DIABETE TIPO 1: COME È CAMBIATO IL TRATTAMENTO INSULINICO?

BASALIZZAZIONE EFFICACE E OTTIMIZZAZIONE DEI BOLI PRANDIALI

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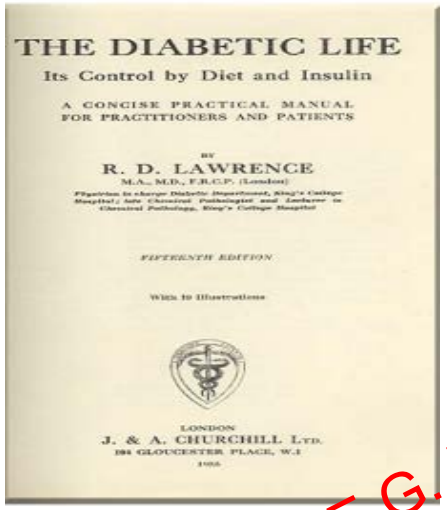
BARI, 16-17 OTTOBRE 2012

AGENDA

- The challenge of insulin substitution in Type 1 Diabetes
- Insulin titration
  - Basal
  - Prandial
- The timing of insulin injection
- *Dawn* and *dusk* in clinical practice
- Injection technique
- Conclusion

RD Lawrence, 1892-1968


THE DIABETIC LIFE

Its Control by Diet and Insulin

A CONCISE PRACTICAL MANUAL FOR PRACTITIONERS AND PATIENTS

BY

R. D. LAWRENCE

M.A., M.D., F.R.C.P. (London)

FIFTEENTH EDITION

With 16 Illustrations

LONDON

J. & A. CHURCHILL LTD.

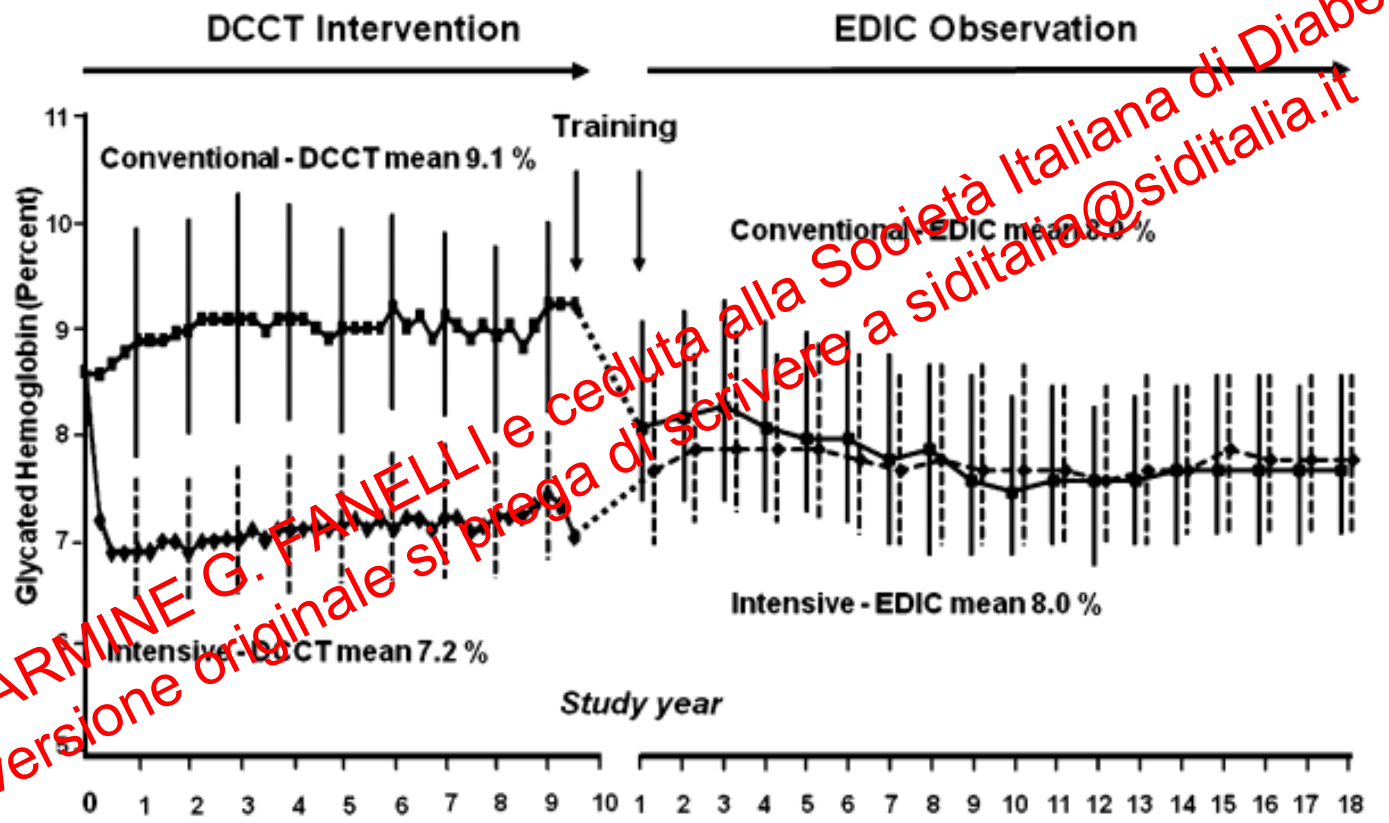
104 GLOUCESTER PLACE, W.1

"….The attempt to keep the blood sugar constantly normal may be ideal in theory, but in practice it is very difficult to achieve and makes the diabetic life unnecessarily hard without adequate benefit…"

Lawrence RD. The Diabetic Life: It's Control by Diet and Insulin. 13th ed. J&A Churchill, 1944

Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications Study at 30 Years: Advances and Contributions

David M. Nathan, Margaret Bayless, Patricia Cleary, Saul Genuth, Rose Gubitosi-Klug, John M. Lachin, Gayle Lorenzi, and Bernard Zinman, for the DCCT/EDIC Research Group*

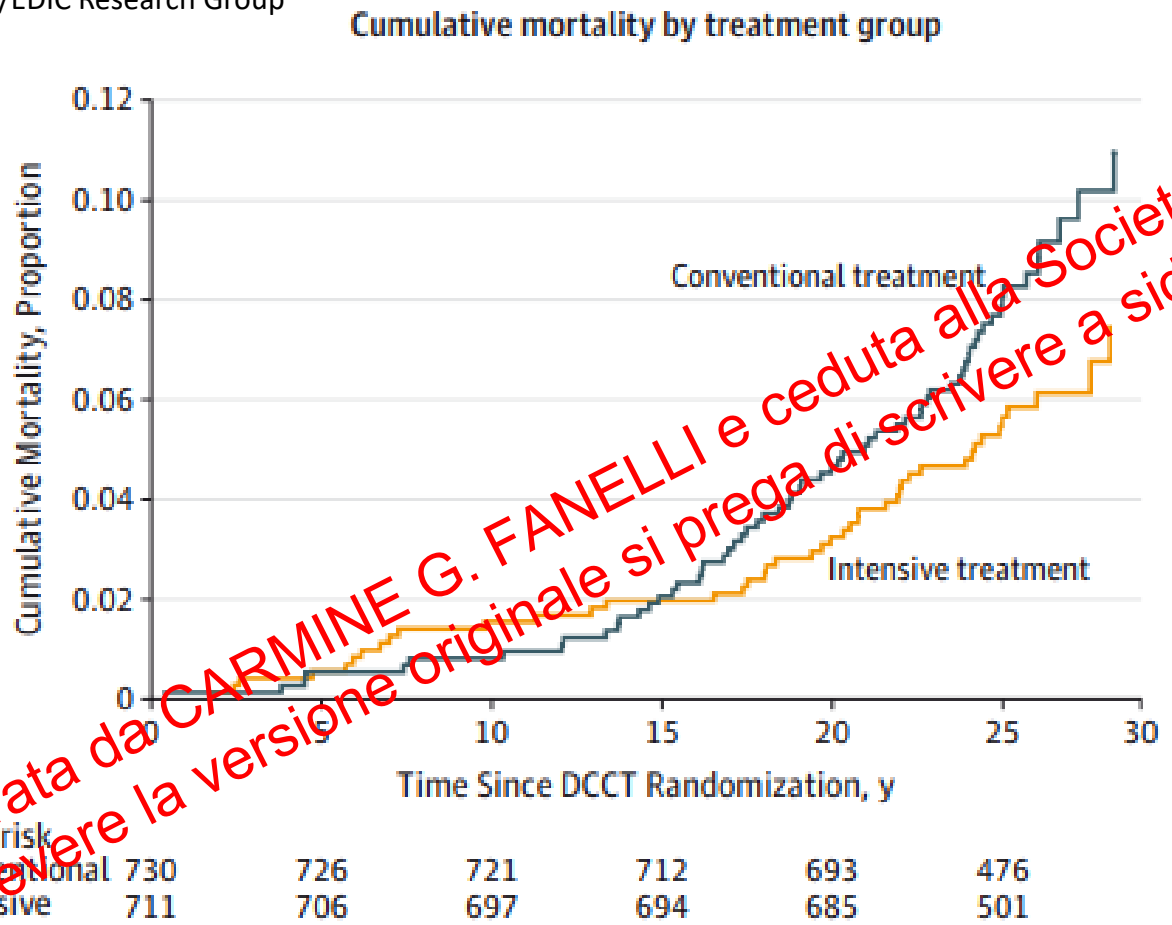


	DCCT baseline (1983–1989) (*N* = 1,441)		End of DCCT (1993) (*N* = 1,422)*		EDIC year 18 (2010–2012) (*N* = 1,284)*	
	INT	CONV	INT	CONV	INT	CONV
	711	730	698	717	620	597
Glucose managment						
Pump or MDI (≥ 3/day) (%)	0	0	97.4	5.0‡	97.6	97.7
Glucose monitoring ≥ 4/day (%)	0	0	52.7	3.8‡	67.7	70.7

DCCT/EDIC. Diabetes 2013; 3976

Association Between 7 Years of Intensive Treatment of Type 1 Diabetes and Long-term Mortality

Writing Group for the DCCT/EDIC Research Group



Data are reported from the Diabetes Control and Complications Trial (DCCT; 1983-1993) and the subsequent observational follow-up Epidemiology of Diabetes Interventions and Complications (EDIC) study (1994 to December 31, 2012). Hazard ratios (HRs), CIs, and P values were obtained from a Cox proportional hazards model. For the intensive vs conventional treatment groups (intent-to-treat analysis), HR = 0.67 (95% CI, 0.46-0.99); P = .045.

DCCT/EDIC JAMA. 2015;313:45-53

CURRENT STATE OF TYPE 1 DIABETES TREATMENT IN U.S.

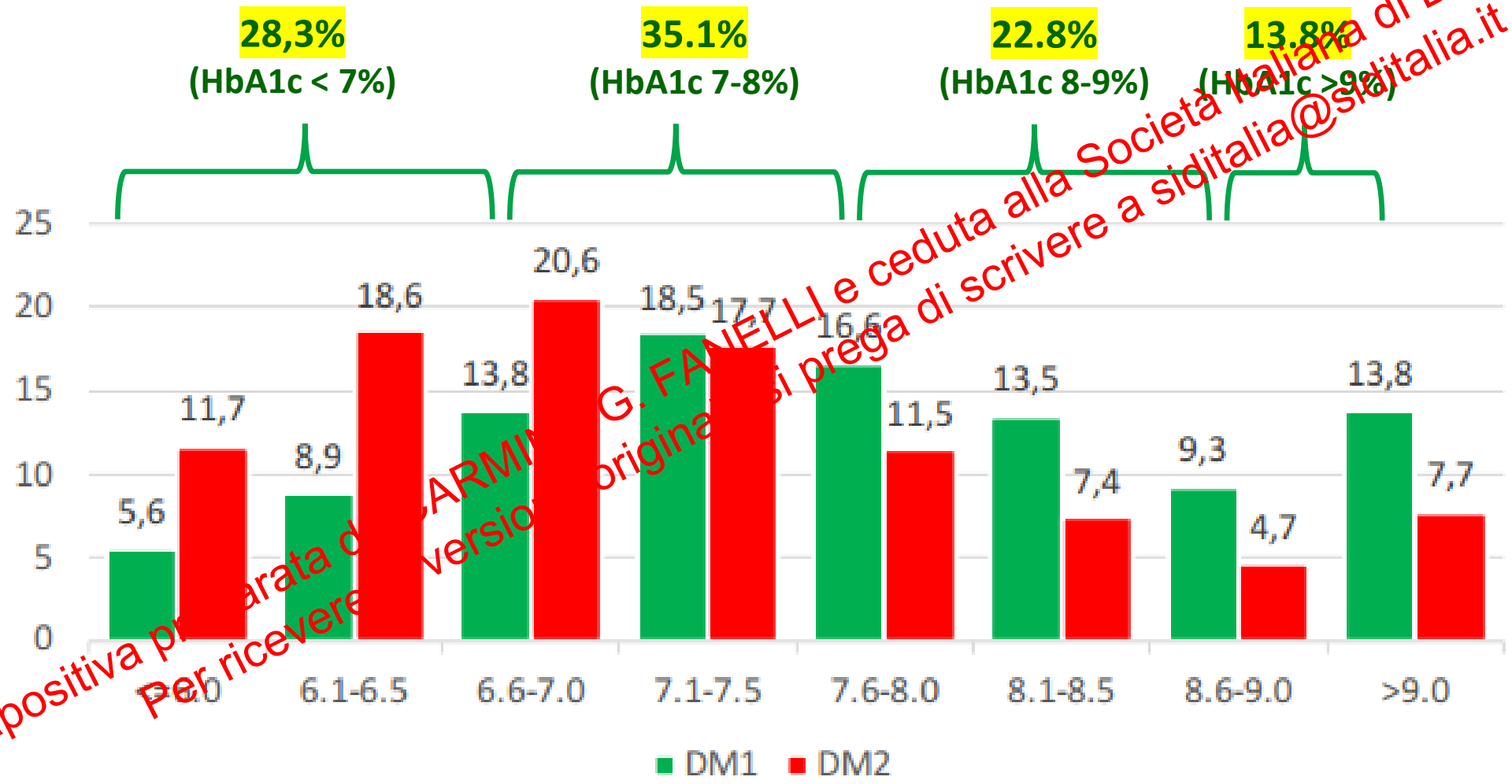
- Only a minority of adults (21%) and youth (17%) with T1D achieve ADA goals for $A1_C$, despite increasing use of insulin pump and CGM
- Severe hypoglycemia is still a common complication especially in older patients
- DKA remains an issue especially in younger patients

