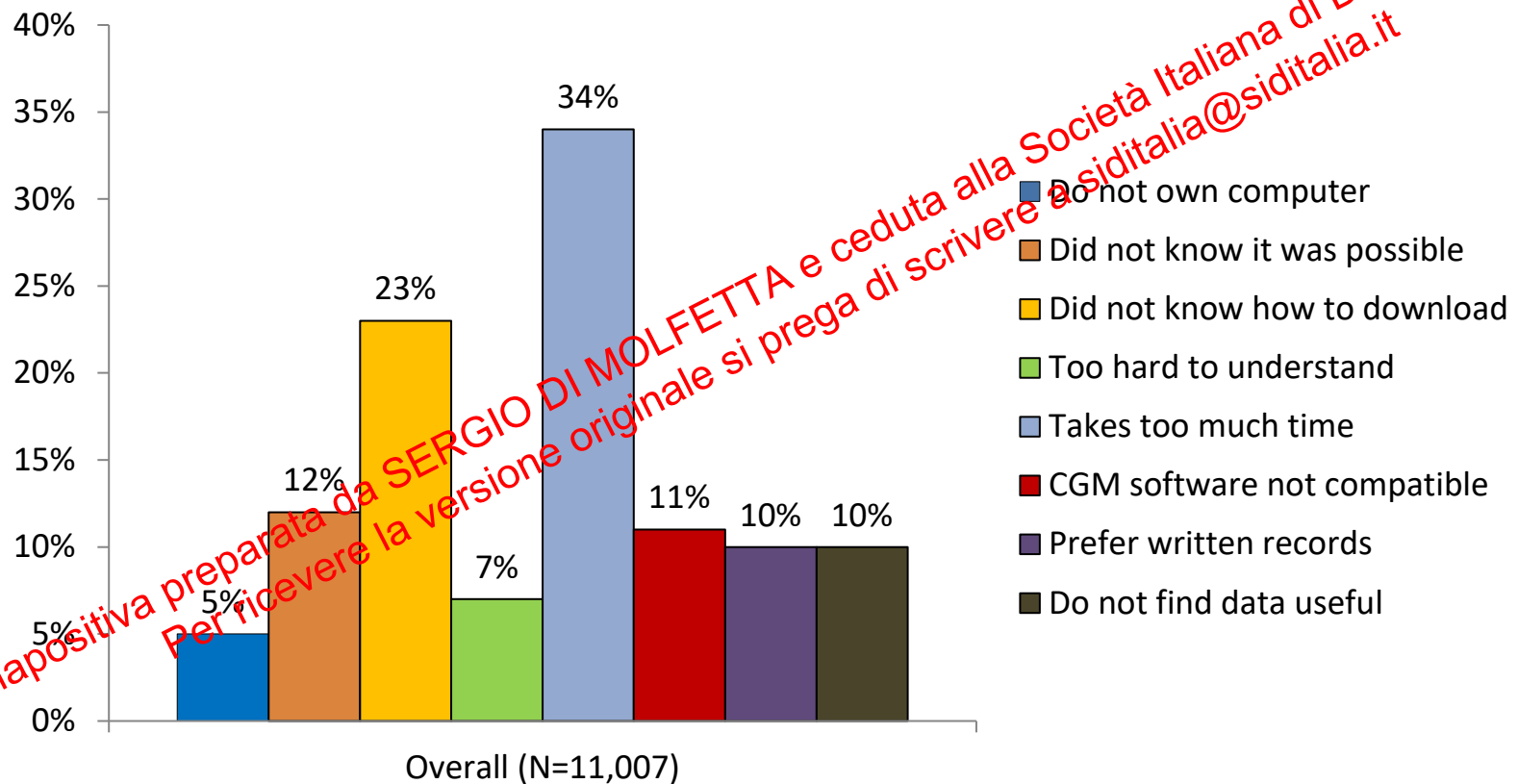
TABLE 2. COMPARISONS BETWEEN ROUTINE REVIEWERS AND NON-ROUTINE REVIEWERS OF AT LEAST ONE DEVICE

Participants, characteristic	Routine Reviewers	Non-Routine Reviewers	P
Adults			
Number of participants	18	136	
Mean age (years)	44.9 ± 13.1	32.9 ± 16.2	0.003
Sex (% male)	41%	48%	0.29
Ethnicity (% minority status)	11%	27%	0.15
Education level (% with at least college degree) ^a	83%	66%	0.13
Insurance status (% with non-private insurance)	11%	25%	0.18
Mean duration of type 1 diabetes (years)	28.7 ± 15.5	17.2 ± 12.7	0.0006
Mean A1c (%)	7.2 ± 1.0	8.1 ± 1.6	0.03
Children			
Number of participants	50	132	
Mean age of child (years)	10.8 ± 4.0	12.3 ± 3.9	0.02
Sex of child (% male)	58%	53%	0.55
Ethnicity (% minority status)	14%	21%	0.33
Caregiver education (% with at least college degree)	75%	64%	0.17
Insurance status (% with non-private insurance)	11%	22%	0.10
Mean duration of type 1 diabetes (years)	3.7 ± 3.1	5.5 ± 3.8	0.005
Mean A1c (%)	7.8 ± 1.4	8.6 ± 1.7	0.001

Unadjusted mean ± SD values or frequencies are shown, as indicated. *P* values were obtained from *t* tests for continuous variables and χ^2 tests for dichotomous variables.

^aParticipants 18 to <26 years of age were categorized as having a college degree if they had completed at least some college. A1c, hemoglobin A1c.

Reasons For Infrequent Downloading (<Once A Month)



Invita paziente

Data di nascita

Collega paziente

Collega il paziente a uno studio LibreView o come paziente privato.

I membri dell'équipe di cura di questo studio avranno accesso ai dati di questo paziente.

Invita il paziente a caricare e condividere i suoi dati del glucosio da remoto.



Crea un rapporto monouso

Carica un dispositivo per visualizzare e stampare rapporto adesso.

- Visibile solo per 24 ore
- Nessun dato salvato in modo permanente
- I dati non possono essere aggiunti al profilo di un paziente



Crea un rapporto collegato al paziente

Carica un dispositivo e collegalo ad un paziente per salvare i dati da visualizzare in qualsiasi momento.

- Aggiungi i dati del dispositivo al profilo del paziente
- Salva i dati per la visualizzazione futura

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Personal

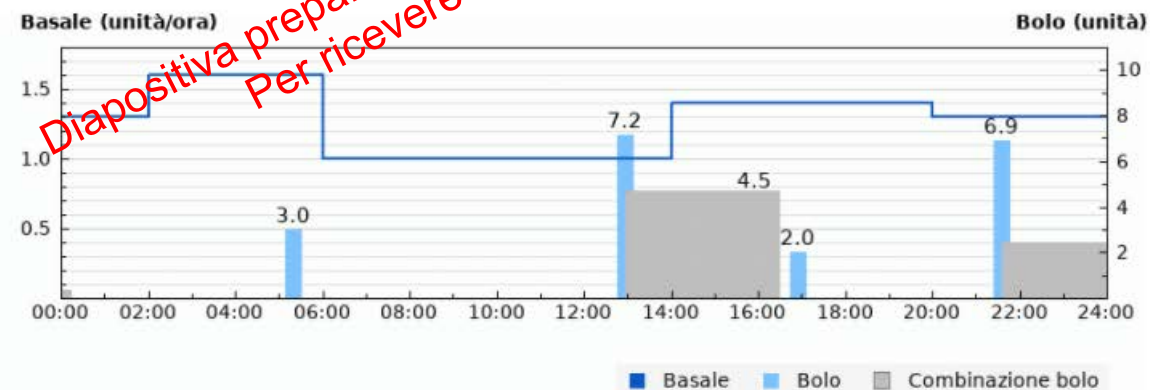
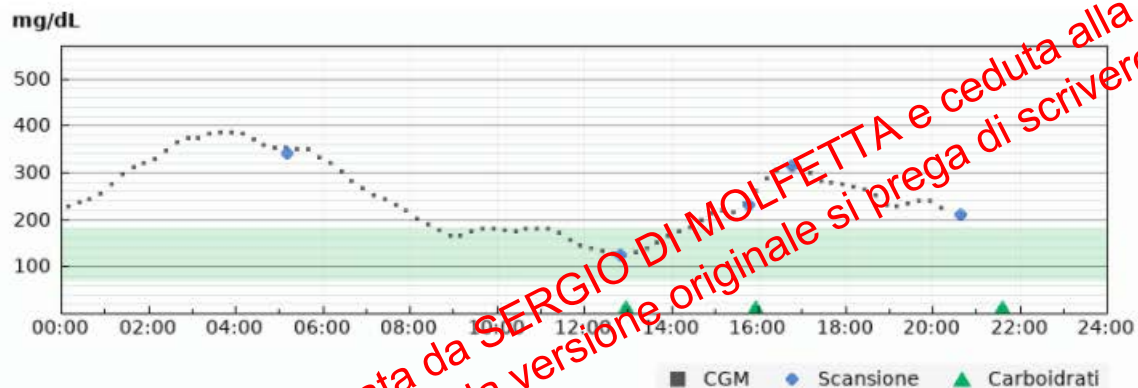
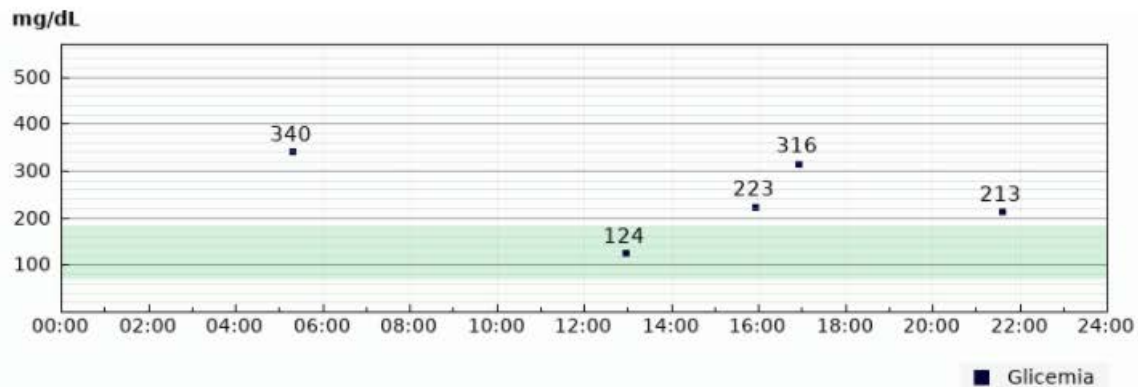
–for patients



