XX CONGRESSO NAZIONALE AMD
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La terapia insulinica in corso di nutrizione enterale

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FATTORI CHE INFLUENZANO L'ANDAMENTO GLICEMICO IN DIABETICI CHE RICEVONO NE

- Composizione della dieta-formula e quantità somministrata
- Modalità di somministrazione (continua, in boli, ciclica)

FATTORI CHE INFLUENZANO L'ANDAMENTO GLICEMICO IN DIABETICI CHE RICEVONO NE

- Composizione della dieta-formula e quantità somministrata

Reviews/Commentaries/ADA Statements
REVIEW ARTICLE

Enteral Nutritional Support and Use of Diabetes-Specific Formulas for Patients With Diabetes

A systematic review and meta-analysis

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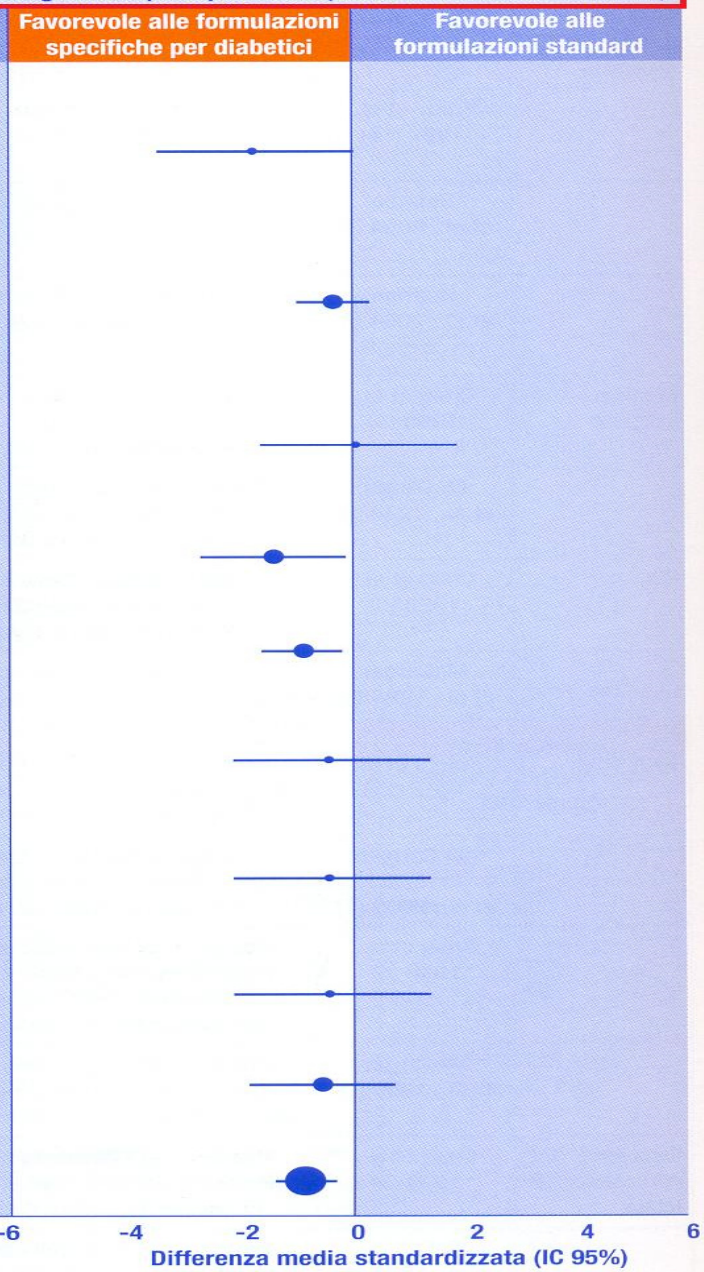
(Diabetes Care 28: 2267-2279, 2005.)

Sono stati valutati 23 studi dei quali 16 condotti in T2DM; 4 in T1DM; 1 in entrambi i tipi di diabete; 2 in pazienti con iperglicemia da stress. La maggior parte degli studi ha confrontato fra di loro formule standard con formule specifiche per diabetici (iperlipidiche con elevato contenuto di MUFA, ridotto apporto di CHO, iperproteiche, con fibre, fruttosio, antiossidanti) che sono state somministrate per os come integratori o per SNG.