T1D Exchange

Foster NC et al, Diabetes Technol Ther, 2019

ANNALI AMD 2018

VALUTAZIONE DEGLI INDICATORI AMD DI QUALITA' DELL'ASSITENZA AL DIABETE IN ITALIA



HbA1c (media±DS) 7,8±1,3

Type 1 Diabetes Treatment

- Individualized glycemic targets
- Optimized insulin therapy
- Life-long education support

Type 1 Diabetes Treatment

Glycemic targets	American Diabetes Association [8]	Linee guida SID-AMD 2018
HbA1c	< 7% (53 mmol/mol)[a] < 8% (64 mmol/mol) for patients with history of severe hypoglycemia or comorbid diseases[a] < 6.5% (48 mmol/mol) for selected patients (short duration of diabetes, long life expectancy, or no significant cardiovascular disease) if it can be achieved without significant hypoglycemia or adverse events[a]	< 6,5 % (48 mmol/mol) senza complicanze < 7 % (53 mmol/mol) con complicanze < 8 % (64 mmol/mol) con ipoglicemie gravi, età avanzata, comorbilità
FPG or preprandial PG	4.4–7.2 mmol/L (80–130 mg/dL)	80 – 130 mg/dl
Peak postprandial PG[b]	< 10 mmol/L (180 mg/dL)	< 160 mg/dl

JAMA | Original Investigation

Effect of Insulin Degludec vs Insulin Glargine U100 on Hypoglycemia in Patients With Type 1 Diabetes

The SWITCH 1 Randomized Clinical Trial

Table 2. Analysis of Hypoglycemia in the Maintenance and Full Treatment Periods

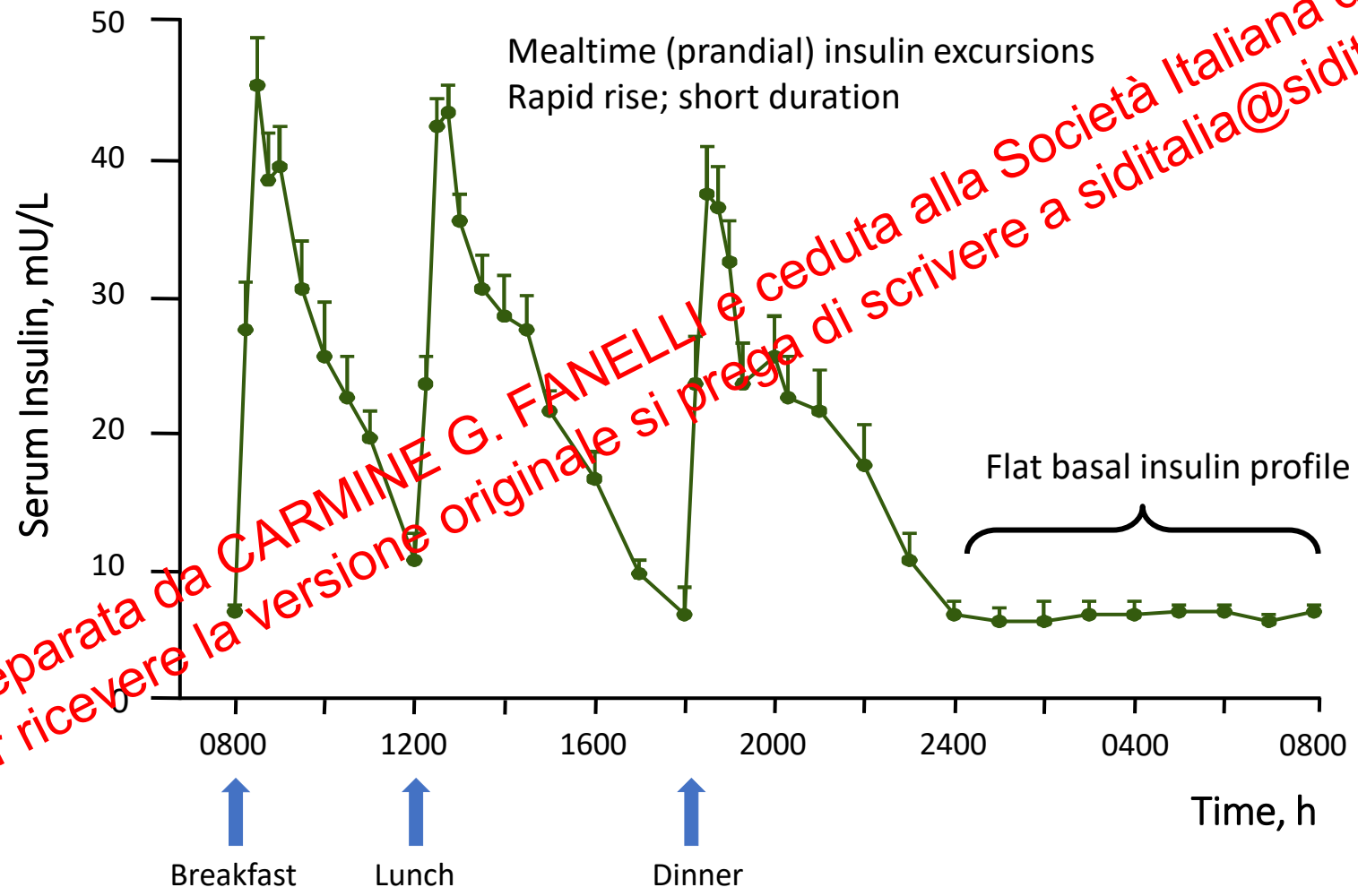
	Safety Analysis Set (n = 500)						Insulin Degludec vs Insulin Glargine U100, Full Analysis Set (n = 501)			
	Insulin Degludec			Insulin Glargine U100						
Definition	Incidence, No. (%)	No. of Events	Rate/100 PYE	Incidence, No. (%)	No. of Events	Rate/100 PYE	ERR (95% CI)	*P* Value	Absolute Rate Differences/100 PYE (95% CI)	Difference in % PYE (95% CI)
Full Treatment Period										
Included in the analysis[d]										
No.	454			460						
PYE	259.2			261.4						
Overall symptomatic hypoglycemia	377 (83.0)	5300	2044.6	396 (86.5)	5668	2168.4	0.94 (0.91 to 0.98)	.002	−66.17 (−108.8 to −23.55)	−3.5 (−7.4 to 0.4)
Nocturnal symptomatic hypoglycemia	210 (46.3)	929	358.2	248 (53.9)	972	371.9	0.75 (0.68 to 0.83)	<.001	−39.35 (−54.09 to −24.61)	−7.7 (−12.9 to −2.4)
Severe hypoglycemia	90 (19.8)	225	86.8	119 (25.9)	275	105.2	0.74 (0.61 to 0.90)	.003	−6.84 (−11.73 to −1.96)	−6.0 (−10.8 to −1.3)

-26%

The overall rates of severe hypoglycemia were 61.2 per 100 patient-years (DCCT. Diabetes 1997; 46: 271-286)

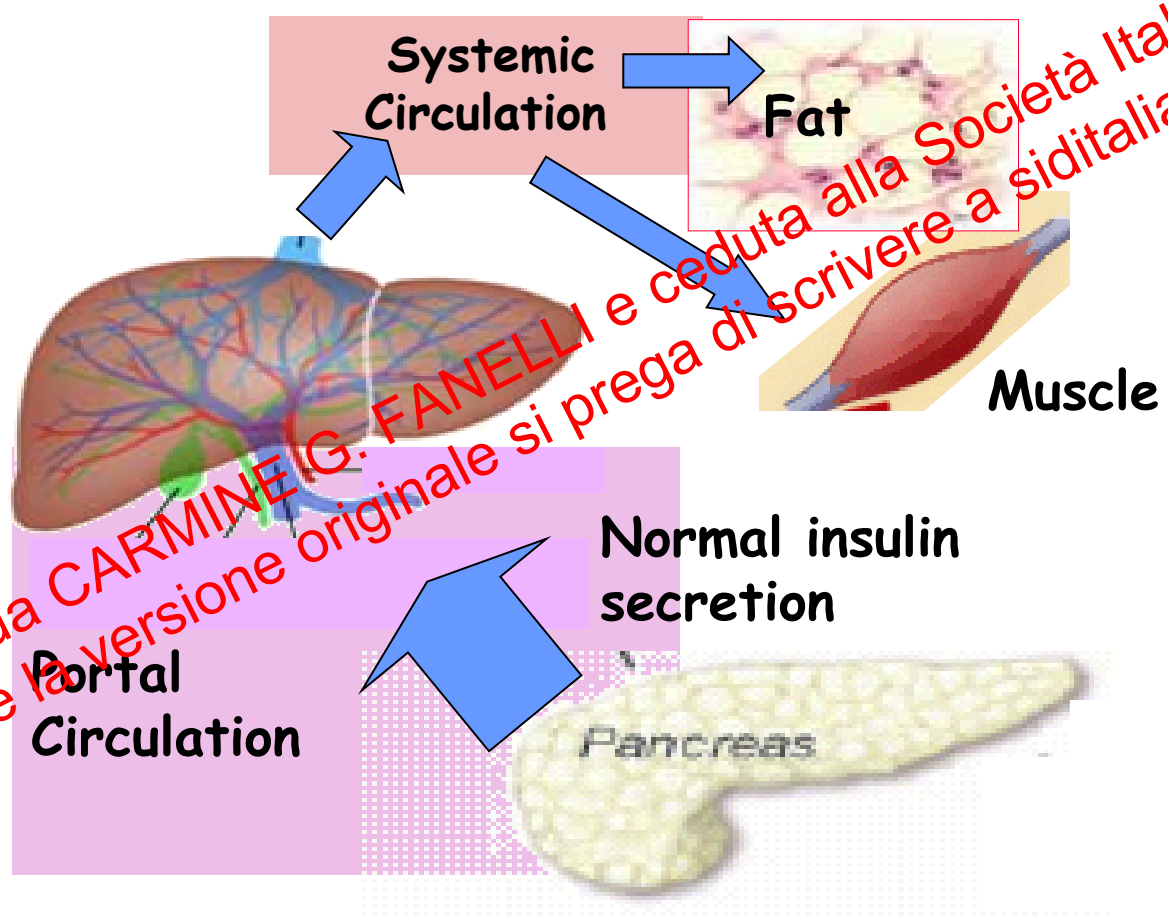
Lane W. et al. JAMA. 2017;318:33-44

Insulin Replacement Therapy Aims to Recreate the Normal Blood Insulin Profile

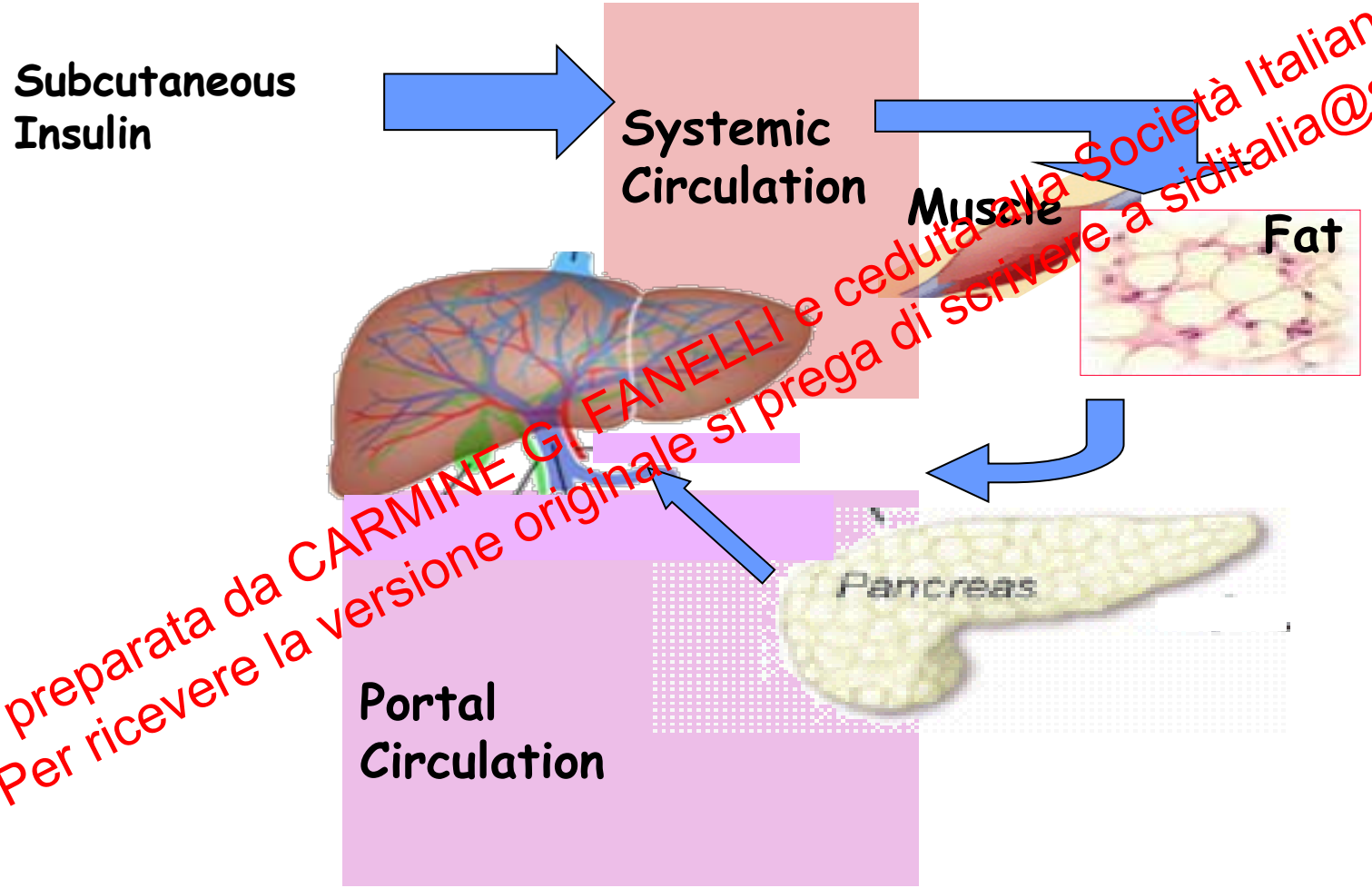


Kruszynska YT, et al. *Diabetologia.* 1987;30:16-21.