Clinic

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Sabato 3/10



Basale		Bolo		Espandi ▼
Ora	U	Ora	U	
00:00	1.300	00:00	0.35	▲
00:30	1.300	(Ext.	14min)	
02:00	1.600	05:19	3.00	
06:00	1.600	(Corr:	3.00)	
14:00	1.400	Altera		
20:00	1.300	(Suggerito:	3.25)	
		(Corr:	3.25)	
		12:58	11.85	
			4.70	
		(Comb.	210min)	▼

Carboidrati	
Ora	
12:58	140g
15:56	50g
21:35	110g

Table 1—Key metrics for CGM data analysis and reporting

CGM metric	Measures	ATTD consensus
1	Mean glucose Severe hypoglycemia* Percentage of time in hypoglycemic ranges, mg/dL (mmol/L)	√ (calculated) ✓ Clinical diagnosis: event requiring assistance (level 3)
2	Clinically significant/very low/immediate action required	<54 (<3.0) (level 2)
3	Alert/low/monitor Percentage of time in target range, mg/dL (mmol/L)	<70–54 (<3.9–3.0) (level 1)
4	Default Secondary Percentage of time in hyperglycemic ranges, mg/dL (mmol/L)	70–180 (3.9–10.0) 70–140 (3.9–7.8)
5	Alert/elevated/monitor	>180 (>10) (level 1)
6	Clinically significant/very elevated/immediate action required Diabetic ketoacidosis* Glycemic variability	>250 (>13.9) (level 2) Clinical diagnosis: ketones, acidosis, and usually hyperglycemia (level 3) CV Stable Unstable CV ≤36%, CV ≥36% SD
7	Primary glycemic variability Stable Unstable Secondary glycemic variability	CV Stable Unstable CV ≤36%, CV ≥36% SD
8	eA1C	√ (calculated) ✓
9	Three time blocks: sleep, wake, 24 h Recommended data sufficiency	12:00 A.M.–6:00 A.M., 6:00 A.M.–12:00 A.M., 12 A.M.–12:00 A.M.
10	Collection period (minimum no. of weeks)	2
11	Percentage of expected CGM readings (minimum percentage)	70–80 (10 of 14 days)
12	Episodes of hypoglycemia/hyperglycemia (minimum no. of minutes) (with beginning and end of episode defined)	15 min
13	Area under the curve	√ (calculated)
14	Risk of hypoglycemia and hyperglycemia	LBGI/HBGI recommended
15	Standardized CGM visualization of data	AGP recommended

*Severe hypoglycemia (level 3) and diabetic ketoacidosis (level 3) are not key CGM metrics per se. However, these conditions are included in the table because they are important clinical categories that must be assessed and documented.

} Data sufficiency



Glucose Management Indicator (GMI): A New Term for Estimating A1C From Continuous Glucose Monitoring

$$\text{GMI (\%)} = 3.31 + 0.02392 \times [\text{mean glucose in mg/dL}]$$

A calculator to compute GMI is available at www.jaeb.org/gmi and www.AGPreport.org/agp/links

Table 2—Explaining GMI to individuals with diabetes

GMI tells you what your approximate A1C level is likely to be, based on the average glucose level from your CGM readings for 14 or more days.

- GMI gives you the A1C level that would usually be expected from a large number of individuals with diabetes who have the same average CGM glucose level as you.
- However, your laboratory A1C might be similar to, higher than, or lower than your GMI.
 - Your GMI is calculated from your average CGM glucose, which measures glucose in interstitial fluid (under the skin) every 1–5 min.
 - Laboratory A1C is a measure of how much glucose has attached to the hemoglobin in your red blood cells over the life of each red blood cell, 120 days.
 - Each person's red blood cells may live for a slightly different number of days, and there may be differences in factors that affect how glucose attaches to your red blood cells. Therefore, we do not expect people with the same average glucose or calculated GMI to have the exact same laboratory A1C value.
 - There also are certain medical conditions that affect the life span of red blood cells that may explain differences between the GMI and laboratory A1C, including hemoglobinopathies and hemolytic anemia.

Here is what having a difference in laboratory-measured A1C and GMI may mean:

Laboratory A1C vs. GMI	
8.0% vs. 7.8%	A1C measured from a blood test that is similar to your GMI means that your average CGM glucose level is about what would be predicted from the measured A1C. (Based on the average of values from many other people.)
8.0% vs. 7.2%	A1C measured from a blood test that is higher than your GMI means that your average CGM glucose level is lower than would be predicted from the measured A1C. (Based on the average of values from many other people.)
7.2% vs. 8.0%	A1C measured from a blood test that is lower than your GMI means that your average CGM glucose level is higher than would be predicted from the measured A1C. (Based on the average of values from many other people.)

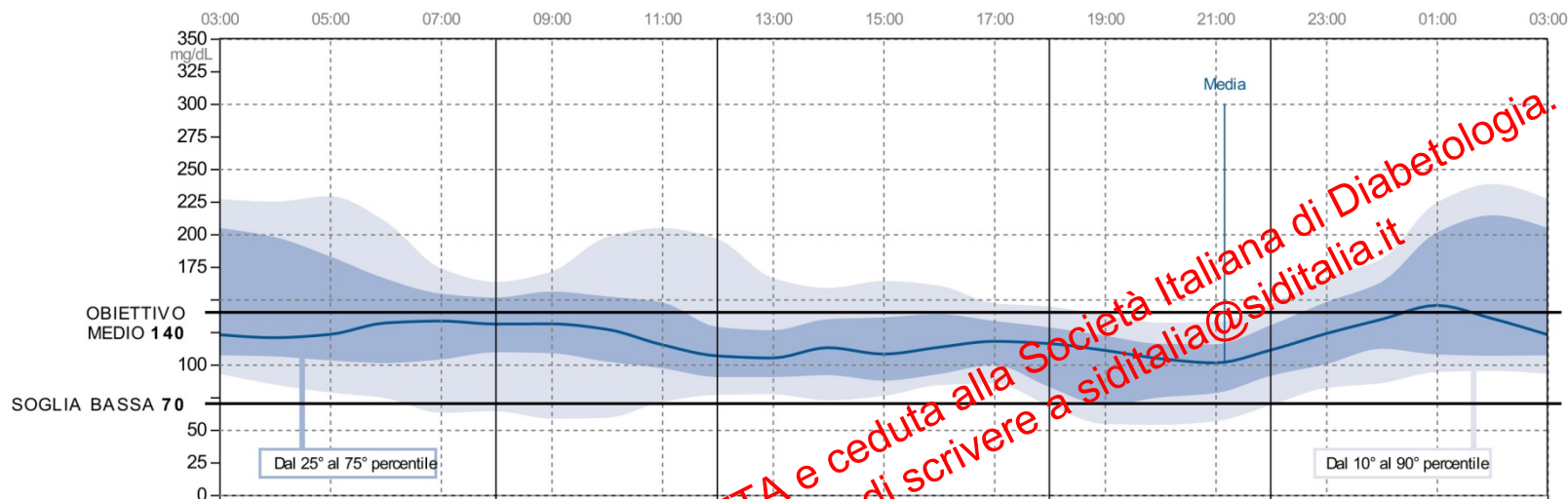
A difference between your laboratory measured A1C and your GMI level, while not unexpected, may be important to consider in your diabetes management. Please discuss with your health care team.

25 marzo 2019 - 7 aprile 2019 (14 Giorni)

♀ 52 yrs; HbA1c 6.9%

A1c stimata **6,0 %** o **42** mmol/mol

Glucosio



Probabilità di GLUCOSIO BASSO							
GLUCOSIO MEDIO Rispetto all'obiettivo							
VARIABILITÀ SOTTO LA MEDIA Mediana al 10° percentile							

LA VARIABILITÀ SOTTO LA MEDIA È ALTA! In questo modo è difficile raggiungere l'obiettivo glucosio medio senza aumentare la probabilità di glucosio basso.
Fattori che possono contribuire alla variabilità sotto la media:

- ☐ Dieta irregolare
- ☐ Errata o mancata assunzione di farmaci
- ☐ Consumo di alcolici
- ☐ Variazioni nel livello di attività
- ☐ Malattia

Impostazioni IMPOSTAZIONE GLUCOSIO BASSO CONSENTITO: Medio OBIETTIVO MEDIO :140 mg/dL (A1c: 6,5% o 82 mmol/mol)

Legenda OK BASSO MODERATO ALTO PASTO RIPOSO NOTTURNO

Table 1—Key metrics for CGM data analysis and reporting

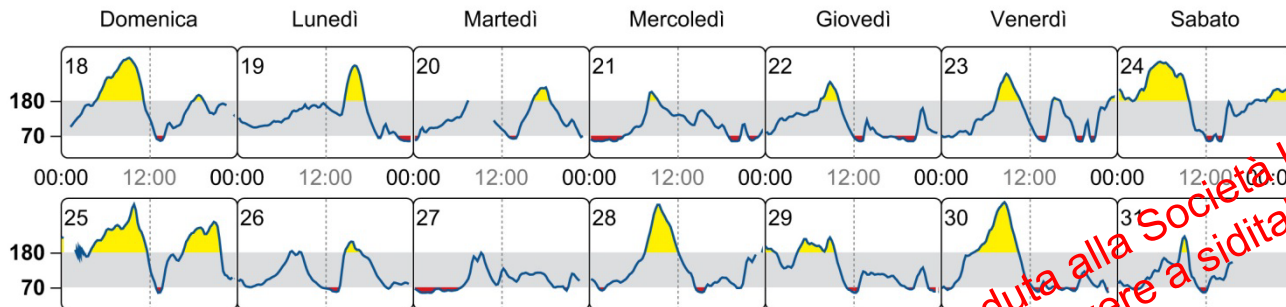
CGM metric	Measures	ATTD consensus
1	Mean glucose Severe hypoglycemia* Percentage of time in hypoglycemic ranges, mg/dL (mmol/L)	√ (calculated) Clinical diagnosis: event requiring assistance (level 3)
2	Clinically significant/very low/immediate action required	<54 (<3.0) (level 2)
3	Alert/low/monitor Percentage of time in target range, mg/dL (mmol/L)	<70–54 (<3.9–3.0) (level 1)
4	Default Secondary Percentage of time in hyperglycemic ranges, mg/dL (mmol/L)	70–180 (3.9–10.0) 70–140 (3.9–7.8)
5	Alert/elevated/monitor	>180 (>10) (level 1)
6	Clinically significant/very elevated/immediate action required Diabetic ketoacidosis* Glycemic variability	>250 (>13.9) (level 2) Clinical diagnosis: ketones, acidosis, and usually hyperglycemia (level 2) CV CV <36% CV ≥36% SD
7	Primary glycemic variability Stable Unstable Secondary glycemic variability	CV CV <36% CV ≥36% SD
8	eA1C	√ (calculated)
9	Three time blocks: sleep/wake, 24 h Recommended data sufficiency	12:00 A.M.–6:00 A.M., 6:00 A.M.–12:00 A.M., 12 A.M.–12:00 A.M.
10	Collection period (minimum no. of weeks)	2
11	Percentage of expected CGM readings (minimum percentage)	70–80 (10 of 14 days)
12	Episodes of hypoglycemia/hyperglycemia (minimum no. of minutes) (with beginning and end of episode defined)	15 min
13	Area under the curve	√ (calculated)
14	Risk of hypoglycemia and hyperglycemia	LBGI/HBGI recommended
15	Standardized CGM visualization of data	AGP recommended

*Severe hypoglycemia (level 3) and diabetic ketoacidosis (level 3) are not key CGM metrics per se. However, these conditions are included in the table because they are important clinical categories that must be assessed and documented.