13 studi erano di breve durata (< 24 h) e hanno valutato solo integratori, i rimanenti sono durati da 6 giorni a 3 mesi e hanno valutato sia integratori, sia diete-formula somministrate per SNG.

Incremento della glicemia post-prandiale (tutti trial clinici randomizzati)

Studio	Confronto (durata dello studio)	Dimensioni dello studio	Effetto (IC 95%)
Peters et al., 1989 (11)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	10 (10:10)	-1,87 (da -2,94 a -0,8)
Sanz-Paris et al., 1998 (3)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (fruttosio, fibre) (insulina, breve termine, somministrazione orale)	40 (20:20)	-0,16 (da -0,78 a 0,46)
Sanz-Paris et al., 1998 (3)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (fruttosio, fibre) (sulfanilurea, breve termine, somministrazione orale)	12 (7:5)	0,04 (da -1,1 a 1,19)
del Carmen Crespillo et al., 2003 (4)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	11 (11:11)	-1,63 (da -2,6 a -0,65)
Metanalisi formulazioni specifiche per diabetici vs formulazioni standard (solo breve termine) Test per eterogeneità Q test 14.203, 3df, p=0,003			-0,71 (da -1,14 a -0,27)*
Craig et al., 1998 (5)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (fibre) (lungo termine, sonda)	34 (14:13)	-0,38 (da -1,15 a 0,38)
McCargar et al., 1998 (6)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (fibre) (lungo termine, somministrazione orale)	34 (16:16)	-0,4 (da -1,1 a 0,3)
Mesejo et al., 2003 (7)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (fibre) (lungo termine, sonda)	61 (26:24)	-0,38 (da -0,94 a 0,18)
Metanalisi formulazioni specifiche per diabetici vs formulazioni standard (solo lungo termine) Test per eterogeneità Q test 1,065, 2df, p=0,587			-0,38 (da -0,76 a 0)¶
Metanalisi formulazioni specifiche per diabetici vs formulazioni standard (tutti gli studi) Test per eterogeneità Q test 16,253, 6df, p=0,012			-0,52 (da -0,81 a -0,24)†



Analisi basata sui risultati relativi alle variazioni rispetto al basale
*Le formulazioni specifiche per diabetici hanno ridotto l'incremento della glicemia post-prandiale di 1,18 mmol/l (IC 95% 0,54-1,73) (Studi a breve termine)
¶Le formulazioni specifiche per diabetici hanno ridotto l'incremento della glicemia post-prandiale di 0,69 mmol/l (IC 95% 0,10-1,49) (Studi a lungo termine)
†Le formulazioni specifiche per diabetici hanno ridotto l'incremento della glicemia post-prandiale di 1,03 mmol/l (IC 95% 0,58-1,47) (Tutti gli studi)
Breve termine: pasto singolo o alimentazione continua con follow-up <24 h - Lungo termine: follow-up tra 5 giorni e 3 mesi

Picco glicemico (tutti trial clinici randomizzati)

Studio	Confronto (durata dello studio)	Dimensioni dello studio	Effetto (IC 95%)	Favorevole alle formulazioni specifiche per diabetici	Favorevole alle formulazioni standard
Hofman et al., 2004 (8)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, sonda)	12 (12:12)	-1,23 (da -2,11 a -0,35)		
Hofman et al., 2004 (8)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	10 (10:10)	-1,35 (da -2,33 a -0,37)		
Metanalisi formulazioni specifiche per diabetici vs formulazioni standard (tutti gli studi) Test per eterogeneità Q test 0,071, 1df, p=0,79			-1,28 (da -1,94 a -0,63)*		