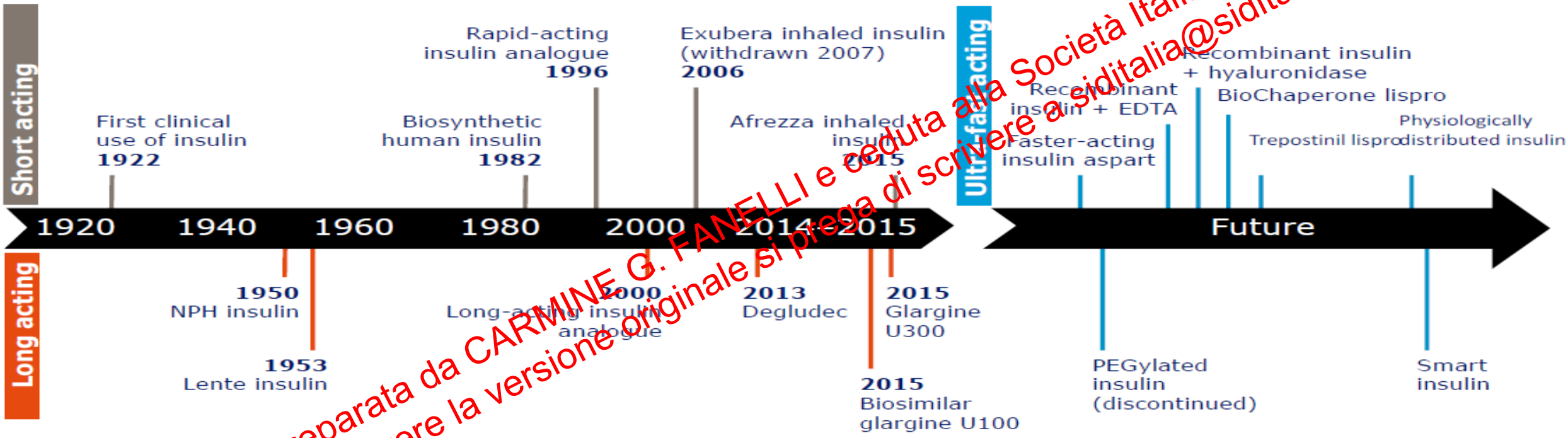
IN PHYSIOLOGY



IN DIABETES



The Long Road of Insulin Substitution



Despite advances for optimising insulin replacement therapy, many patients with T1D struggle to attain a good glycaemic control

Adapted from Cahn A et al. *Lancet Diabetes Endocrinol* 2015;3:638–652.

Insulin Therapy

- Insulin treatment is essential for individuals with type 1 diabetes.
- Insufficient provision of insulin causes not only hyperglycemia but also metabolic disturbances like hypertriglyceridemia and ketoacidosis as well as tissue catabolism.
- Insulin requirements can be estimated based on weight (**0.4 to 1.0 U/kg/day**). Higher amounts are required during puberty, pregnancy, and medical illness.
- **0.5 U/kg/day** as a typical starting dose in patients with type 1 diabetes who are metabolically stable, with half administered as prandial insulin given to control blood glucose after meals and the other half as basal insulin to control glycemia in the periods between meal absorption.

ADA Standards of Care 2020;
Standard Italiani SID- AMD 2018

Insulin Therapy

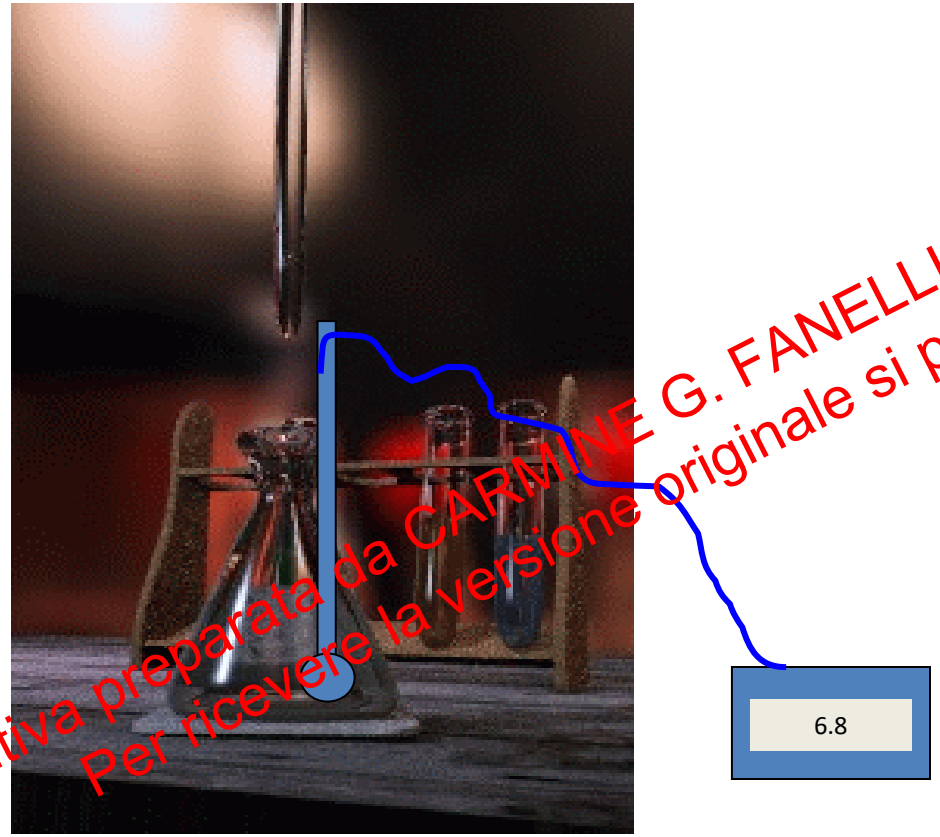
- Longer-acting basal analogs (U-300 glargine or degludec) may confer a lower hypoglycemia risk compared with U-100 glargine in individuals with type 1 diabetes.

- Most individuals with type 1 diabetes should use rapid-acting insulin analogs to reduce hypoglycemia risk.

- Most people with type 1 diabetes should be treated with multiple daily injections of prandial and basal insulin, or continuous subcutaneous insulin infusion.

ADA Standards of Care 2020;
Standard Italiani SID- AMD 2018

Titration in Medicine



Titration is the **process** of gradually adjusting the dose of a **medication** until the required therapeutic effect is reached, while **avoiding** as many side effects as possibile

Dailey G, Fine-tuning therapy with basal insulin for optimal glycemic control in type 2 diabetes: a review.

Curr Med Res Opin 2004;20:2007-14.

QUESTION

How to titrate basal insulin in type 1 diabetes?

Titration of basal insulin in T1DM

The Use of FPG to Titrate Basal Insulin in T1DM

Pre-breakfast SMBG		Dose adjustment IDeg simple[a]	Dose adjustment IDeg stepwise[b]
mmol/L	mg/dL	U	U
<3.1	<56	−4	−4
3.1-3.9	56-70		−2
4.0-5.0	71-90	0	0
5.1-7.0	91-126	+4	+2
7.1-8.0	127-144		+4
8.1-9.0	145-162		+6
>9.0	>162		+8

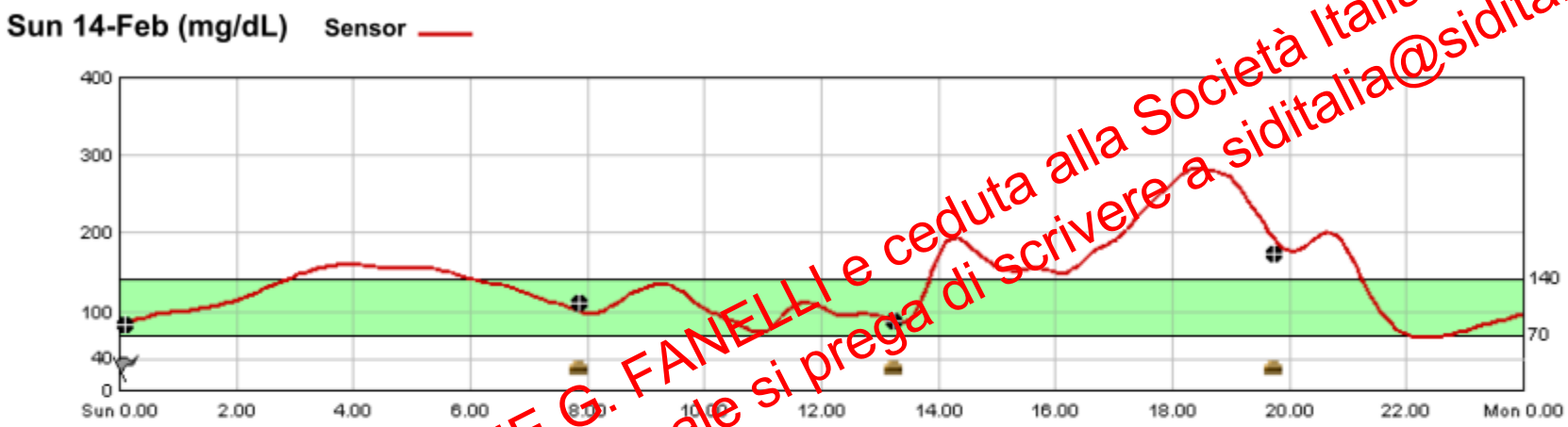
IDeg = Insulin degludec, SMBG = self-measured blood glucose. [a]Based on a single measurement on the day of titration, [b]Based on the lowest of 3 consecutive days' measurements

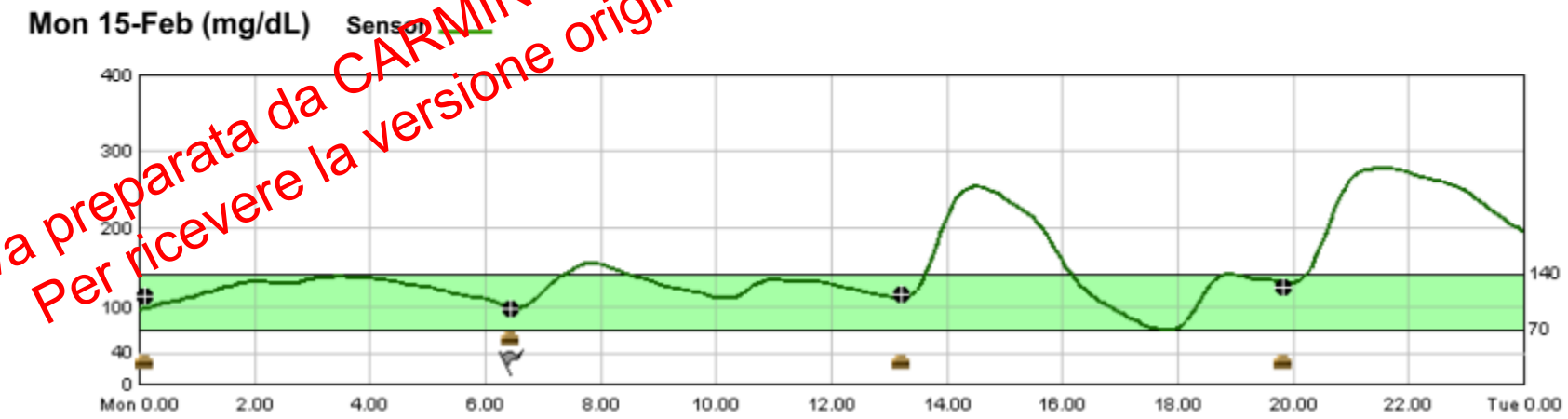
The Use of FPG to Titrate Basal Insulin in T1DM

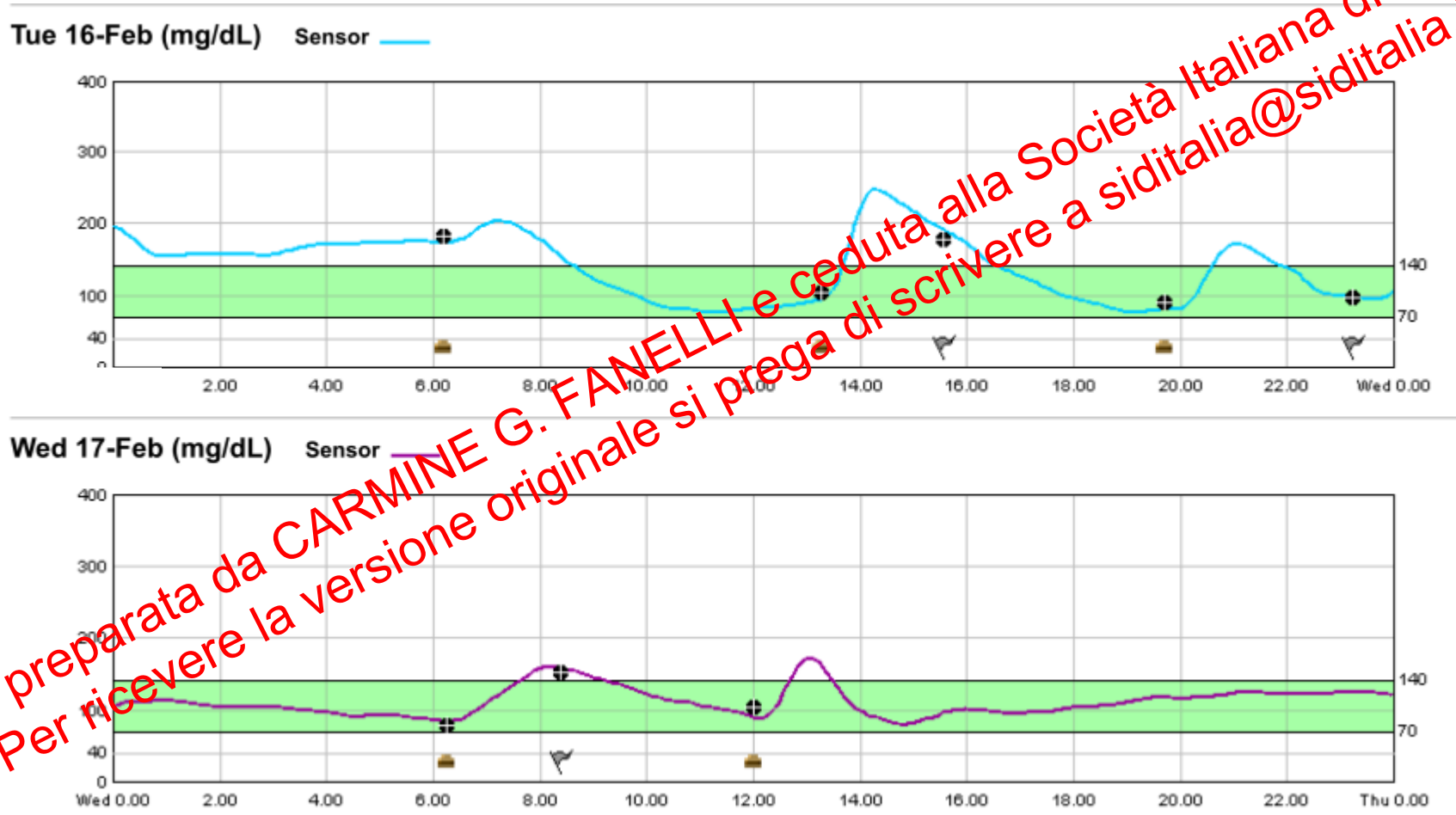
- If the basal insulin dose is correct, the bedtime BG should be about the same as the next morning's FBS, assuming no snack rapid-acting insulin at night time
- If the BG is decreasing significantly overnight, then the basal insulin dose is too much
- If the BG is increasing significantly overnight, then the basal insulin dose is too little.