Glycemic variability

17/10/2020-31/10/2020

VS, ♂ 59 yrs
LADA (1998)
MDI 42 U/day
Apr 2020: HbA1c 7.1%



17/10/2020-31/10/2020

RF, ♀ 76 yrs
DM2 (1980)
MDI 32 U/day
Jun 2020: HbA1c 7.3%

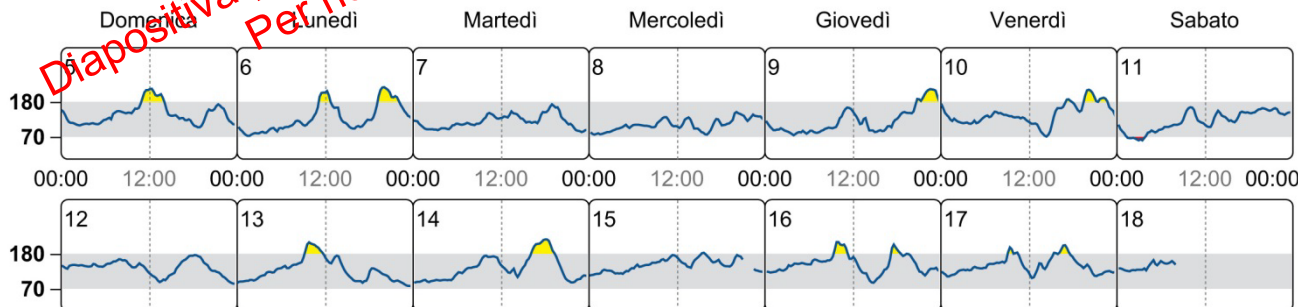
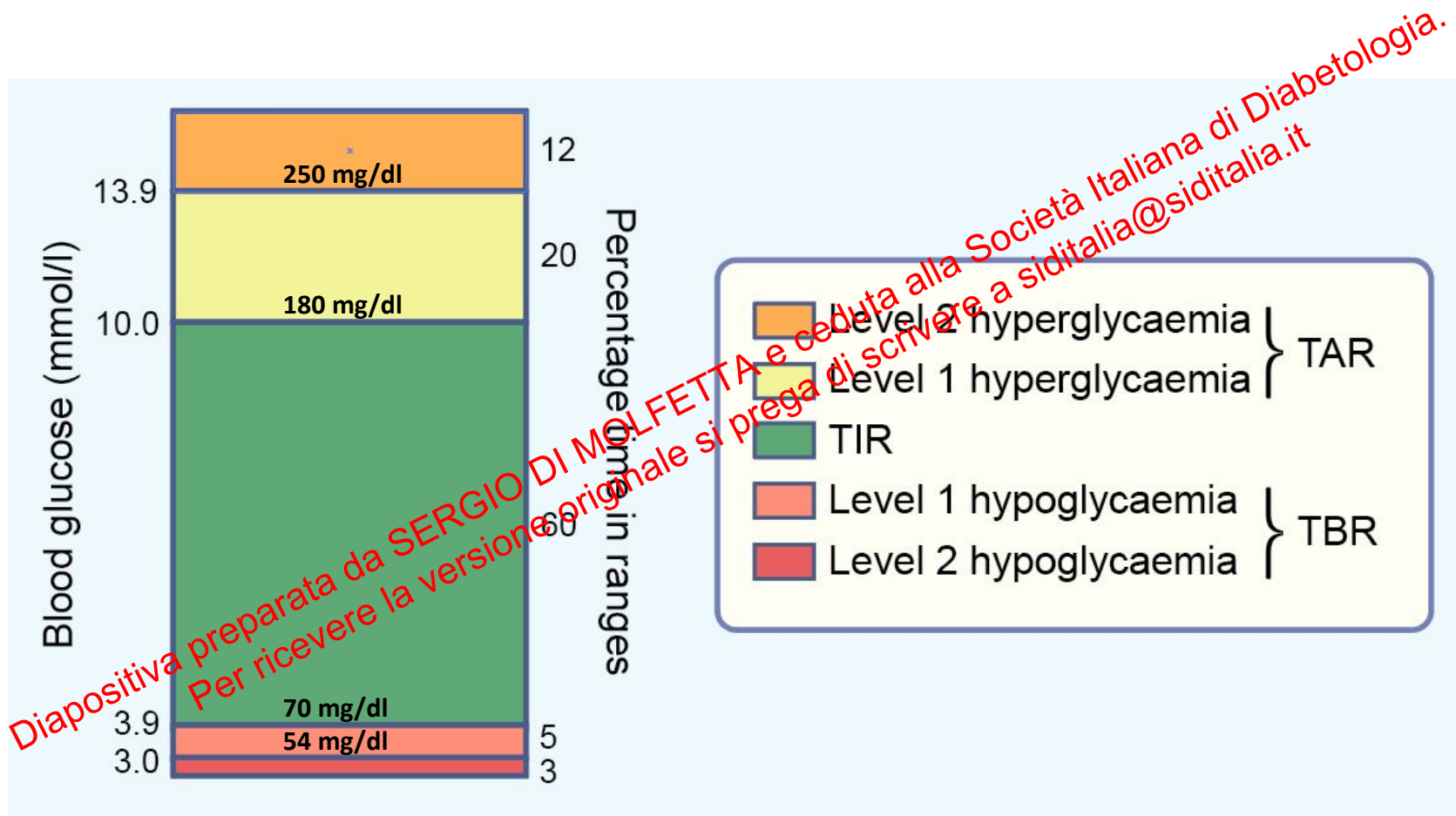


Table 1—Key metrics for CGM data analysis and reporting

CGM metric	Measures	ATTD consensus
1	Mean glucose Severe hypoglycemia* Percentage of time in hypoglycemic ranges, mg/dL (mmol/L)	√ (calculated) Clinical diagnosis: event requiring assistance (level 3)
2	Clinically significant/very low/immediate action required	<54 (<3.0) (level 2)
3	Alert/low/monitor Percentage of time in target range, mg/dL (mmol/L)	<70–54 (<3.9–3.0) (level 1)
4	Default Secondary Percentage of time in hyperglycemic ranges, mg/dL (mmol/L)	70–180 (3.9–10.0) 70–140 (3.9–7.8)
5	Alert/elevated/monitor	>180 (>10) (level 1)
6	Clinically significant/very elevated/immediate action required Diabetic ketoacidosis* Glycemic variability	>250 (>13.9) (level 2) Clinical diagnosis: ketones, acidosis, and usually hyperglycemia (level 2) CV Stable Unstable CV <36%, CV ≥36% SD
7	Primary glycemic variability Stable Unstable Secondary glycemic variability	CV CV <36%, CV ≥36% SD
8	eA1C	√ (calculated)
9	Three time blocks: sleep/wake, 24 h Recommended data sufficiency	12:00 A.M.–6:00 A.M., 6:00 A.M.–12:00 A.M., 12 A.M.–12:00 A.M.
10	Collection period (minimum no. of weeks)	2
11	Percentage of expected CGM readings (minimum percentage)	70–80 (10 of 14 days)
12	Episodes of hypoglycemia/hyperglycemia (minimum no. of minutes) (with beginning and end of episode defined)	15 min
13	Area under the curve	√ (calculated)
14	Risk of hypoglycemia and hyperglycemia	LBGI/HBGI recommended
15	Standardized CGM visualization of data	AGP recommended

*Severe hypoglycemia (level 3) and diabetic ketoacidosis (level 3) are not key CGM metrics per se. However, these conditions are included in the table because they are important clinical categories that must be assessed and documented.

Time in ranges





Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations From the International Consensus on Time in Range

Table 5—Estimate of A1C for a given TIR level based on type 1 diabetes and type 2 diabetes studies

Beck et al. (26) (n = 545 participants with type 1 diabetes)			Virtosky and McMahon (27) (n = 1,137 participants with type 1 or type 2 diabetes)	
TIR 70–180 mg/dL (3.9–10.0 mmol/L)	A1C, % (mmol/mol)	95% CI for predicted A1C values, %	TIR 70–180 mg/dL (3.9–10.0 mmol/L)	A1C, % (mmol/mol)
20%	9.4 (79)	(8.0, 10.8)	20%	10.6 (92)
30%	8.9 (74)	(7.5, 10.2)	30%	9.8 (84)
40%	8.4 (68)	(7.1, 9.7)	40%	9.0 (75)
50%	7.9 (62)	(6.6, 9.2)	50%	8.3 (67)
60%	7.4 (57)	(6.1, 8.8)	60%	7.5 (59)
70%	7.0 (53)	(5.6, 8.3)	70%	6.7 (50)
80%	6.5 (48)	(5.2, 7.8)	80%	5.9 (42)
90%	6.0 (42)	(4.7, 7.3)	90%	5.1 (32)
Every 10% increase in TIR = ~0.5% (5.5 mmol/mol) A1C reduction			Every 10% increase in TIR = ~0.8% (8.7 mmol/mol) A1C reduction	
The difference between findings from the two studies likely stems from differences in number of studies analyzed and subjects included (RCTs with subjects with type 1 diabetes vs. RCTs with subjects with type 1 or type 2 diabetes with CGM and SMBG).				

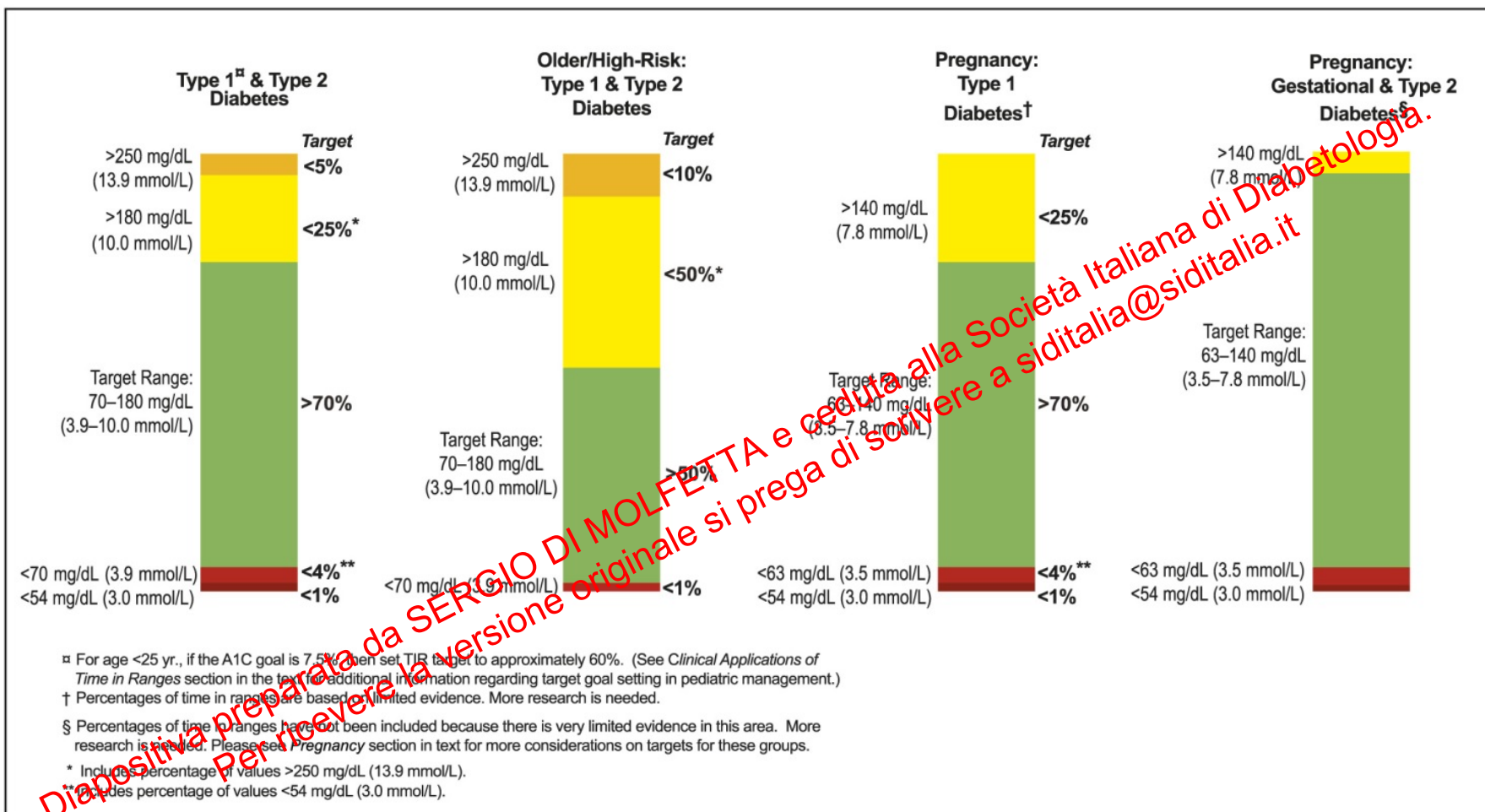
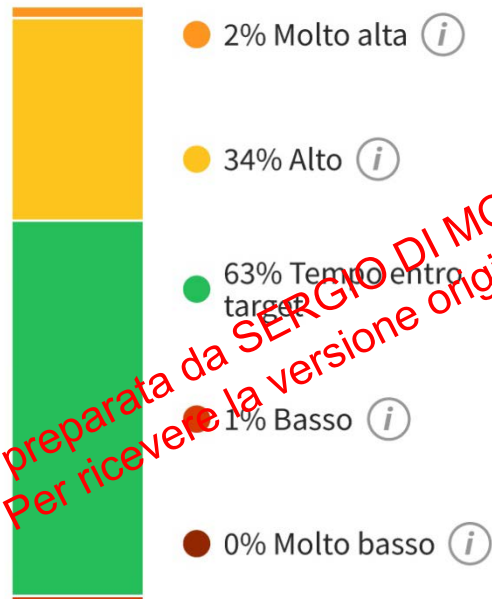


Figure 1—CGM-based targets for different diabetes populations.

AD, ♀ 52 yrs
LADA (2015)
MDI 32 U/day
Jun 2020: HbA1c 7.6%

RT-CGM + MDI

RT-CGM+CSII (HCL)



Intervallo impostato: 70-180 mg/dL

22/08/2020 – 04/09/2020

22/10/2020 – 02/11/2020

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

MV, ♀ 39 yrs
LADA (2018)
MDI 30 U/day
36 w pregnant

Istantanea

18 ottobre 2020 - 31 ottobre 2020 (14 Giorni)

Glucosio

GMI 5,8 % • 40 mmol/mol

GLUCOSIO MEDIO

105 mg/dL

% sopra intervallo

% nell'intervallo

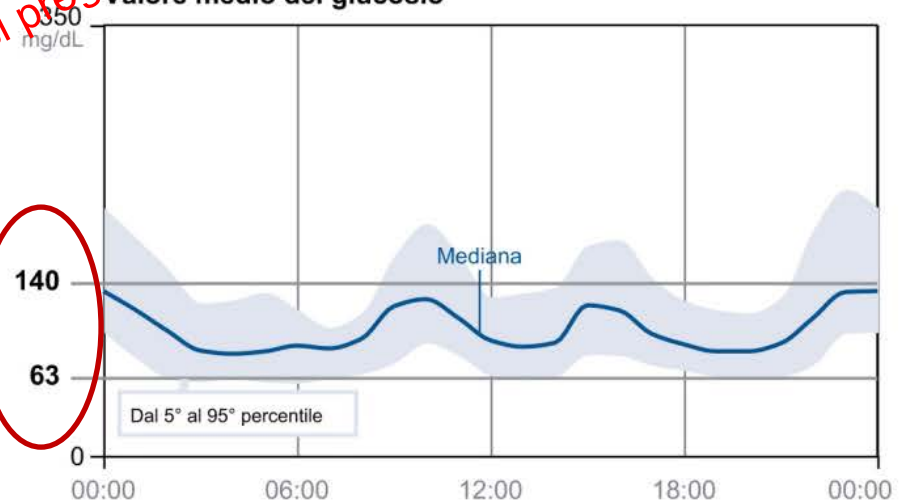
% sotto intervallo

18 %

82 %

5 %

Valore medio del glucosio



Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Critical Reappraisal of the Time-in-Range: Alternative or Useful Addition to Glycated Hemoglobin?

Table 1. Comparison of the Pros and Cons of HbA1c and Time-in-Range.

	HbA1c	TiR
Measurement methods	Many (also many labs)	a number of CGM systems
Reference method available	Yes	No
Standardized quality control	Yes	No
Affected by physiological/pathological factors like anemia, hemoglobinopathies, iron deficiency, age, gender, and ethnic group	Yes	No
Measurement method/CGM system has an impact	Yes	Yes
Reflects acute glucose swings	No	Yes
Reflects glycemic variability	No	Yes
Reflects long-term glucose control	Yes	No (depending on the duration of analysis)
Reflects low/high glucose values	No	No (limited) ^a
Focuses on rapid changes in treatment	No	Yes
Focuses on long-term glycemic control	Yes	No
Quality control (Rili-Bank)	Yes	No
Accuracy of measurement	High	Moderate
Evidence for endpoints	Strong	Weak
Acceptance by regulatory agencies	High	Low
Knowledge at health care insurance companies	High	Low

Abbreviations: CGM, continuous glucose monitoring; TiR, Time-in-Range.

^aTime below and above target Range needed.



Association of Time in Range, as Assessed by Continuous Glucose Monitoring, With Diabetic Retinopathy in Type 2 Diabetes

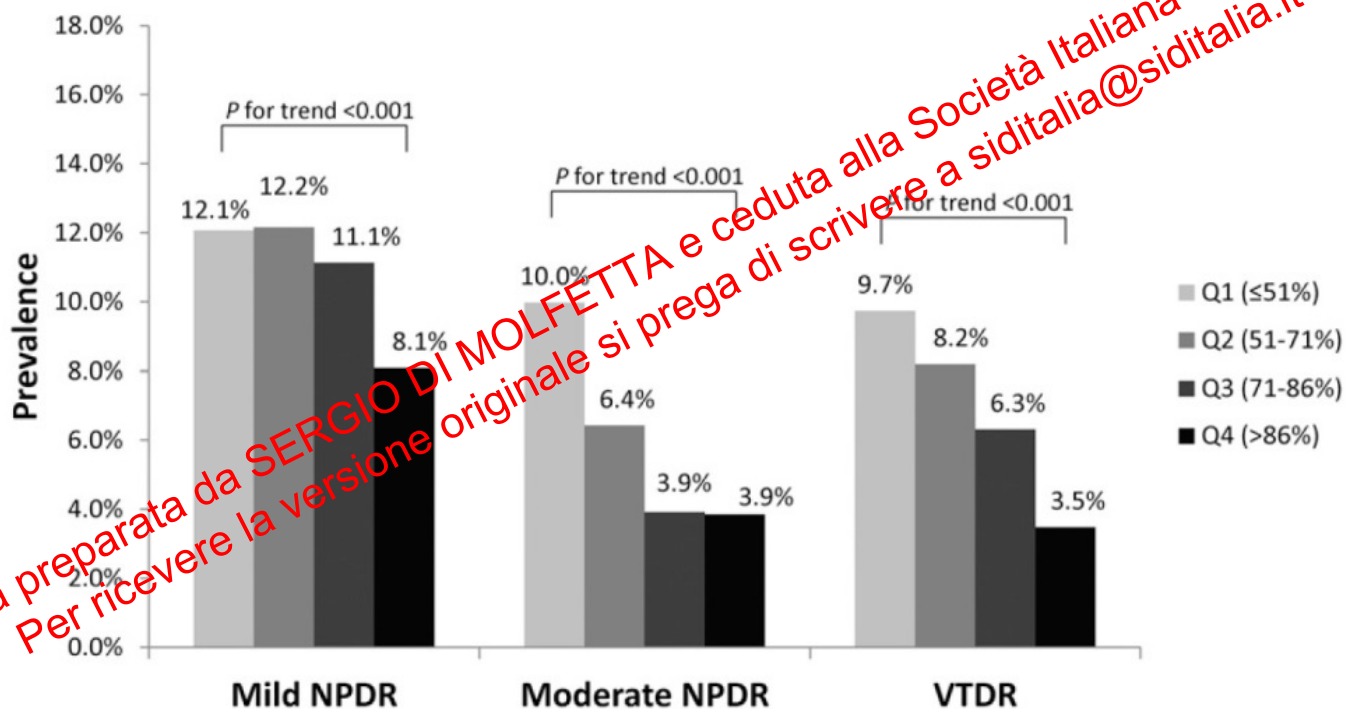


Figure 1—Prevalence of DR by severity, as a function of TIR quartile.