The Use of FPG to Titrate Basal Insulin in T1DM is Necessary but NOT Sufficient

- Basal insulin should not be titrated just based on the FBS; it should be adjusted based on the relationship of the bedtime BG to the morning FBS







Clinical experience: switching to and from concentrated insulins

Current Therapy	Switch to U100 Glargine	Switch to U300 Glargine	Switch to Degludec
U100 Glargine	--	Switch dose for dose the same; likely need to uptitrate	Consider downtitrating by 10%
U300 Glargine	Consider downtitrating by 20%	--	Consider downtitrating by 20%
Degludec	Switch dose for dose the same; likely need to uptitrate	Switch dose for dose the same; likely need to uptitrate	--

Strategies for Treating PPG

- Titration of prandial insulin is a complex task and algorithms are not the keys.
- It requires an integrated approach with education of patients to choose and calculate pre-meal doses accounting for variations in meal size, composition and physical activity
- Postprandial glucose excursions may be better controlled by adjusting the timing of prandial insulin dose administration
- The optimal time to administer prandial insulin varies, based on the type of insulin used, measured blood glucose level, timing of meals, and carbohydrate consumption.
- Too many patients are still injecting after the meal, not before.

Aspects of Self-Reported Diabetes Management in 2016–2018

Insulin use

Timing of insulin bolus, *n* (%)

- At least several minutes before the meal
- Immediately before the meal
- During the meal
- After the meal

Overall, N = 11,007	*6–12 years old, N = 1312*	*13–17 years old, N = 2179*	*18–25 years old, N = 2440*	*26–49 years old, N = 2122*	*≥50 years old, N = 1953*
2671 (24)	359 (27)	626 (20)	419 (17)	544 (26)	723 (37)
4822 (44)	579 (44)	1491 (47)	1009 (41)	944 (44)	798 (41)
1178 (11)	105 (8)	351 (11)	339 (14)	262 (12)	121 (6)
2336 (21)	269 (21)	711 (22)	673 (28)	372 (18)	311 (16)

Premeal insulin was associated with lower HbA1c and fewer missed meal insulin doses

T1D Exchange

Foster NC et al, DTT, 2019

Pharmacokinetics and pharmacodynamics of bolus insulins

Available online at ScienceDirect www.sciencedirect.com
Elsevier Masson France EM|consulte www.em-consulte.com
Diabetes & Metabolism 36 (2010) 165–169

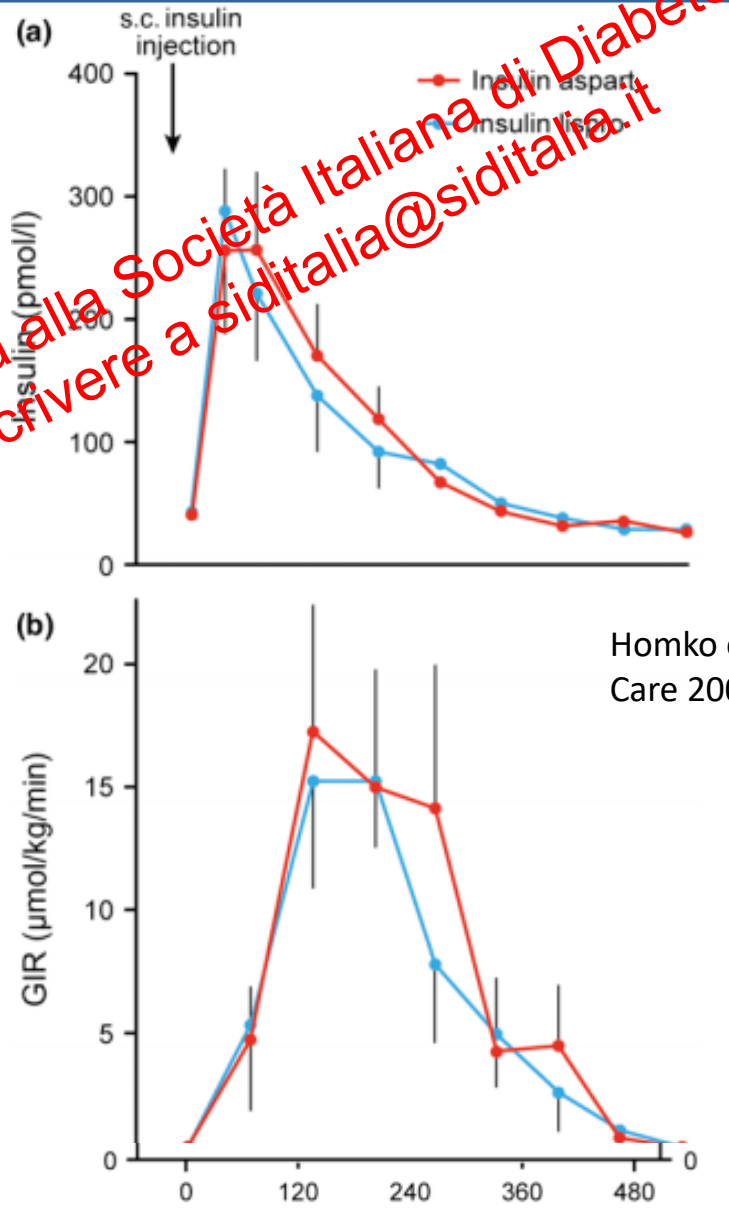
Original article

Peak-time determination of post-meal glucose excursions in insulin-treated diabetic patients

S. Daenen, A. Sola-Gazagnes, J. M'Bemba, C. Dorange-Breillard, F. Defer, F. Elgrably, É. Larger*, G. Slama

- Retrospective analysis
- 69 ambulatory continuous glucose-monitoring system (CGMS) profiles
- 75 consecutive insulin-treated patients with diabetes
- The parameters measured were the peak post-meal blood glucose values and peak time.

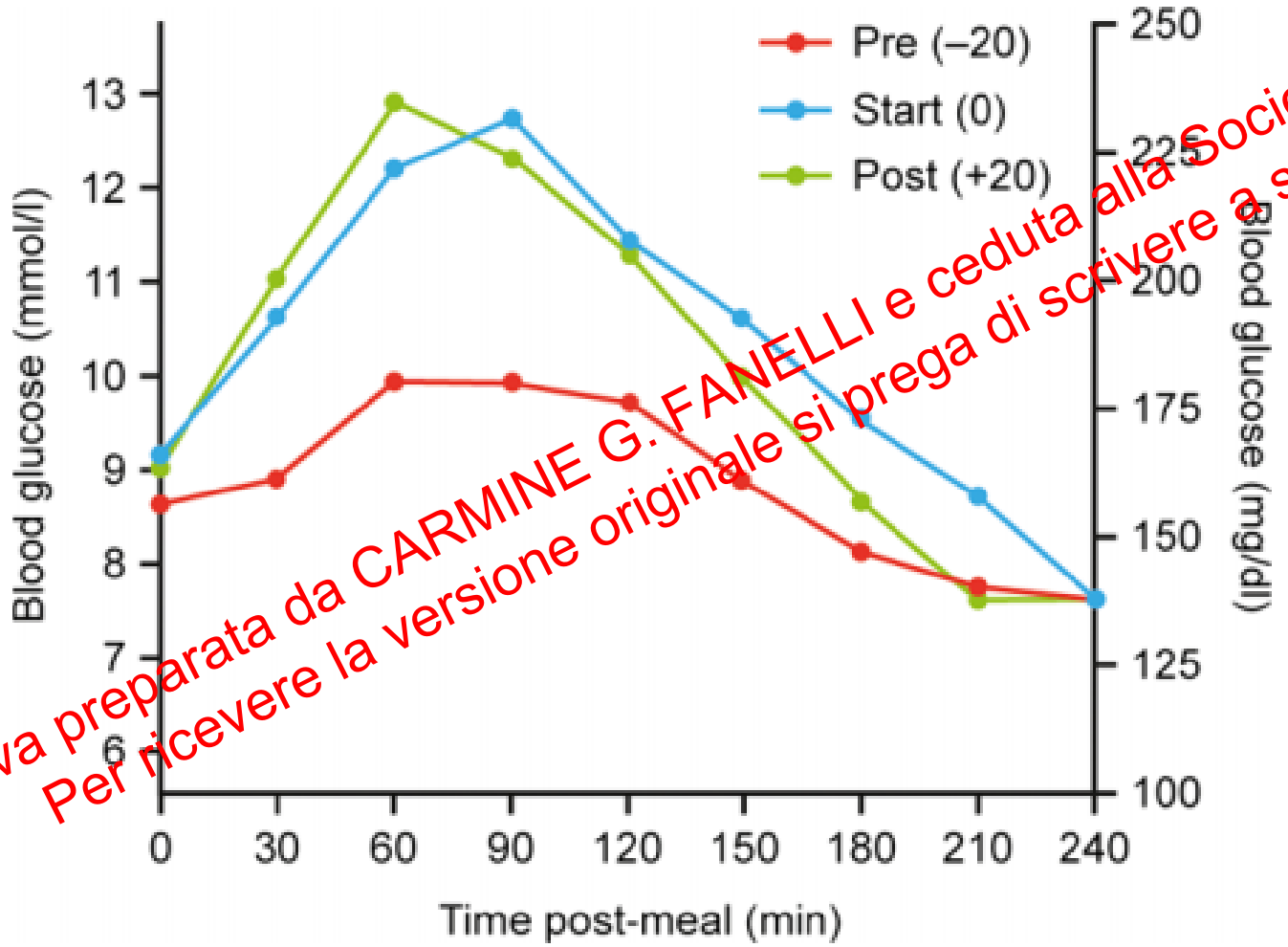
Results: 80% of post-meal blood glucose peaks were observed at less than 90 min after the start of the meal.



Homko et al. Diabetes Care 2003; 26: 2027-2031

Timing of Meal Insulin Boluses to Achieve Optimal Postprandial Glycemic Control in Type 1 Diabetes

Mean BG levels after meal initiation in three treatment arms



- PRE, bolus 20’ before the meal
- START, bolus at the meal start
- POST, bolus 20’ after the meal start

N= 23 T1 DM

Cobry E et al. Diabetes Technol Ther 2010;12:173-7

P<0.05 for PRE versus START for 60, 90, and 120 min and for PRE versus POST for 30, 60, 90, 120, and 150 min.

PHARMACOLOGIC THERAPY FOR TYPE 1 DIABETES

Recommendations

9.3 Consider educating individuals with type 1 diabetes on matching prandial insulin doses to carbohydrate intake, premeal blood glucose levels, and anticipated physical activity. C

ADA Standards of Care 2020

F. TERAPIA MEDICA NUTRIZIONALE

1. Diabete di tipo 1

Le persone affette da diabete di tipo 1 devono ricevere, preferibilmente da un medico o da un dietista, esperti in terapia medica nutrizionale (MNT, *medical nutrition therapy*) del diabete e quindi inseriti nel team diabetologico, una MNT individualizzata al fine di raggiungere gli obiettivi terapeutici. *III A*

Un approccio multispecialistico è necessario per integrare la MNT in un programma terapeutico che deve tenere in considerazione le esigenze personali, la disponibilità ai cambiamenti, i target metabolici, il trattamento ipoglicemizzante, il livello di attività fisica e lo stile di vita. *VI B*

Le raccomandazioni generali sulla composizione della dieta nelle persone con diabete di tipo 1 non differiscono da quelle della popolazione generale.

Nelle persone con diabete tipo 1 la terapia insulinica deve essere integrata in un programma nutrizionale e di attività fisica individuale. *VI B*

I pazienti in terapia insulinica basal-bolus devono modificare i bolo di insulina preprandiali sulla base dei carboidrati contenuti nei pasti. *I A*

Il counting dei carboidrati si conferma nel contesto della MNT componente essenziale, e identifica la strategia più efficace per il controllo glicemico nel paziente con diabete in trattamento insulinico intensivo. *I B*

Nei pazienti trattati con dosi costanti di insulina l'introduzione dei carboidrati con i pasti deve essere mantenuta costante nelle quantità e nei tempi. *III B*

In corso di esercizio fisico programmato, si raccomanda l'aggiustamento della terapia insulinica. Quando invece l'esercizio fisico non sia programmato, è opportuno prevedere l'introduzione di supplementi orali. *II B*

In corso di malattie acute intercorrenti si raccomandano l'introduzione di adeguati quantitativi di liquidi e carboidrati, il controllo di glicemia e chetonuria. *III B*

La MNT deve essere considerata una componente del programma di gestione della glicemia per tutti i pazienti ricoverati con diabete e/o iperglicemia. *II A*

Le strutture di ricovero dovrebbero valutare l'implementazione di un sistema di programmazione dei pasti per i soggetti con diabete tale da garantire un contenuto glucidico adeguato e l'appropriato intervallo di tempo rispetto alla terapia insulinica. *VI B*

Non è raccomandata l'imposizione di una dieta restrittiva nei soggetti con diabete ricoverati in strutture di lungodegenza. Deve essere invece garantito un programma alimentare basato su un menù regolare in termini di intervallo temporale e contenuto glucidico. *III B*

Effect of Fat, Protein and Carbohydrates in a Meal on Postprandial Glycemia

In type 1 diabetes:

- Fat reduces the early glucose response (the first 2–3 h after the meal).
- Fat delays the peak blood glucose due to the delayed gastric emptying.
- Fat leads to late post meal (>3 h) hyperglycemia.
- Fat consumption increases the need for insulin requirements.
- High-fat/protein meals require more insulin than lower-fat/protein meals with identical carbohydrate content.