TABLE 1. Ranking of Factors That Have a "Big Impact" on Daily Life With Diabetes by Respondents' Diabetes Type and Therapy

Rank*	Diabetes/Therapy Type		
	T1	T2I	T2NI
1	Food choices (63%)	Food choices (67%)	Food choices (64%)
2	Time-in-range (57%)	Time-in-range (45%)	Time-in-range (41%)
		A1C (44%)	A1C (43%)
3	Unexpected blood glucose numbers (42%)	Nondiabetes health issues (36%) Dosing insulin (34%)	Nondiabetes health issues (31%)
4	Dosing insulin (37%)	Unexpected blood glucose numbers (28%)	Unexpected blood glucose numbers (20%)
5	Hypoglycemia (30%) A1C (30%) Nondiabetes health issues (27%)	Symptoms of complications (24%)	Symptoms of complications (15%)

*This table depicts the percentage of survey respondents within each group who scored a particular factor (e.g., food choices) as having a "big impact" on daily life with diabetes. To better understand the relative importance of these factors, they have been grouped and ranked according to measurable breaks of 4%. In each group food choices was the highest-ranking "big impact" factor and was followed by a measurable break in all instances. Whereas a measurable break also follows time-in-range (defined in the survey as "time spent in the ideal blood glucose range") for T1 respondents, time-in-range and A1C fell within the same group for all T2 respondents, regardless of whether they were on insulin therapy, indicating roughly equal relative importance. In contrast, a far smaller proportion of T1 respondents considered A1C to have as big of an impact as time-in-range in their daily life. Because food choices cannot be used to assess diabetes therapies, time-in-range emerged as the measurable therapy outcome that had the biggest impact on daily life with diabetes for all groups of respondents. Note that differences across diabetes/therapy type groups are not necessarily significant (see Supplementary Figure S1 for full data).

Table 1—Key metrics for CGM data analysis and reporting

CGM metric	Measures	ATTD consensus
1	Mean glucose Severe hypoglycemia* Percentage of time in hypoglycemic ranges, mg/dL (mmol/L)	√ (calculated) Clinical diagnosis: event requiring assistance (level 3)
2	Clinically significant/very low/immediate action required	<54 (<3.0) (level 2)
3	Alert/low/monitor Percentage of time in target range, mg/dL (mmol/L)	<70–54 (<3.9–3.0) (level 1)
4	Default Secondary Percentage of time in hyperglycemic ranges, mg/dL (mmol/L)	70–180 (3.9–10.0) 70–140 (3.9–7.8)
5	Alert/elevated/monitor	>180 (>10) (level 1)
6	Clinically significant/very elevated/immediate action required Diabetic ketoacidosis* Glycemic variability	>250 (>13.9) (level 2) Clinical diagnosis: ketones, acidosis, and usually hyperglycemia (level 3) CV Stable Unstable CV ≤36%, CV ≥36% SD
7	Primary glycemic variability Stable Unstable Secondary glycemic variability	CV Stable Unstable CV ≤36%, CV ≥36% SD
8	eA1C	√ (calculated)
9	Three time blocks: sleep/wake, 24 h Recommended data sufficiency	12:00 A.M.–6:00 A.M., 6:00 A.M.–12:00 A.M., 12 A.M.–12:00 A.M.
10	Collection period (minimum no. of weeks)	2
11	Percentage of expected CGM readings (minimum percentage)	70–80 (10 of 14 days)
12	Episodes of hypoglycemia/hyperglycemia (minimum no. of minutes) (with beginning and end of episode defined)	15 min
13	Area under the curve	√ (calculated)
14	Risk of hypoglycemia and hyperglycemia	LBGI/HBGI recommended
15	Standardized CGM visualization of data	AGP recommended ✓

*Severe hypoglycemia (level 3) and diabetic ketoacidosis (level 3) are not key CGM metrics per se. However, these conditions are included in the table because they are important clinical categories that must be assessed and documented.

Ambulatory Glucose Profile (AGP)

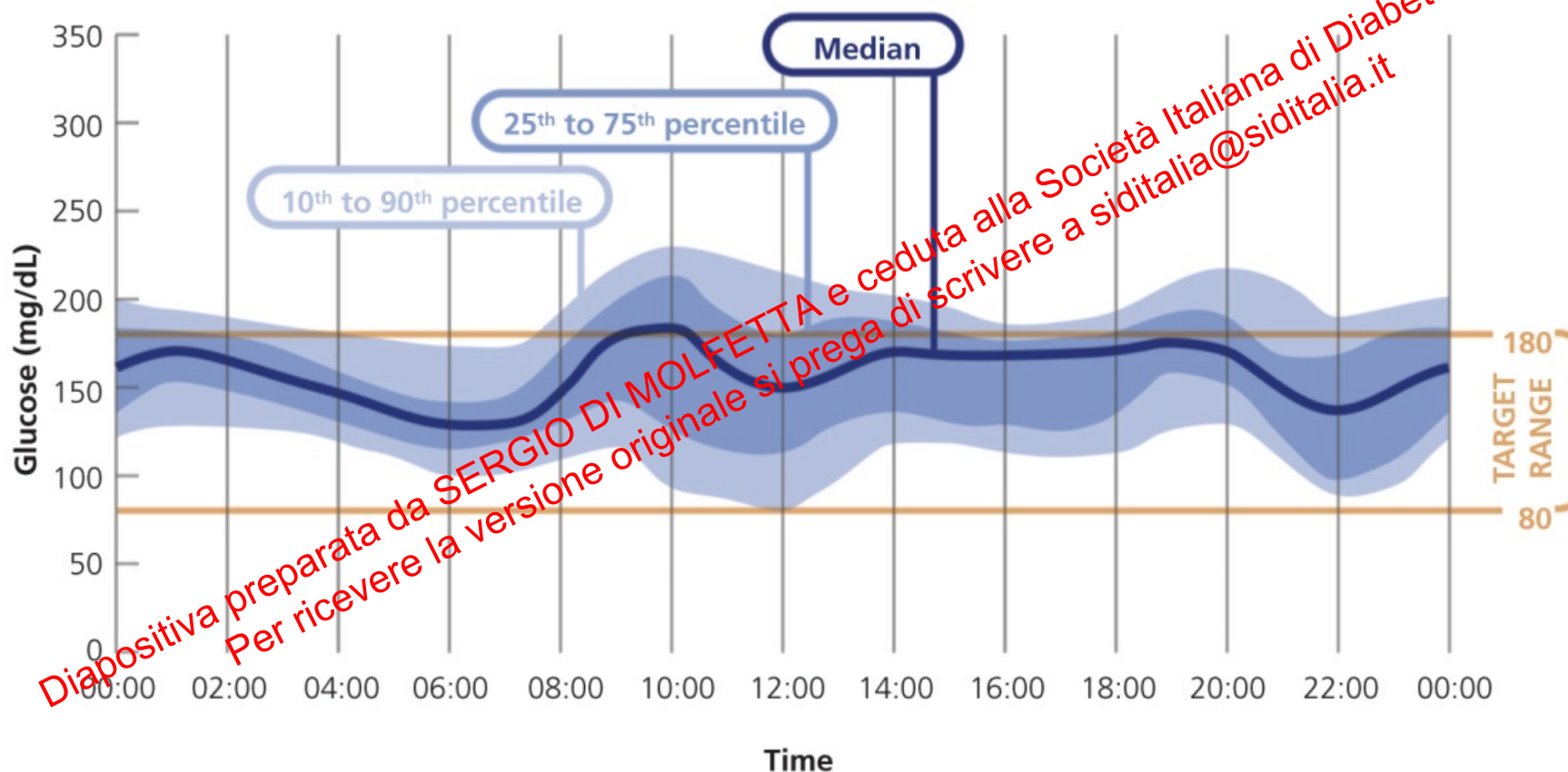


Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 1	Confirm that adequate data are available. For current CGM users, a minimum of 70% of 2 weeks of data is recommended. ³⁴ Fewer days are needed when professional CGM systems are used.
Step 2	Print out the AGP and ask patients to describe their daily self-management. When are they taking their insulin and how much? When do they wake? When do they eat? Do they exercise and, if so, what type of exercise and when are they doing it? Document this information on the AGP printout.
Step 3	Ask patients what they see in the AGP and why they think it may be important. Then listen. Interactive discussion with patients allows them to better understand how their insulin, food, and other factors affect their glucose levels and also helps clinicians identify knowledge deficits or behaviors that may not support glycemic goals.
Step 4	Look for problematic glycemic patterns in the following order of priority: • Hypoglycemia • Hyperglycemia • Wide glycemic variability Review the overall glucose profile (in the view) to determine the time of day when patterns are occurring, then review the daily graphs to double-check patterns to see if they are clustered on certain days.
Step 5	Encourage patients to reflect on what they think may be causing the problem and discuss potential solutions.
Step 6	Collaboratively develop an action plan. Make sure patients fully understand the changes they will be making and that they have the knowledge/skills to implement the plan.
Step 7	Make a copy of the marked up AGP printout for the patient and enter the original into the electronic medical record (EMR). If electronic entry is not possible, copy and paste the AGP into the EMR as a progress note.
^a An expanded teaching tool is available at https://www.idcpublishing.com/ .	

Caso #1

- Daniela, 63 anni, impiegata
- Diabete tipo LADA dall'età di 42 anni, attualmente in terapia MDI (26-29 UI/die)
- Ipertensione arteriosa e ipercolesterolemia in trattamento farmacologico, ateromasia carotidea non stenosante
- Per il verificarsi di episodi di ipoglicemia, a maggio 2019 ha cominciato ad utilizzare il sistema FGM
- Ottobre 2019: HbA1c 7,4%, glicemia 106 mg/dl, colesterolo totale 135 mg/dl (LDL-C 71 mg/dl) creatinina 0,9 mg/dl (eGFR 67 ml/min), non microalbuminuria; peso 57 kg (BMI 22,8 kg/m²); PA 110/70 mmHg
- A dicembre 2019 rinforzo educativo (refresh del conteggio dei carboidrati, frequenza di scansioni, prevenzione delle ipoglicemie)

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 1	Confirm that adequate data are available. For current CGM users, a minimum of 70% of 2 weeks of data is recommended. ³⁴ Fewer days are needed when professional CGM systems are used.
--------	--

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Report AGP

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

STATISTICHE E TARGET GLUCOSIO

12 gennaio 2020 - 25 gennaio 2020

14 Giorni

% di tempo in cui il sensore è attivo

100%

Intervallo e target per

Diabete tipo 1 o tipo 2

Intervallo di glucosio	Target % di letture (Ora/Giorno)
Intervallo stabilito 70-180 mg/dL	Superiore a 70% (16h 48min.)
Inferiore a 70 mg/dL	Inferiore a 4% (58min.)
Inferiore a 54 mg/dL	Inferiore a 1% (14min.)
Superiore a 180 mg/dL	Inferiore a 25% (6h)
Superiore a 250 mg/dL	Inferiore a 5% (1h 12min.)

Ogni aumento del 5% del tempo nell'intervallo (70-180 mg/dL) è clinicamente vantaggioso.

Valore medio del glucosio

120 mg/dL

Indicatore di gestione del glucosio (GMI)

6,2% o 44 mmol/mol

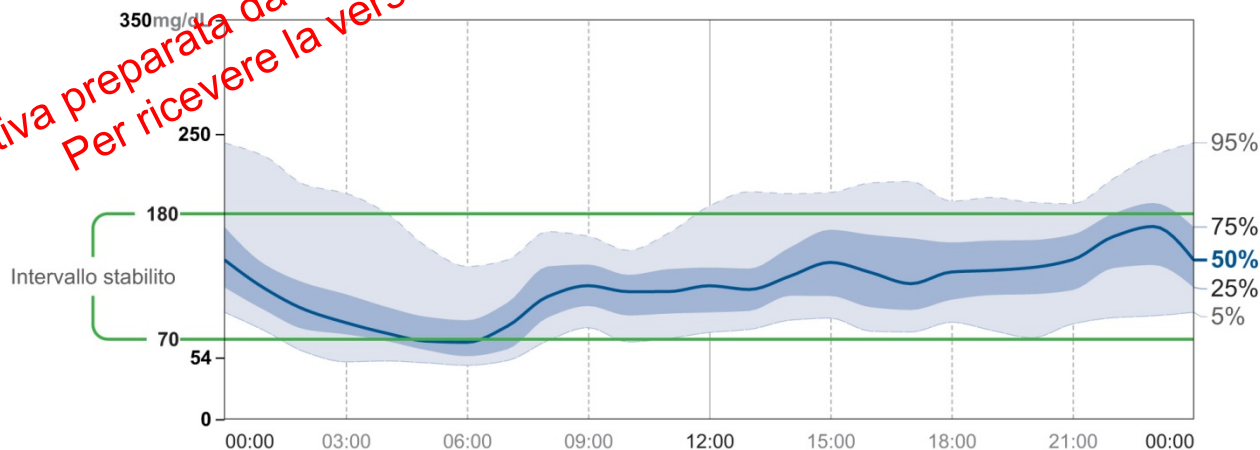
Variabilità del glucosio

35,8%

Definito come coefficiente di variazione in percentuale (%CV); $\leq 36\%$ target

PROFILO DI GLUCOSIO AMBULATORIALE (AGP)

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



TEMPO NEGLI INTERVALLI

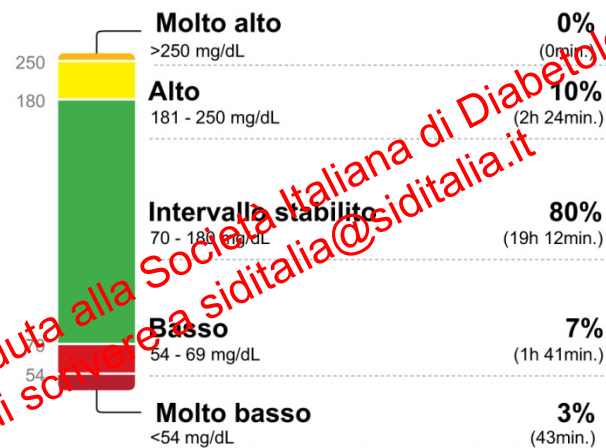


Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 2	Print out the AGP and ask patients to describe their daily self-management. When are they taking their insulin and how much? When do they wake? When do they eat? Do they exercise and, if so, what type of exercise and when are they doing it? Document this information on the AGP printout.
Step 3	Ask patients what they see in the AGP and why they think it may be important. Then listen. Interactive discussion with patients allows them to better understand how their insulin, food, and other factors affect their glucose levels and also helps clinicians identify knowledge deficits or behaviors that may not support glycemic goals.

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a sditalia@siditalia.it

Glucosio

Dom
19 gen



Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
113 mg/dL	212 grammi	16,0 unità	12,0 unità

Lun
20 gen



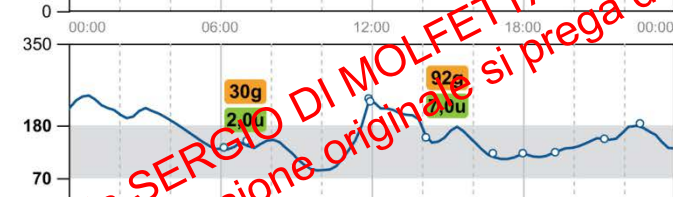
Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
124 mg/dL	210 grammi	15,0 unità	12,0 unità

Mar
21 gen



Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
124 mg/dL	179 grammi	13,0 unità	12,0 unità

Mer
22 gen



Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
158 mg/dL	122 grammi	9,0 unità	12,0 unità

Gio
23 gen



Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
126 mg/dL	176 grammi	13,0 unità	12,0 unità

Ven
24 gen



Valore medio del glucosio	Carb.	Insulina ad azione rapida	Insulina ad azione lenta
94 mg/dL	115 grammi	8,0 unità	12,0 unità

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

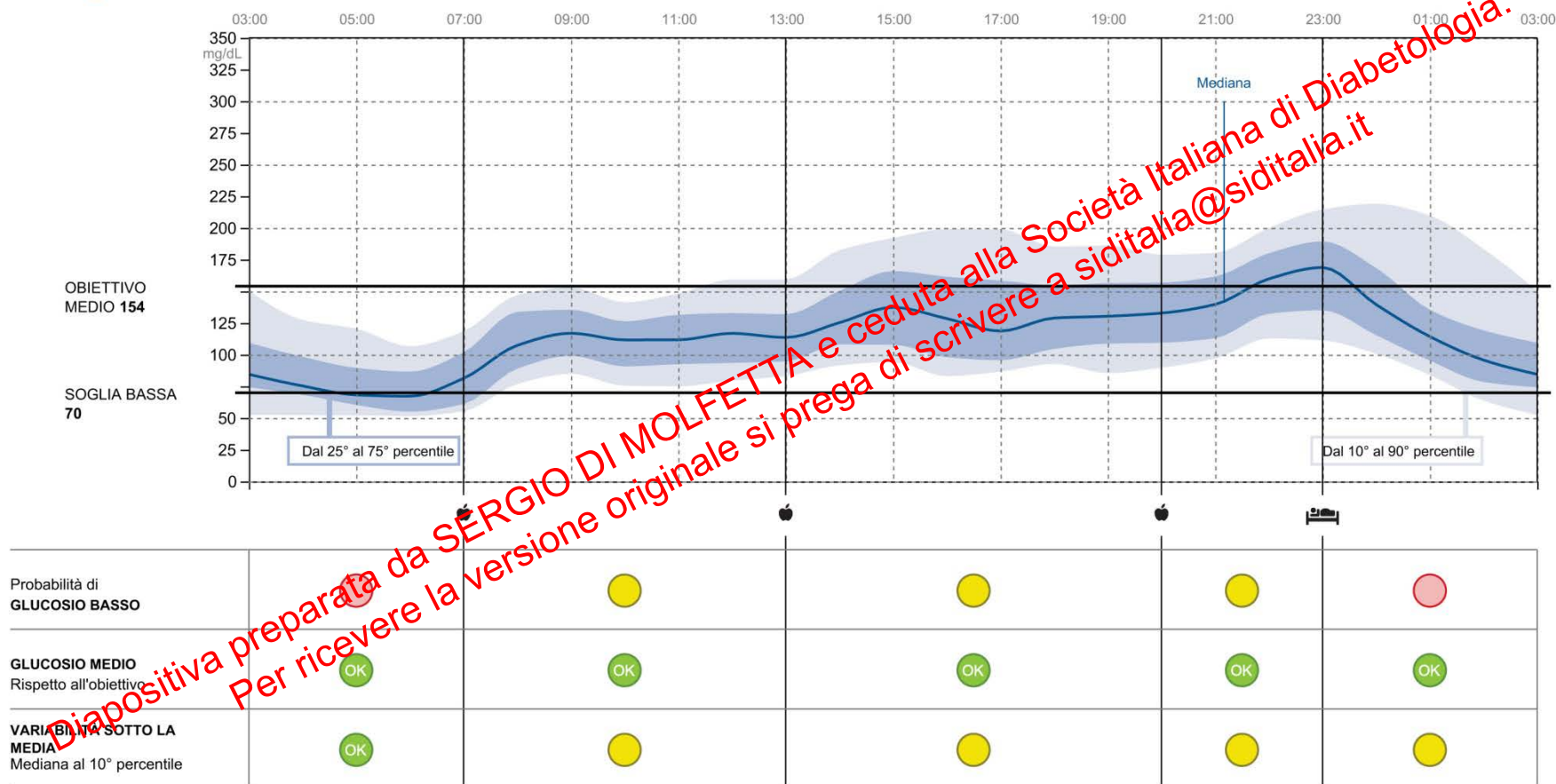
Step 4	Look for problematic glycemic patterns in the following order of priority: • Hypoglycemia • Hyperglycemia • Wide glycemic variability Review the overall glucose profile (in the view) to determine the time of day when patterns are occurring, then review the daily graphs to double-check patterns to see if they are clustered on certain days.
Step 5	Encourage patients to reflect on what they think may be causing the problem and discuss potential solutions.