Bell K.J. et al. Diabetes Care 2015, 38, 1008–1015

Diabetes Care

Diabetes Care 2020, 38, 43:59-66

Amount and Type of Dietary Fat, Postprandial Glycemia, and Insulin Requirements in Type 1 Diabetes: A Randomized Within-Subject Trial

Kirstine J. Bell,[1] Chantelle Z. Fio,[1] Stephen Twigg,[1,2] Sally-Anne Duke,[3] Gregory Fulcher,[3] Kylie Alexander,[3] Margaret McGill,[2] Jencia Wong,[2] Jennie Brand-Miller,[1] and Garry M. Steil[4,5]

Adults with T1D using insulin pump therapy.

On the first six visits, participants consumed meals containing 45 g carbohydrate with 0 g, 20 g, 40 g, or 60 g fat and saturated, monounsaturated, or polyunsaturated fat.

Insulin was dosed using individual insulin/carbohydrate ratio as a dual-wave 50/50% over 2 h.

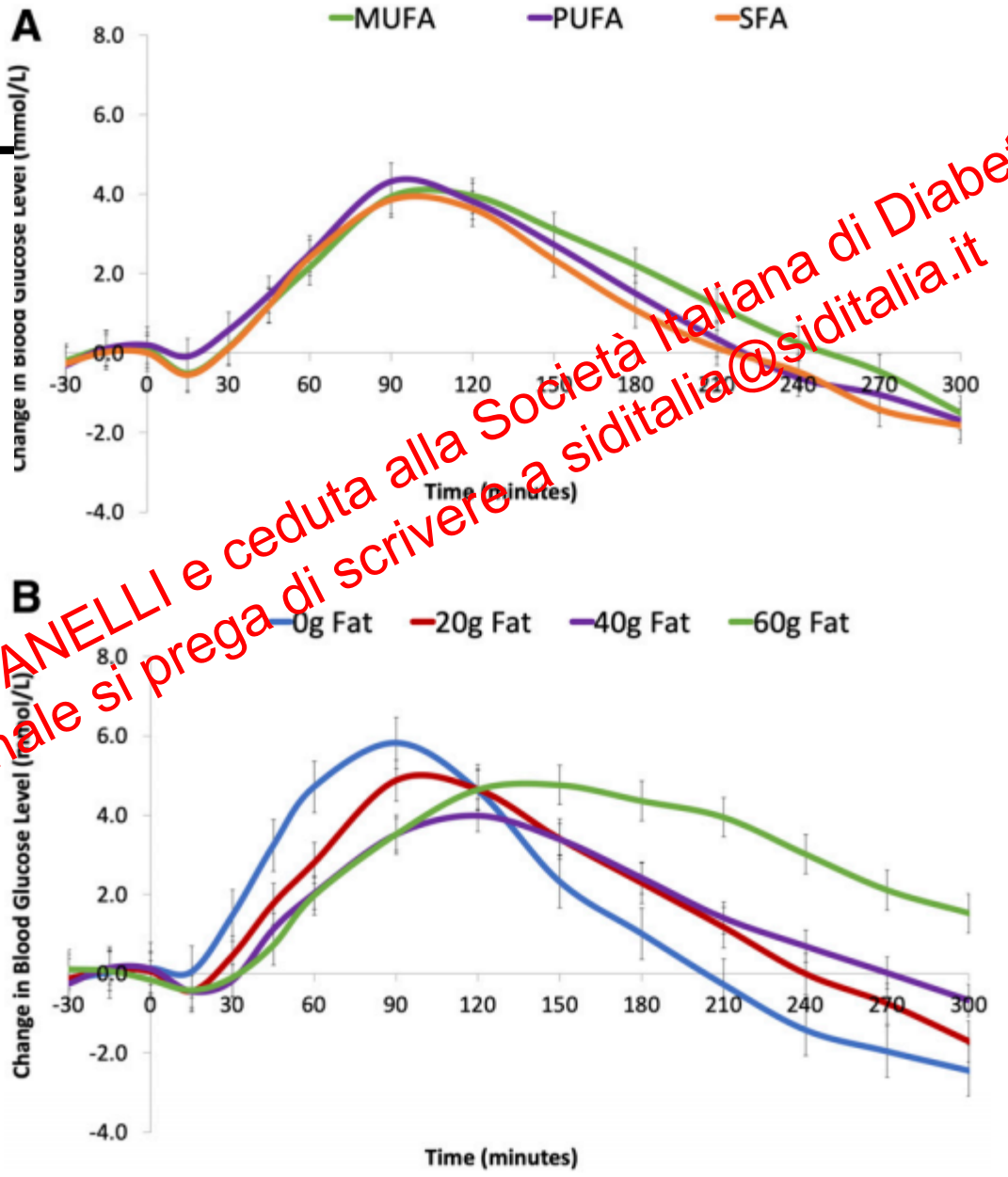


Figure 1—Postprandial glucose profiles for varying types (*A*) ($n = 16$) and amounts of fat (*B*) ($n = 15$) in adults with T1D using insulin pump therapy with insulin dosed according to individualized ICR as dual-wave 50/50% over 2 h.

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On subsequent visits, participants repeated the 20–60-g fat meals with the insulin dose estimated using a model predictive bolus (MPB) until glycemic control was achieved.

To achieve glycemic control, on average participants required dual-wave insulin bolus:

for 20 g fat, +6% insulin, 74/26% over 73 min;

For 40 g fat, +6% insulin, 63/37% over 75 min; and

For 60 g fat, +21% insulin, 49/51% over 105 min.

CONCLUSIONS This study provides clinical guidance for mealtime insulin dosing recommendations for dietary fat in T1D.

Diabetes Care

Diabetes Care 2020, 38, 43:59-66

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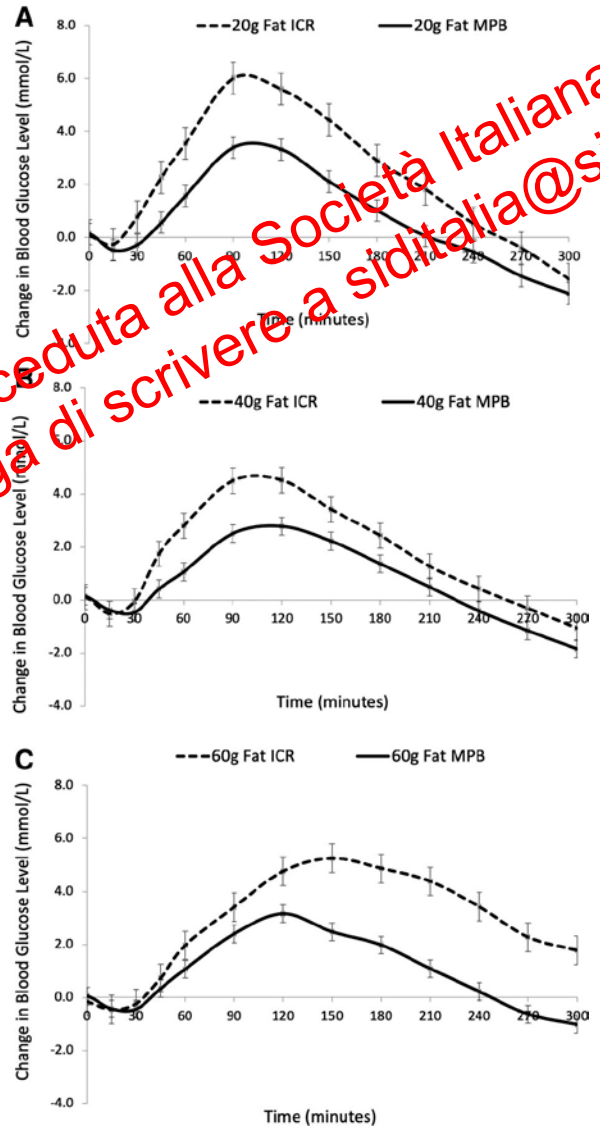


Gastric Emptying Impacts the Timing of Meal Glucose Peak in Subjects With Uncomplicated Type 1 Diabetes

Roberta Lupoli,[1] Annalisa Creanza,[2] Ettore Griffo,[2] Gerardo Nardone,[2] Alba Rocco,[2] Lutgarda Bozzetto,[2] Giovanni Annuzzi,[2] Gabriele Riccardi,[2] and Brunella Capaldo[2]

[1]Department of Neurosciences, Reproductive and Odontostomatological Sciences, Federico II University, 80131 Naples, Italy; and [2]Department of Clinical Medicine and Surgery, Federico II University, 80131 Naples, Italy

J Clin Endocrinol Metab 103: 2269–2276, 2018

42 T1DM

GE (Gastric Emptying) was assessed by using the 13C-octanoate breath test with a standardized solid meal.

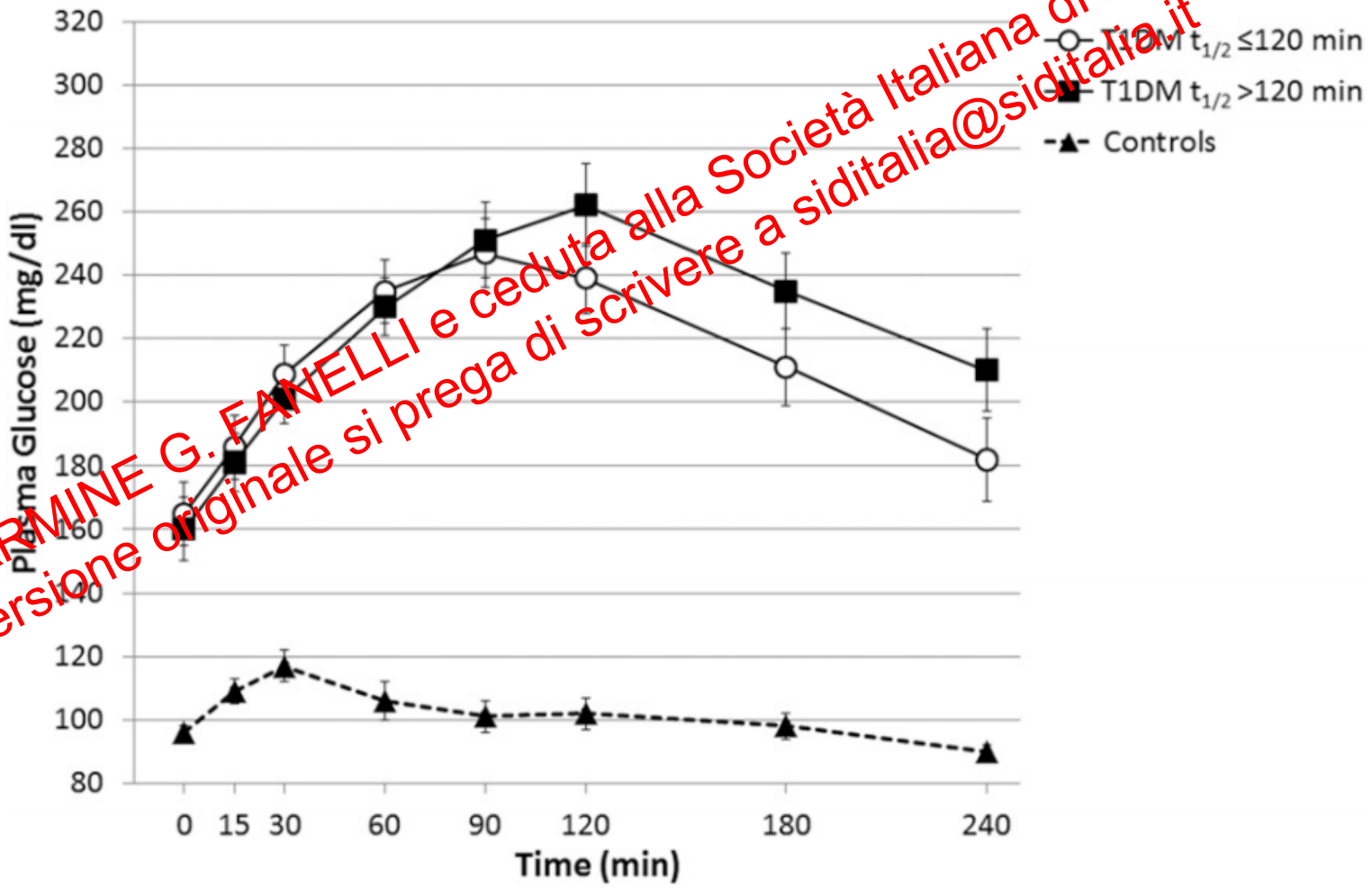


Figure 1. Plasma glucose response to the test meal in patients with T1DM who have normal or delayed GE time. Data are expressed as mean ± standard error of the mean.