Indicatori di profilo del glucosio

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

Glucosio

A1c stimata **5,8 %** **40** mmol/mol



Impostazioni IMPOSTAZIONE GLUCOSIO BASSO CONSENTITO: Medio OBIETTIVO MEDIO: 154 mg/dL (A1c: 7,0% o 53 mmol/mol)

Legenda OK BASSO MODERATO ALTO PASTO RIPOSO NOTTURNO

Diario giornaliero

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

VEN 17 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



SAB 18 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



Legenda Glucosio alto (>250) Glucosio basso (<70) ○ Scansione sensore 🍏 ➡ Registrato Picco postprandiale ● Nuovo sensore ⌚ Modifica ora

17,0u-2,0+0,0 15,0u Pasto + Correzione + Modif. utente = Totale * Test con striscia

Diario giornaliero

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

DOM 19 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



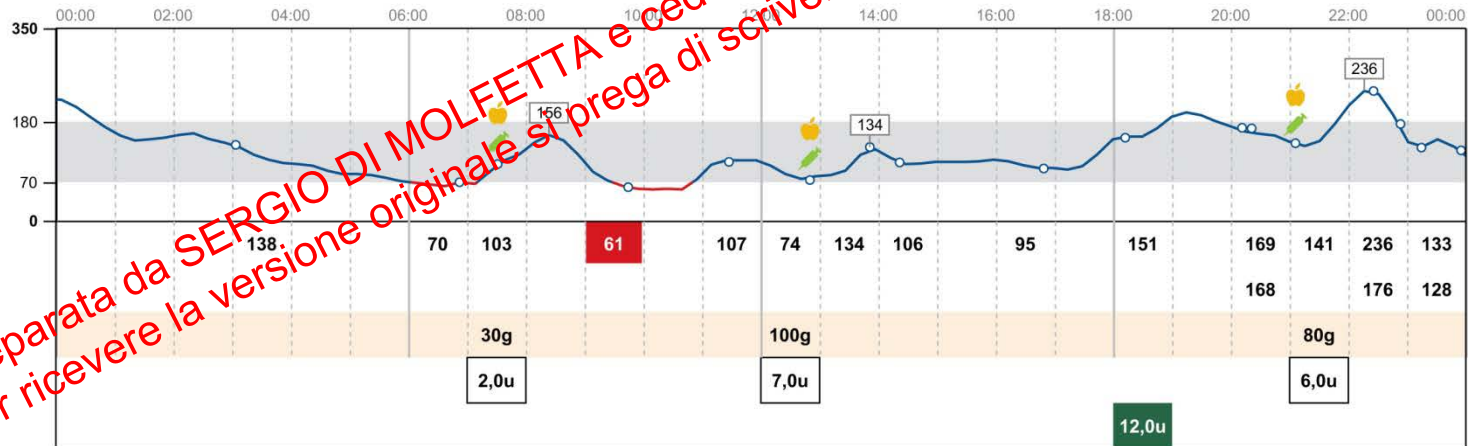
LUN 20 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



Legenda Glucosio alto (>250) Glucosio basso (<70) Scansione sensore Registrato Picco postprandiale Nuovo sensore Modifica ora

17,0u-2,0+0,0 **15,0u** Pasto + Correzione + Modif. utente = Totale * Test con striscia

Diario giornaliero

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

MAR 21 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



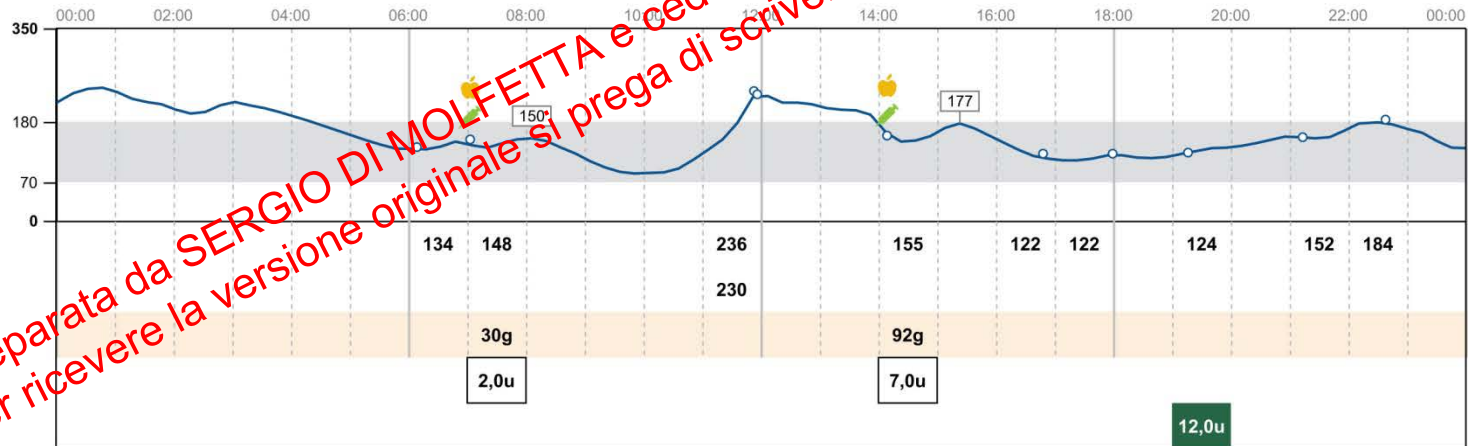
MER 22 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



Legenda Glucosio alto (>250) Glucosio basso (<70) Scansione sensore Registrato Picco postprandiale Nuovo sensore Modifica ora

17,0u-2,0+0,0 15,0u Pasto + Correzione + Modif. utente = Totale * Test con striscia

Diario giornaliero

12 gennaio 2020 - 25 gennaio 2020 (14 Giorni)

GIO 23 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



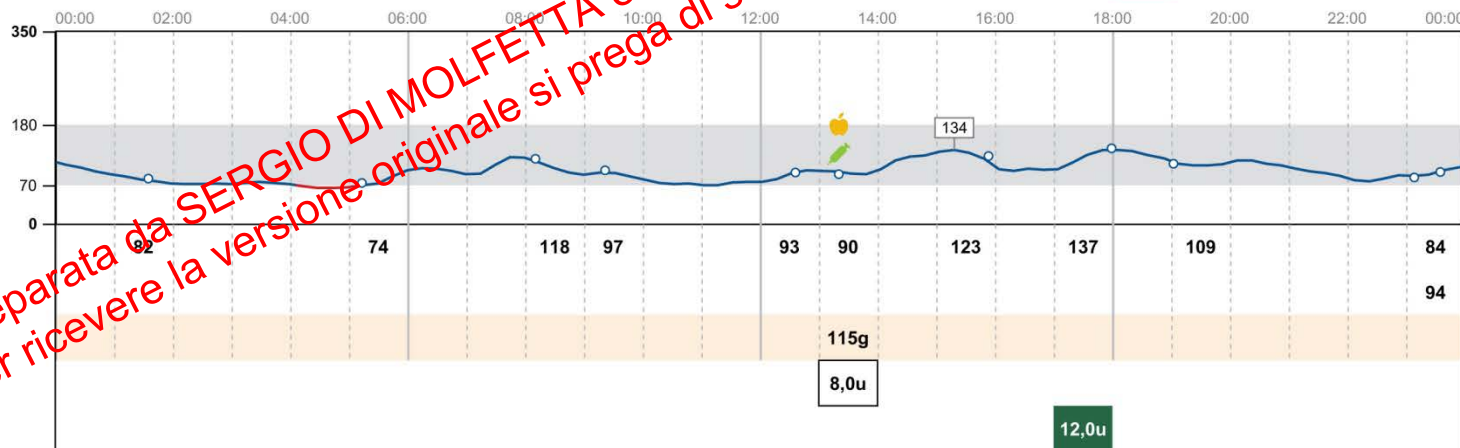
VEN 24 gen

Glucosio mg/dL

Carb. grammi

Insulina ad azione rapida

Insulina ad azione lenta



Legenda Glucosio alto (>250) Glucosio basso (<70) Scansione sensore Registrato Picco postprandiale Nuovo sensore Modifica ora

17,0u-2,0+0,0 15,0u Pasto + Correzione + Modif. utente = Totale * Test con striscia

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Riduzione della dose di insulina lenta!

- | | |
|--------|---|
| Step 6 | Collaboratively develop an action plan. Make sure patients fully understand the changes they will be making and that they have the knowledge/skills to implement the plan. |
| Step 7 | Make a copy of the marked up AGP printout for the patient and enter the original into the electronic medical record (EMR). If electronic entry is not possible, copy and paste the AGP into the EMR as a progress note. |

^aAn expanded teaching tool is available at <https://www.idcpublishing.com/>.

Caso #2

- Antonella, 56 anni, casalinga
- Diabete tipo LADA dall'età di 50 anni, attualmente in terapia MDI (22-28 UI/die)
- Tiroidite cronica autoimmune in terapia sostitutiva con L-T4 50 mcg/die
- Per il verificarsi di repentine oscillazioni glicemiche con alternanza di ipoglicemie ed iperglicemie, ad ottobre 2018 ha cominciato ad utilizzare un RT-CGM (avviso glucosio basso 80 mg/dl, avviso glucosio alto 250 mg/dl, avviso ipoglicemia urgente imminente ON)
- Novembre 2019: HbA1c 6.9%, glicemia a digiuno 83 mg/dl, CT 122 mg/dl (LDL-C 46 mg/dl) creatinina 0.57 mg/dl (eGFR 117 ml/min), non microalbuminuria
- Pratica la conta dei carboidrati a tutti i pasti con l'ausilio di un'app per il calcolo dei boli insulinici
- Non ruota adeguatamente i siti di iniezione dell'insulina sull'addome e sulle cosce

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 1	Confirm that adequate data are available. For current CGM users, a minimum of 70% of 2 weeks of data is recommended. ³⁴ Fewer days are needed when professional CGM systems are used.
--------	--

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Riepilogo

Glicemia

CGM

Insulina

Confronto

Periodo: 08/11/2019 - 21/11/2019, 14 giorni

Scegli intervallo di tempo

Tipo di dati glicemici

CGM

Glicemia

CGM

Tempo CGM attivo: 96%



2% Molto alta

23% Alto

73% Tempo entro target

2% Basso

0% Molto basso

Intervallo impostato: 70-180 mg/dL

Tempo entro target

73%

Media

151 mg/dL

Deviazione standard

44 mg/dL

Median

150 mg/dL

Valore massimo

281 mg/dL

Valore minimo

46 mg/dL

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 2	Print out the AGP and ask patients to describe their daily self-management. When are they taking their insulin and how much? When do they wake? When do they eat? Do they exercise and, if so, what type of exercise and when are they doing it? Document this information on the AGP printout.
Step 3	Ask patients what they see in the AGP and why they think it may be important. Then listen. Interactive discussion with patients allows them to better understand how their insulin, food, and other factors affect their glucose levels and also helps clinicians identify knowledge deficits or behaviors that may not support glycemic goals.

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Societa Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a sditalia@siditalia.it

Confronto: Tabella (08/11/2019 - 21/11/2019)

■ <70 mg/dL
 ■ Entro
 ■ > 180 mg/dL
 m I valori con identificativo sono stati inseriti manualmente dal paziente
 K chetoni (mmol/L)
 ☐ Bolo di correzione
 ☐ Sospendi
 ☐ Riprendi
 ☐ Temp. modificato basale
 ☐ Allarme pompa
 ☐ Riempì cannula
 ☐ Spurga
 ☐ unità/ora

	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Totali giornalieri	
Ve 8/11																										Media (0): -- Carboidrati: 135g Insulina: 9.5U Bolo: 100%
									30g		7g			60g				7g					31g			
		1Um							2Um		0.5Um			3.5Um				0.5Um					2Um			
Sa 9/11																										Media (0): -- Carboidrati: 132g Insulina: 10U Bolo: 100%
									29g			8g		53g				9g					23g			
									2.5Um			1Um		2.5Um				1.5Um					2.5Um			
Do 10/11																										Media (0): -- Carboidrati: 124g Insulina: 9.5U Bolo: 100%
									30g			7g			47g									40g		
									2.5Um			1Um			3Um									3Um		
Lu 11/11																										Media (0): -- Carboidrati: 145g Insulina: 10.5U Bolo: 100%
									30g		7g			49g				9g							50g	
									2.5Um		0.5Um			2Um				0.5Um							4Um	
Ma 12/11																										Media (0): -- Carboidrati: 125g Insulina: 8.5U Bolo: 100%
									30g					56g				6g					33g			
									1.5Um					3.5Um				1.5Um					2Um			
Me 13/11																										Media (0): -- Carboidrati: 130g Insulina: 9U Bolo: 100%
											30g			61g									39g			
											2Um			4Um									3Um			
Gi 14/11																										Media (0): -- Carboidrati: 139g Insulina: 9U Bolo: 100%
			10g					10g	30g					55g									34g			
									2Um					3.5Um									3.5Um			
Ve 15/11																										Media (0): -- Carboidrati: 129g Insulina: 11U Bolo: 100%
									35g					60g									34g			
									2.5Um					4.5Um		1.5Um							2.5Um			
Sa 16/11																										Media (0): -- Carboidrati: 51g Insulina: 5.5U Bolo: 100%
						10g													6g				35g			
			1.5Um																1.5Um				1.5Um		1Um	
	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Totali giornalieri	

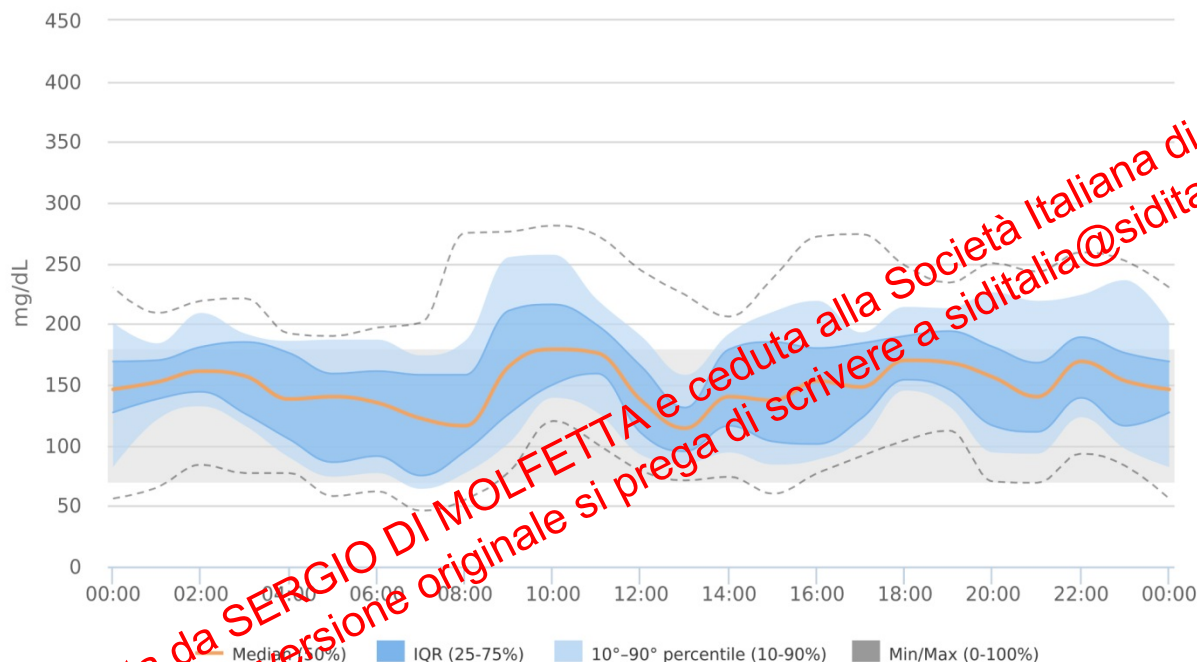
Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
 Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

Step 4	Look for problematic glycemic patterns in the following order of priority: • Hypoglycemia • Hyperglycemia • Wide glycemic variability Review the overall glucose profile (in the view) to determine the time of day when patterns are occurring, then review the daily graphs to double-check patterns to see if they are clustered on certain days.
Step 5	Encourage patients to reflect on what they think may be causing the problem and discuss potential solutions.

CGM: Giorno standard (08/11/2019 - 21/11/2019)



Statistiche

Molto basso < 54 mg/dL	Basso 54 - 70 mg/dL	Tempo entro target 70 - 180 mg/dL	Alto 180 - 250 mg/dL	Molto alta > 250 mg/dL	Tempo CGM attivo
0 %	2 %	73 %	23 %	2 %	96 %

Media periodo: **151 mg/dL**

Deviazione standard (SD): **44 mg/dL**

Valore massimo: **281 mg/dL** (19/11/2019 09:54)

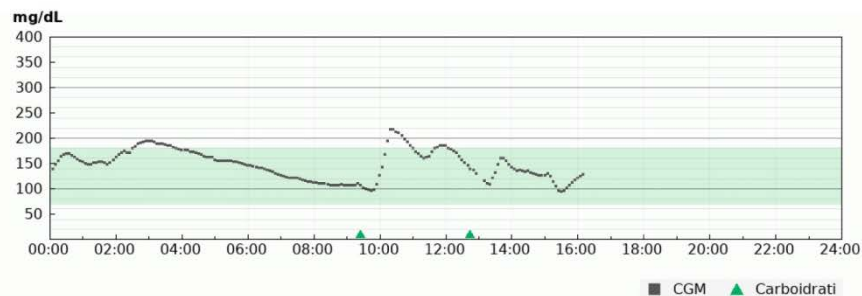
Coefficiente di variazione (CV): **29 %**

Valore minimo: **46 mg/dL** (14/11/2019 06:39)

Glucose management indicator (GMI): **6.9 %**

Le statistiche mostreranno soltanto i dati disponibili per il periodo di tempo selezionato per l'analisi.

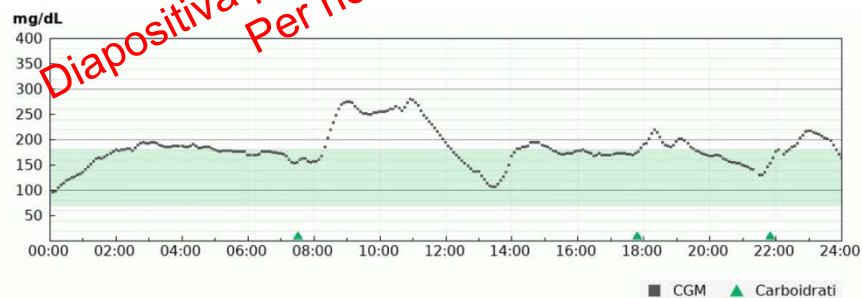
Giovedì 21/11



Mercoledì 20/11



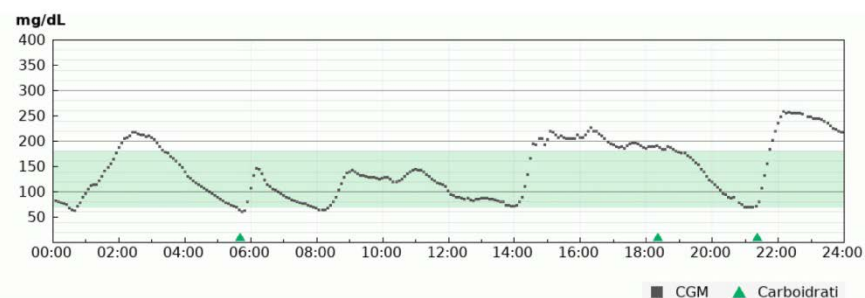
Martedì 19/11



Domenica 17/11



Sabato 16/11



Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it

Giovedì 14/11



Lunedì 11/11



Mercoledì 13/11



Domenica 10/11

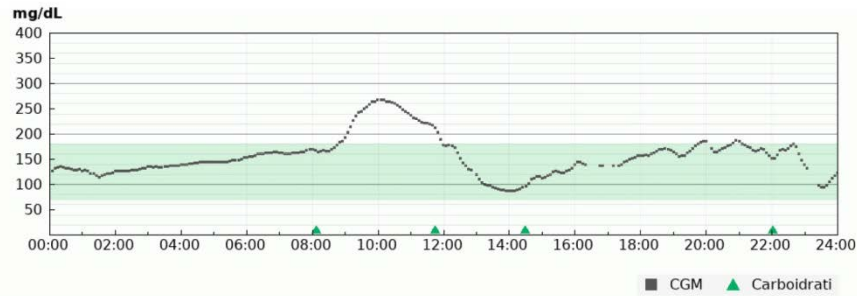


Table 2

Continuous Glucose Monitoring (CGM) Data Interpretation Using the Ambulatory Glucose Profile (AGP)^a

1. Riduzione del RIC a colazione
2. Alzare livello di avviso del glucosio basso
3. Adeguata rotazione dei siti di iniezione dell'insulina

Step 6 Collaboratively develop an action plan. Make sure patients fully understand the changes they will be making and that they have the knowledge/skills to implement the plan.

Step 7 Make a copy of the marked up AGP printout for the patient and enter the original into the electronic medical record (EMR). If electronic entry is not possible, copy and paste the AGP into the EMR as a progress note.

^aAn expanded teaching tool is available at <https://www.idcpublishing.com/>.

Free

Diapositiva preparata da SERGIO DI MOLFETTA e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it