Insulin requirements in patients with diabetes and declining kidney function

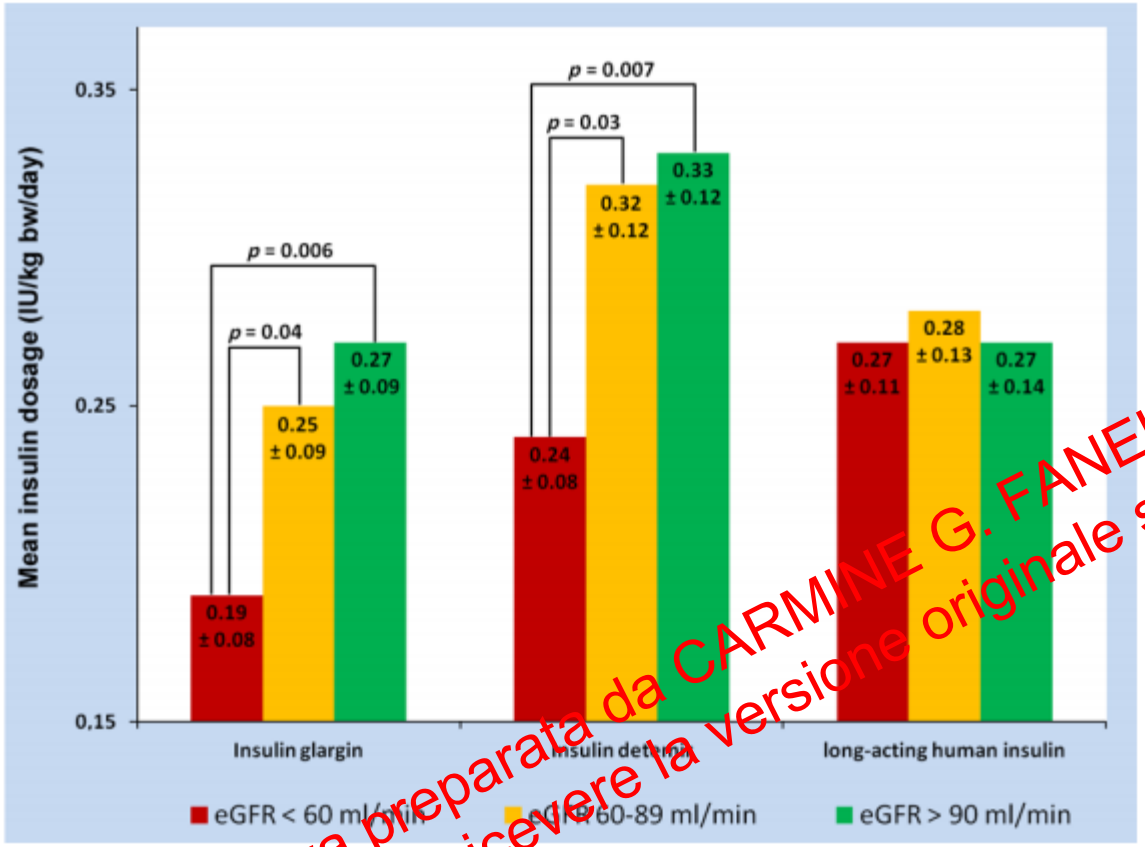


Figure 3. Mean daily dosage of insulin glargine, insulin detemir, and long-acting human insulin [IU/kg body weight (bw)/day] in relation to estimated glomerular filtration rate (eGFR, ml/min).

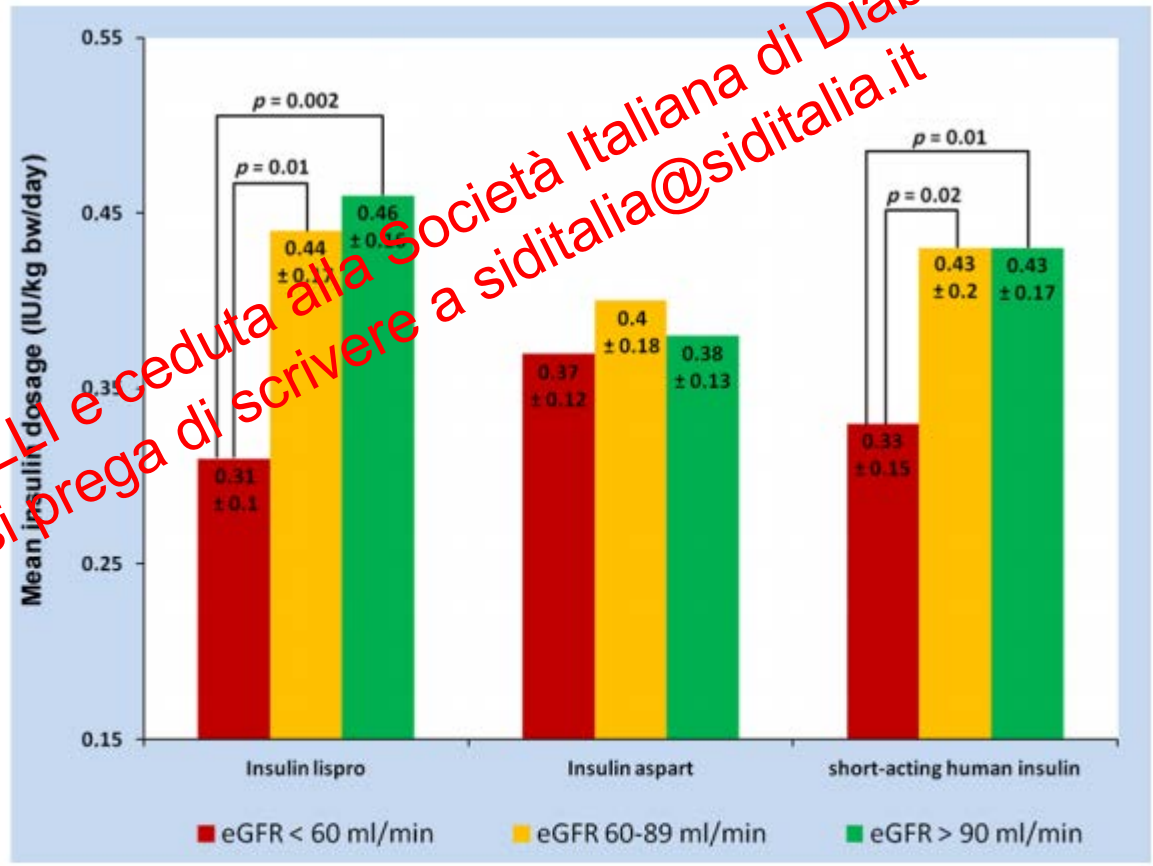
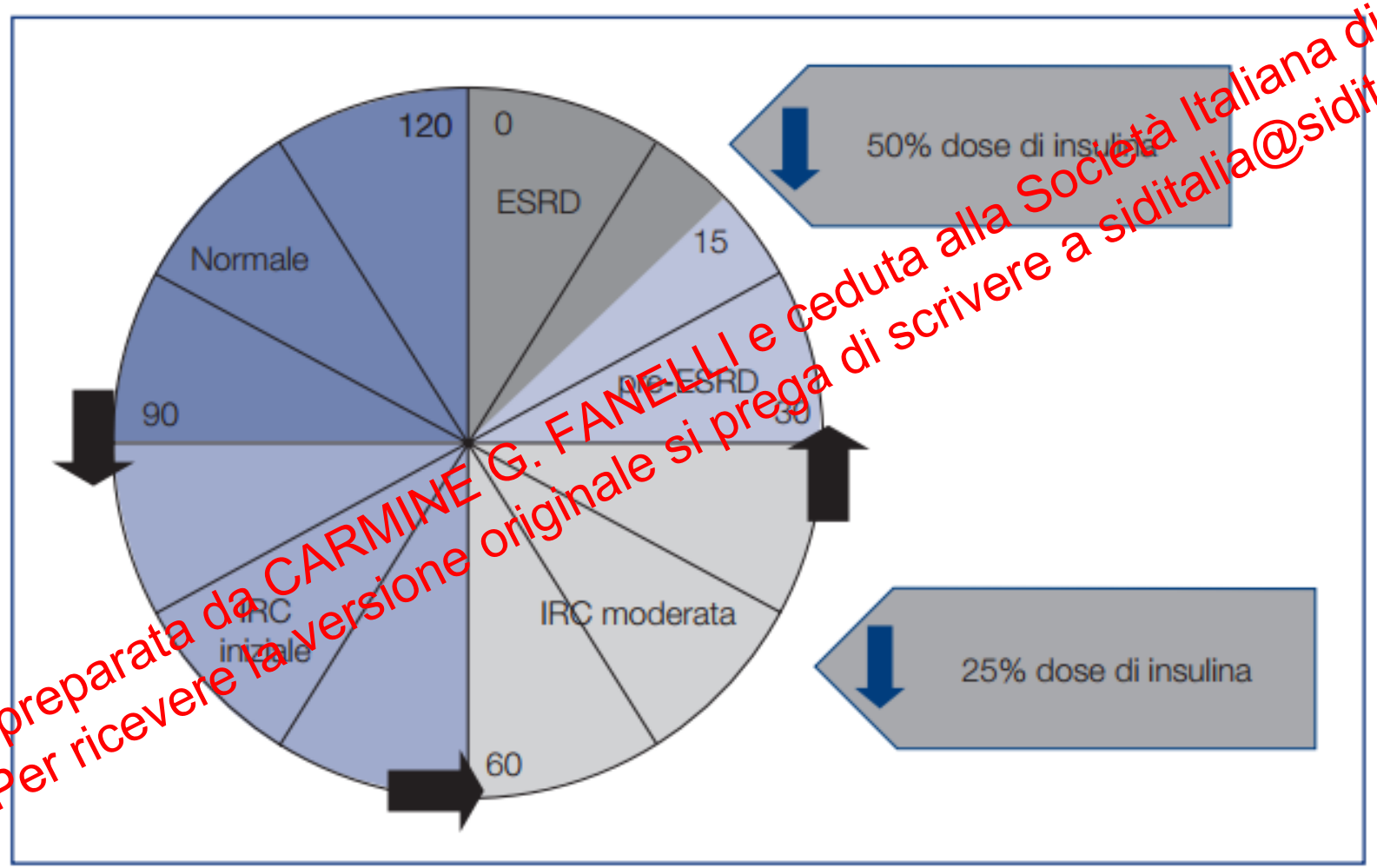


Figure 4. Mean daily dosage of insulin lispro, insulin aspart and short-acting human insulin [IU/kg body weight (bw)/day] in relation to estimated glomerular filtration rate (eGFR, ml/min).

Ther Adv Endocrinol Metab (2013) 4:113–121

Terapia insulinica del diabete nel paziente nefropatico



Trevisan R. et al.G It Diabetol Metab 2015;35:27-35

DAWN AND DUSK

Original Articles

The Dawn Phenomenon, an Early Morning Glucose Rise: Implications for Diabetic Intraday Blood Glucose Variation

MARIA INES SCHMIDT, ANGELIKI HADJI-GEORGOPOULOS, MARC RENDELL, SIMEON MARGOLIS, AND AVINOAM KOWARSKI

Eleven insulin-dependent (type I) diabetic subjects were studied during a 24-h period to assess intraday blood glucose (BG) variation and related free insulin (FI) levels. Ten patients exhibited the dawn phenomenon, a rise in early morning fasting blood glucose (123 ± 81.1 m/dl; mean ± SD). This increase was positively and significantly correlated with the morning postprandial BG peak ($r = 0.723$; $P = 0.012$). FI/BG ratios were highest during the night (0.717 and 0.666 at 2200 and 0400 h, respectively) and lowest during the early morning (0.294 at 0800 h) ($P < 0.01$). Three of the four observed hypoglycemic episodes occurred during the period when free insulin levels were high relative to BG. We conclude that the dawn phenomenon contributed directly and significantly to the BG maximum and indirectly, in some cases, to nocturnal hypoglycemia. It thus played an important role in the intraday blood glucose variation of such patients. DIABETES CARE 4: 579–585, NOVEMBER–DECEMBER 1981.

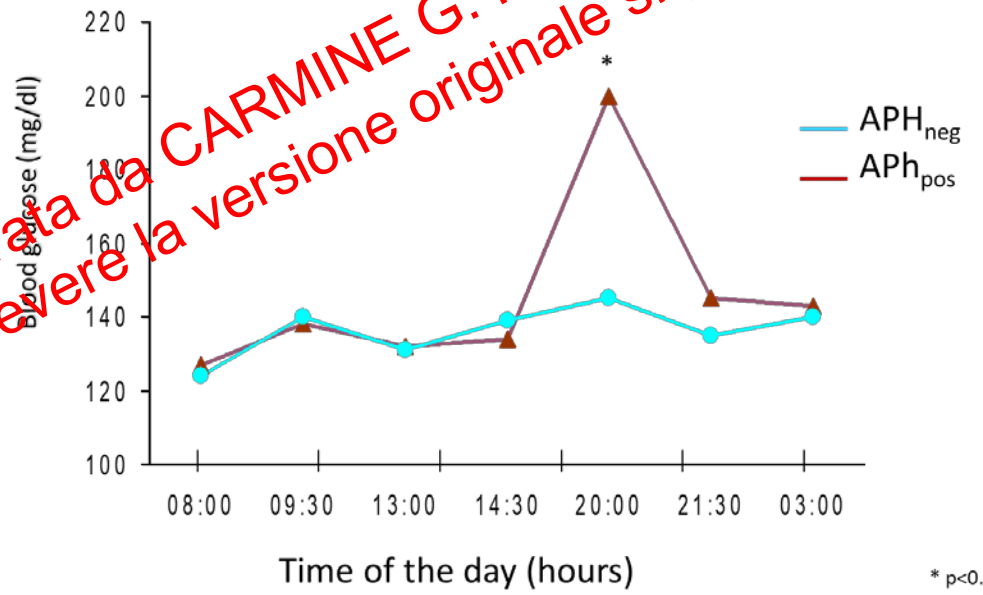
The Dawn Phenomenon

- The night-to-morning elevation of blood glucose before and, to a larger extent, after breakfast, in subjects with type 1 diabetes:
  - It reflects an increased need for insulin in the early morning
  - It is a very frequent event in Type 1 diabetes, it is highly reproducible from day to day; it is influenced by the duration of diabetes, glycaemic control, state of the counterregulation system to hypoglycaemia and insulin sensitivity
  - It contributes importantly to the intraday blood glucose variation of T1 DM subjects

DAWN AND DUSK

DUSK PHENOMENON

- The elevation of blood glucose (BG) in the afternoon, despite optimal 2-h post-lunch BG control, after injection of rapid-acting insulin analog at lunch, in the absence of afternoon snack
  - It occurs in about one third of patients with Type 1 diabetes mellitus
  - It is reproducible in individual T1DM patients
  - It is relevant to BG control since it associates with elevation of HbA1c

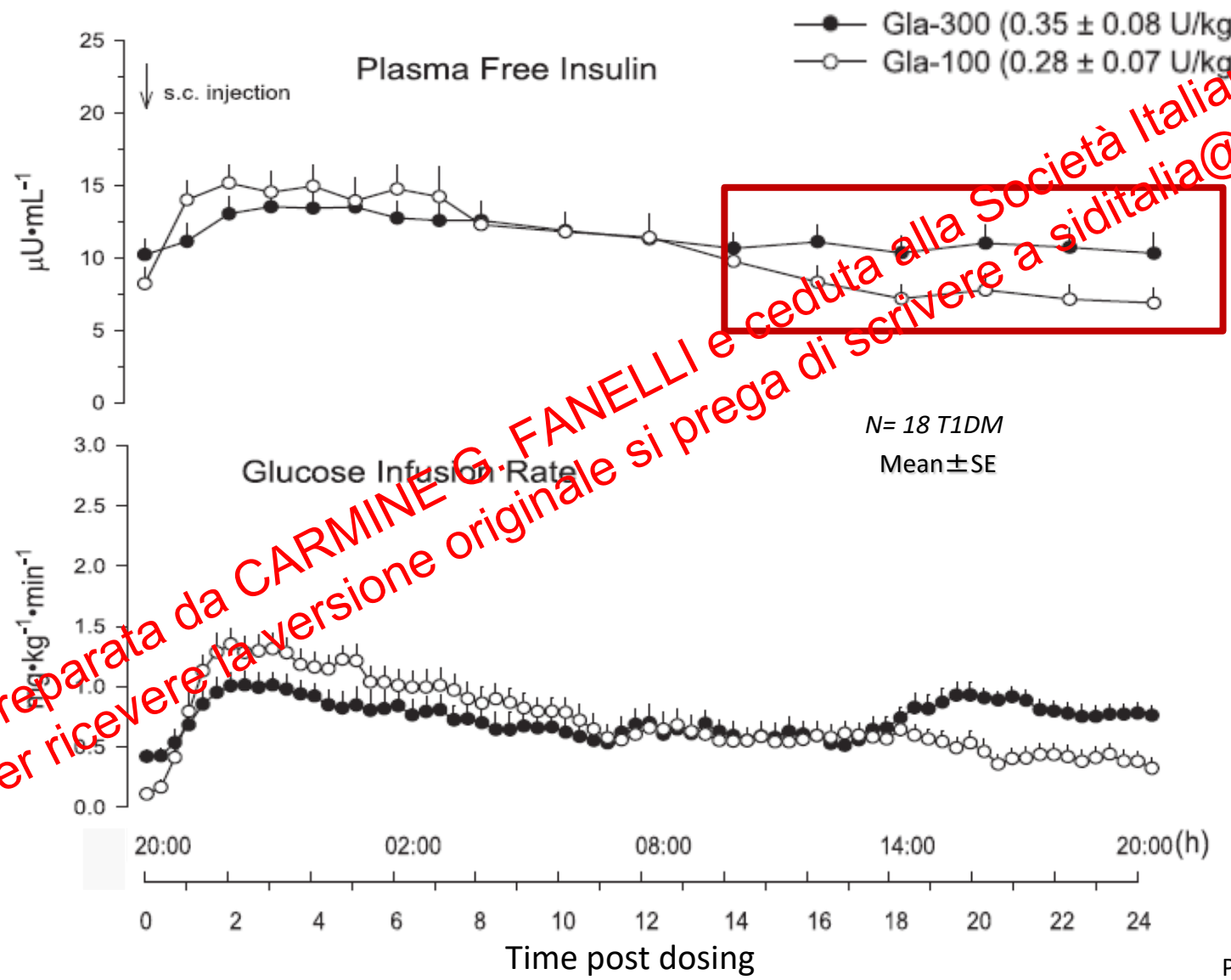


* p<0.05 F. Porcellati et al., ADA 2005

DUSK PHENOMENON: CAUSES

1) Not “enough” basal insulin to cover the 24 h need
   - not adequate insulin titration
   - short duration of action of the insulin formulation
2) Not adequate coverage of meal by rapid acting insulin
   - too short duration of action of rapid acting insulin
   - inadequacy of carbo-counting
   - meal composition (es. fat and fibres slowing down gastric emptying)
   - Gastric emptying delayed
3) Insulin sensitivity

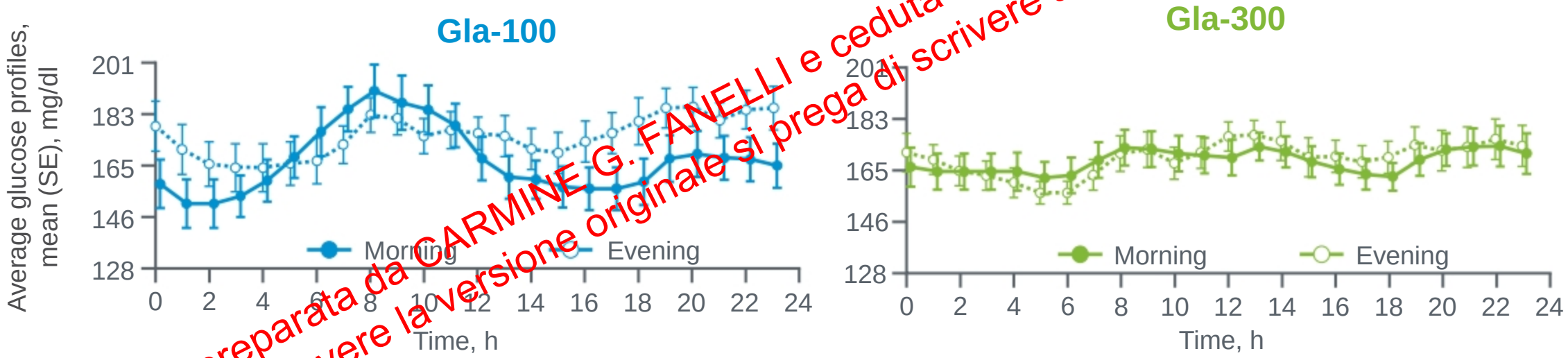
PK-PD of Gla-300 and Gla-100 at Clinical Doses



Porcellati F. et al., Diabetes Care 2019

24-hour glucose profile of AM vs PM administration of Gla 100 or Gla-300 in T1DM

Smoother 24 hr glucose profiles with Gla-300 without "pre-injection" hyperglycemia

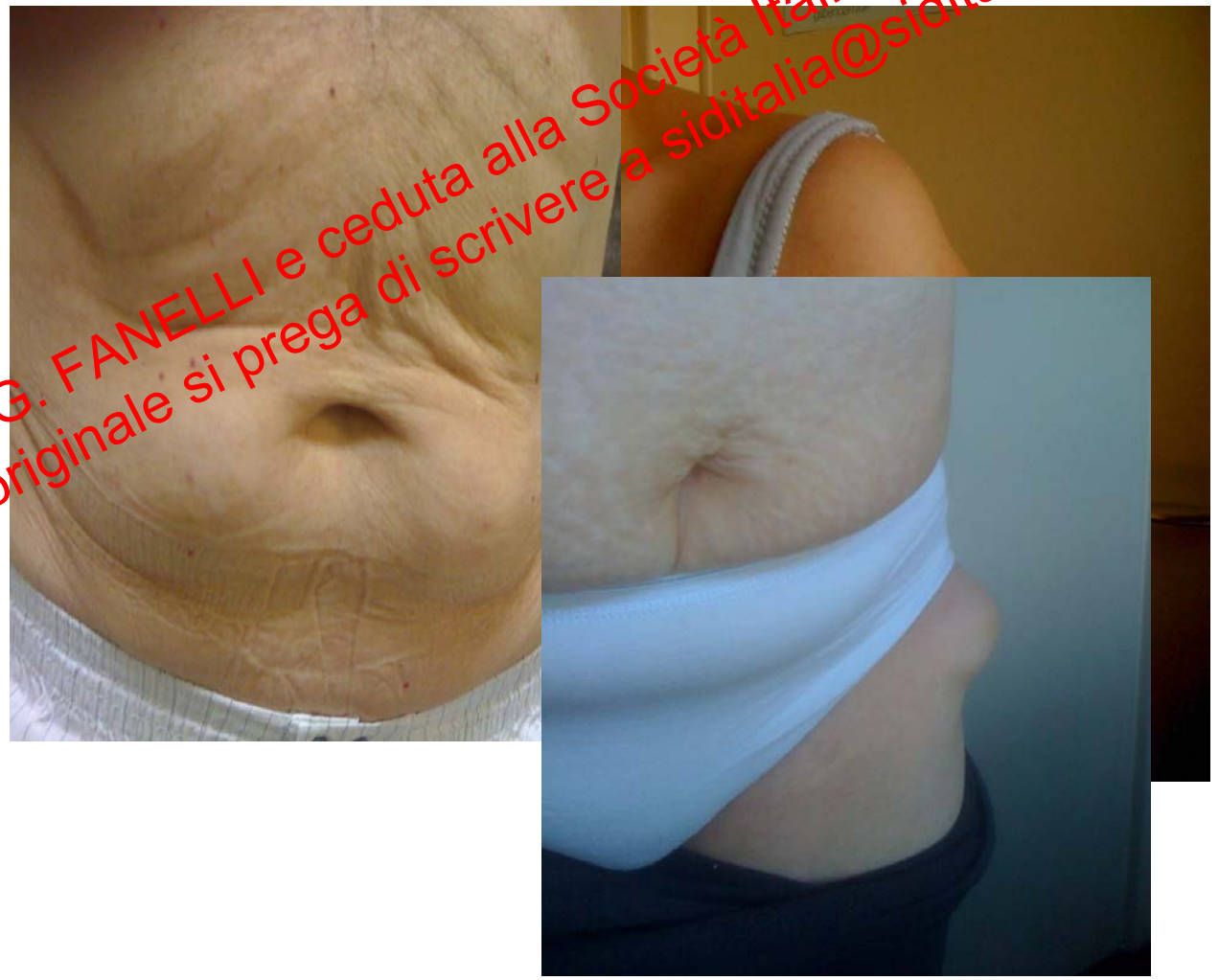


Average 24-h glucose profiles during the last 2 weeks of each treatment period

A 16-week, exploratory, open-label, parallel-group, two-period crossover study designed to compare glucose control in patients with T1DM (N=59) receiving Gla-300 or Gla-100 in morning or evening, in combination with prandial insulin

Bergenstal RM, et al. Diabetes Care 2017;40:554–60

Lipodistrofia da iniezione di insulina: una riconosciuta (.. *ma misconosciuta*) causa di elevata variabilità glicemica



Landau S.. N Engl J Med 2012; 366:e9

Insulin Injection Technique

- It is important that insulin be delivered into the proper tissue in the right way .
- Proper insulin injection technique includes injecting into appropriate body areas, injection site rotation, appropriate care of injection sites to avoid infection or other complications, and avoidance of intramuscular (IM) insulin delivery.
- Recommended sites for insulin injection include the abdomen, thigh, buttock, and upper arm
- Risk for IM insulin delivery is increased in younger and lean patients when injecting into the limbs rather than truncal sites (abdomen and buttocks) and when using longer needles

ADA Standard of Care, 2020

Lipodistrofie

- Injection site rotation is additionally necessary to avoid lipodystrophies.
- Lipohypertrophy can contribute to erratic insulin absorption, increased glycemic variability, and unexplained hypoglycemic episodes.
- Patients and/or caregivers should receive education about proper injection site rotation and to recognize and avoid areas of lipohypertrophy
- Examination of insulin injection sites for the presence of lipohypertrophy, as well as assessment of injection device use and injection technique, are key components of a comprehensive diabetes medical evaluation and treatment plan.

ADA Standard of Care, 2020

Lipodistrofie

Lipodystrophy is a disorder of fat tissue.

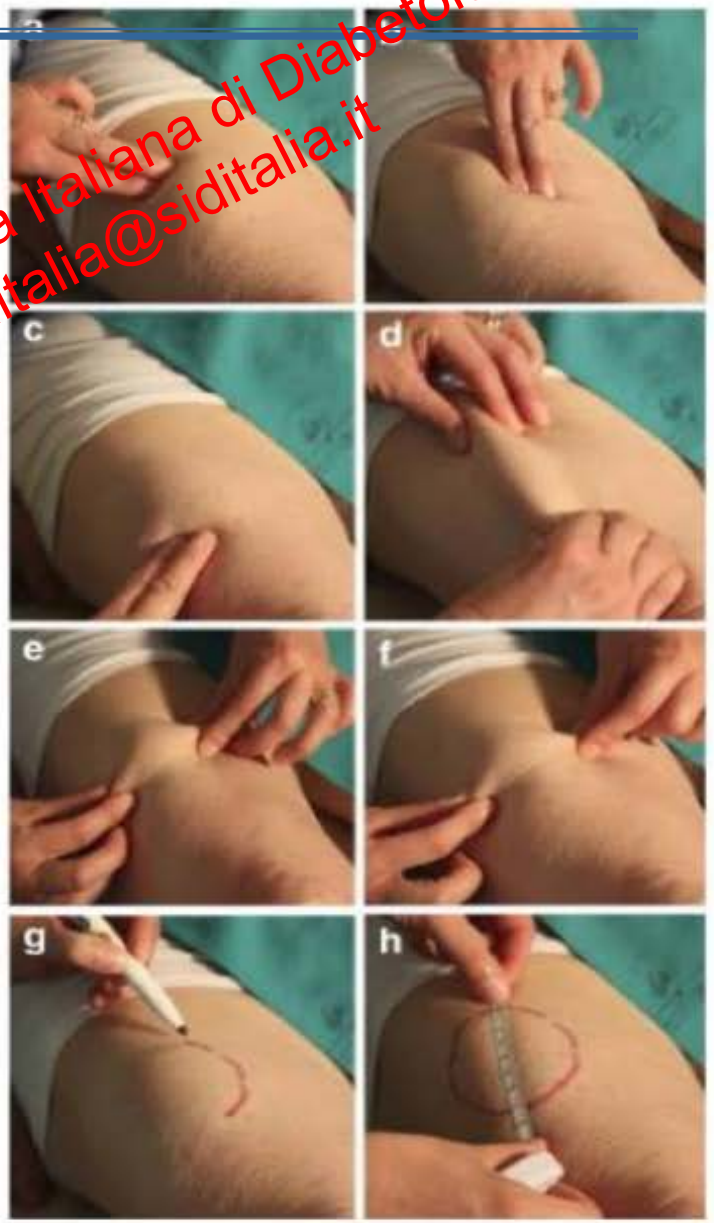
There are 2 main types of lipodystrophy: lipoatrophy, which is loss of adipocytes that clinically manifests as indenting and cratering, and

LH, which is enlargement of adipocytes that manifests as swelling or induration of fat tissue.

LE LIPODISTROFIE (palpazione)

I noduli sono spesso più **poco visibili solo con l'ispezione**

In questo caso è necessario utilizzare una **corretta tecnica palpatoria** che evidenzierà le irregolarità e i **micronoduli del sottocute**



MAYO CLINIC

SPECIAL ARTICLE

New Insulin Delivery Recommendations

CrossMark

Anders H. Frid, MD; Gillian Kreugel, DSN; Giorgio Grassi, MD; Serge Halimi, MD; Debbie Hicks, DSN; Laurence J. Hirsch, MD; Mike J. Smith, DSN; Regine Wellhoener, MD; Bruce W. Bode, MD; Irl B. Hirsch, MD; Sanjay Kalra, MD; Linong Ji, MD; and Kenneth W. Strauss, MD

Mayo Clin Proc. 2016;91(9):1231-1255

Optimizing insulin injection technique and its effect on blood glucose control

Clinical parameter	n.	Mean	Δ
HbA1c at entry	346	8.49	
HbA1c at 3 months	259	7.91	−0.58*
FBG (mg/dL) at entry	249	186.7	
FBG (mg/dL) at 3 months	182	172.5	−14.2*
TDD (IU) insulin at entry	326	50.5	
TDD (IU) insulin at 3 months	256	48.5	−2.0*
BMI at entry	304	28.2	
BMI at 3 months	235	27.7	−0.5*

* $p < 0.05$

Grassi G, et al. Optimizing insulin injection technique and its effect on blood glucose control. Journal of Clinical & Translational Endocrinology 1(4):145-150, 2014.

Structured Education

Lfestyle management

Technology use and interpretation

SBGM

Hypoglycemia prevention

Insulin injection technique

Insulin dose management

CURRENT STATE OF TYPE 1 DIABETES TREATMENT IN U.S.

- Only a minority of adults and youth with T1D achieve ADA goals for A1c, despite

Over the years, many changes in insulin therapy have occurred, including new insulin formulations, new delivery systems and additional therapeutic tactics, with improvement in quality of life and assistance of Type 1 Diabetes.

However, without education, motivation and engagement of patients even the “ideal” insulin and the “perfect” system to monitor blood glucose, will not translate into efficacy and safety

GRAZIE PER LA VOSTRA ATTENZIONE

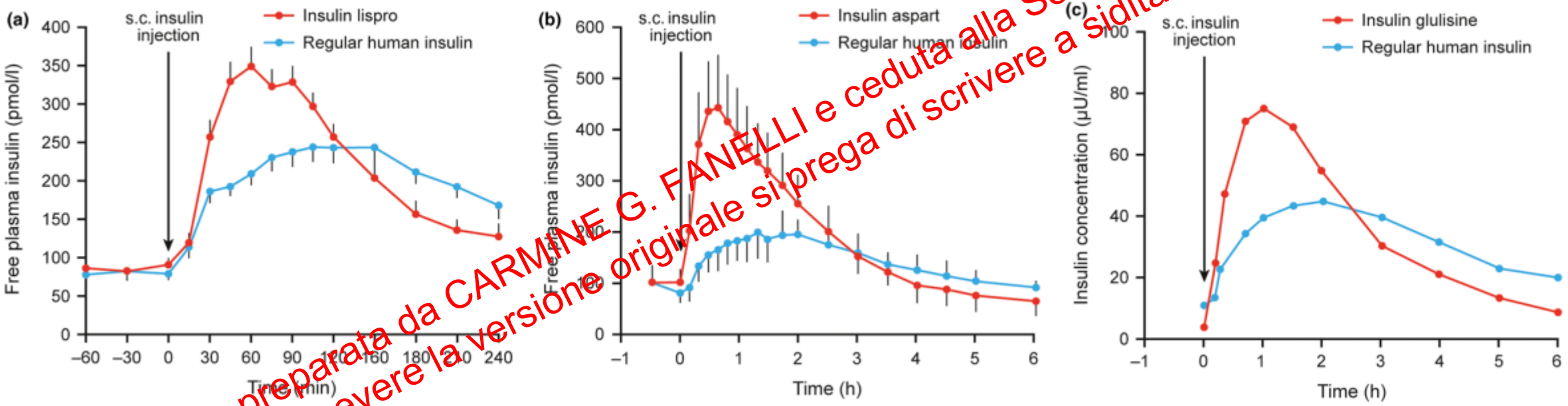
T1D Exchange

Foster NC et al, Diabetes Technology & Therapeutics, 2019

CURRENT STATE OF TYPE 1 DIABETES TREATMENT IN U.S.

BACK UP

Pharmacokinetics of bolus insulins



Slattery et al. Diabet. Med. 2018; 35, 306–316

Recovery of Hypoglycemia Awareness in Long-standing Type 1 Diabetes: A Multicenter 2 × 2 Factorial Randomized Controlled Trial Comparing Insulin Pump With Multiple Daily Injections and Continuous With Conventional Glucose Self-monitoring

Stuart A. Little,[1] Lalantha Leelarathna,[2] Emma Walkinshaw,[3] Hong Kai Tan,[4] Olivia Chapple,[5] Alexandra Lubina-Solomon,[3] Thomas J. Chadwick,[6] Shalleen Barendse,[7] Deborah D. Stocken,[6] Catherine Brennand,[6] Sally M. Marshall,[1] Ruth Wood,[8] Jane Speight,[7,8,9] David Kerr,[10] Daniel Flanagan,[4] Simon R. Heller,[3] Mark L. Evans,[2] and James A.M. Shaw[1,]*

NO DIFFERENCE IN OUTCOMES BETWEEN INSULIN DELIVERY METHOD AND BLOOD GLUCOSE MONITORING METHODOLOGY

avoidance of hypoglycemia, comparing CSII with MDI and adjuvant real-time continuous glucose monitoring (RT) with conventional self-monitoring of blood glucose (SMBG).

Il counting dei carboidrati si conferma nel contesto della MNT, componente essenziale, e identifica la strategia più efficace per il controllo glicemico nel paziente con diabete in trattamento insulinico intensivo. I B

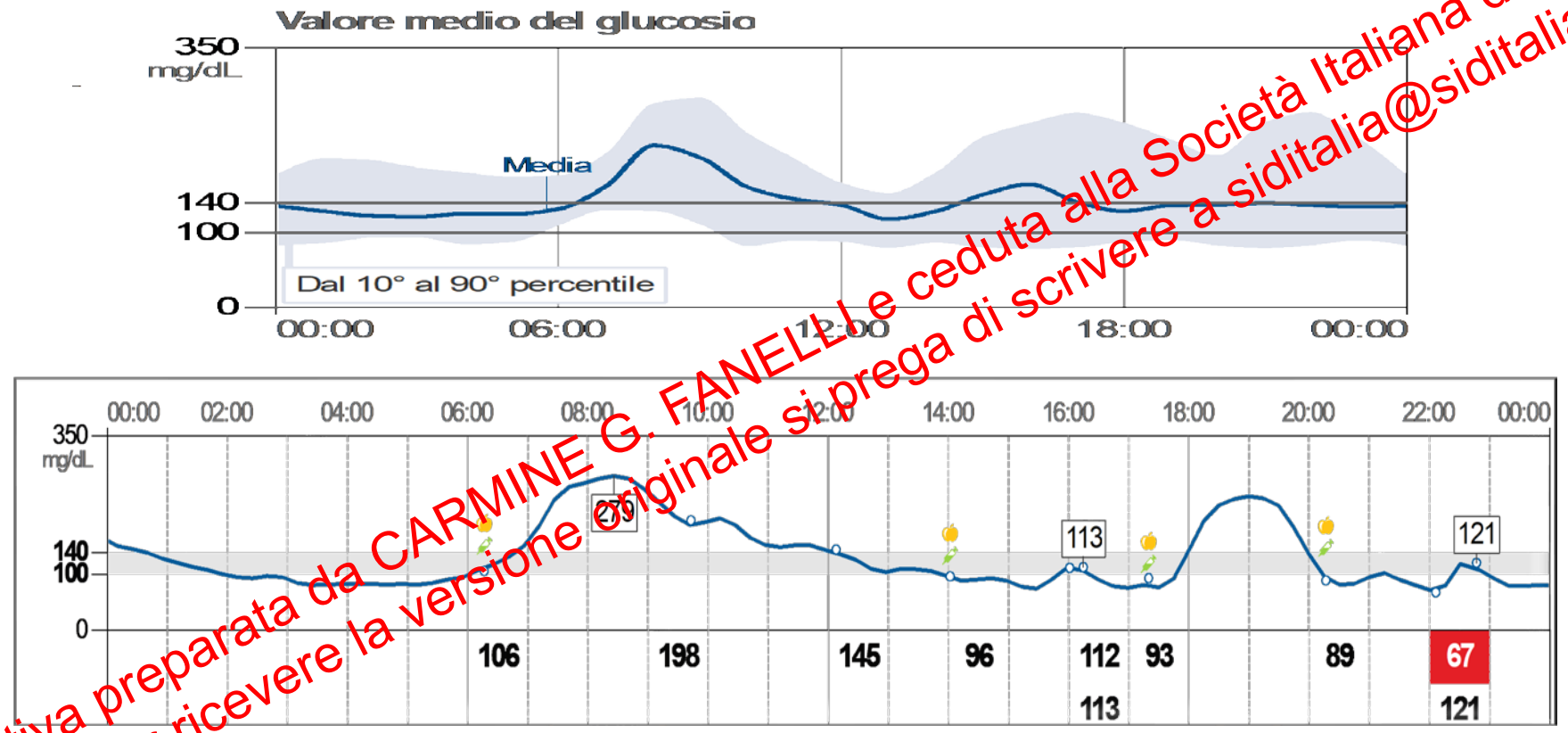
I pazienti devono:

- essere informati sull'indice glicemico dei vari cibi
- prediligere tra i carboidrati quelli a **minor indice glicemico**
- effettuare le dovute correzioni della dose di insulina nel caso consumino CHO ad alto indice glicemico.

ADA Standards of Care 2020

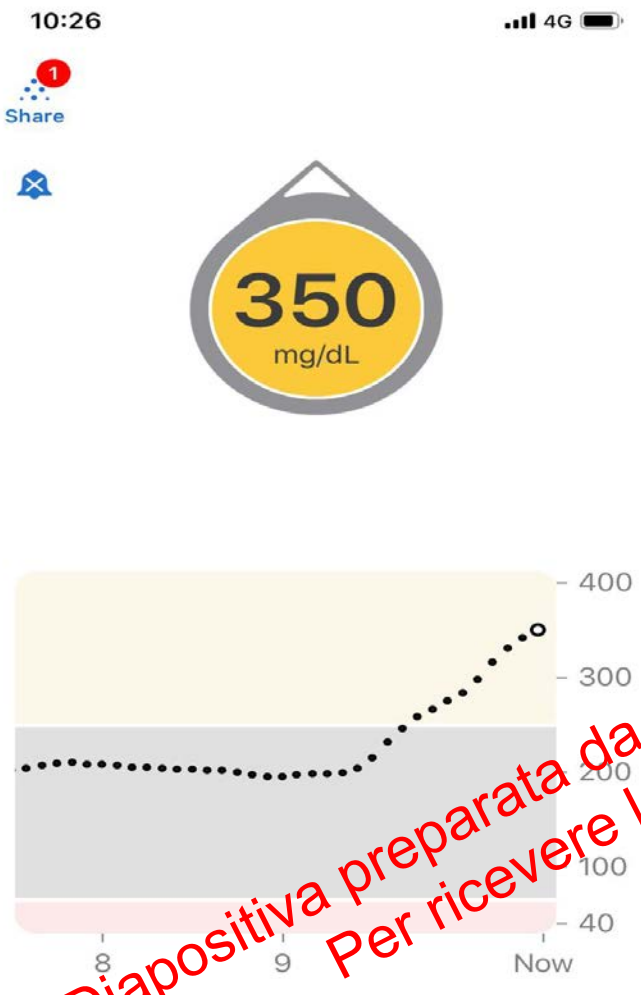
ADI-AMD-SID, 2014; Augustin et al, 2015; Linee guida SID-AMD 2018

Sofia: il risveglio prima della scuola



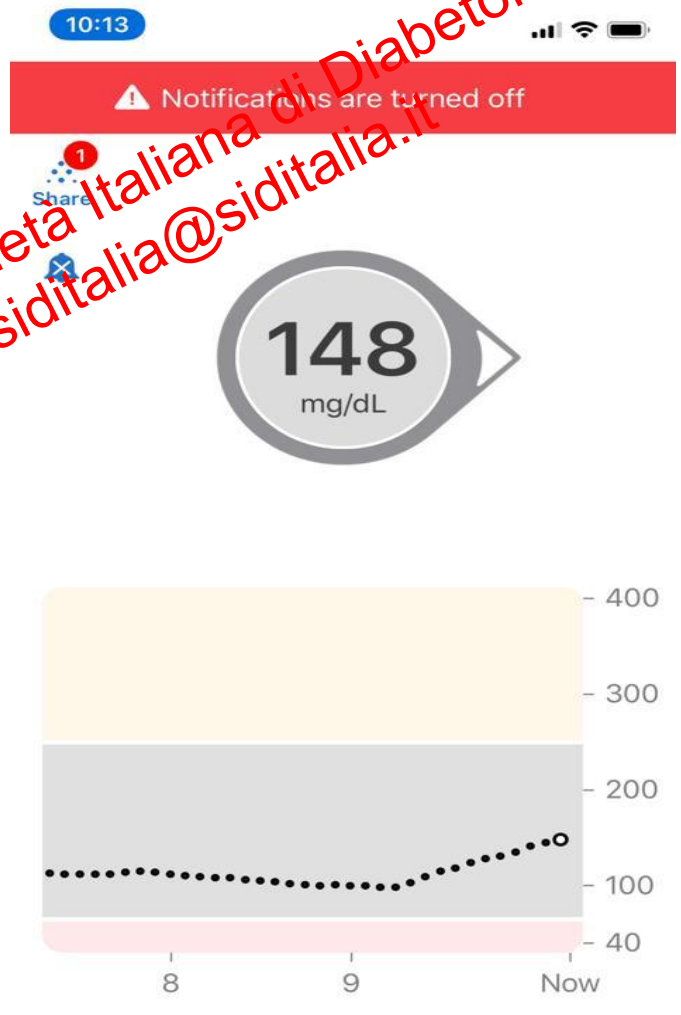
Breakfast meal-time insulin has a dual task in dealing with the breakfast calorie load and correcting “relative” basal hypoinsulinaemia (i.e. higher insulin requirements at dawn)

Lorenzo



16 U di glargine 100
5 U di Lispro 15’ prima di colazione

L’iperglicemia persiste fino al pranzo, nonostante correzione



17 U di Glargine 100
5 U di Faster Aspart 15’ prima di colazione