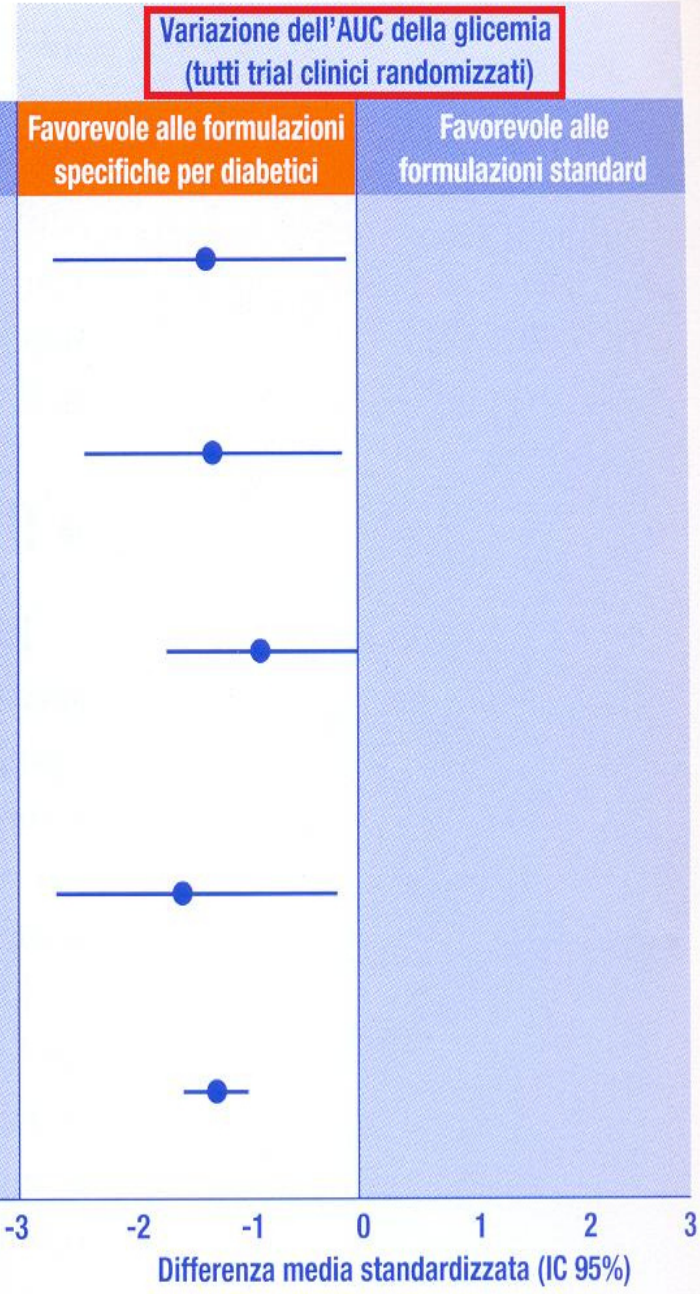
Analisi basata sui risultati relativi al picco glicemico

*Le formulazioni specifiche per diabetici hanno ridotto il picco glicemico di 1,59 mmol/l (IC 95% 0,86-2,32)

Breve termine: pasto singolo o alimentazione continua con follow-up <24 h

Variazione dell'AUC della glicemia (tutti trial clinici randomizzati)

Studio	Confronto (durata dello studio)	Dimensioni dello studio	Effetto (IC 95%)
Golay et al., 1995 (9)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	6 (6:6)	-1,38 (da -2,67 a -0,1)
Printz et al., 1997 (10)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	10 (10:10)	-1,22 (da -2,18 a -0,26)
Hofman et al., 2004 (8)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, sonda)	12 (12:12)	-0,89 (da -1,73 a -0,05)
Hofman et al., 2004 (8)	Formulazioni specifiche per diabetici (elevato contenuto di ac. grassi monoinsaturi, fruttosio, fibre) vs formulazioni standard (breve termine, somministrazione orale)	10 (10:10)	-1,48 (da -2,46 a-0,47)
Metanalisi formulazioni specifiche per diabetici vs formulazioni standard (tutti gli studi) Test per eterogeneità Q test 21,230, 3df, p<0,00			-1,19 (da -1,69 a -0,7)*



Analisi basata sui risultati relativi alle variazioni rispetto al basale

*Le formulazioni specifiche per diabetici hanno ridotto l'AUC della glicemia di 7,96 mmol/l (IC 95% 2,25-13,66)

Breve termine: pasto singolo o alimentazione continua con follow-up <24 h

FABBISOGNO DELLA TERAPIA IPOGLICEMIZZANTE, COMPLICAZIONI, MORTALITA'

L'utilizzo di diete-formula patologia specifiche rispetto a diete-formula standard determina:

- Riduzione del fabbisogno insulinico per il mantenimento del target glicemico
- Non differenze per quanto riguarda l'evenienza di ipoglicemie
- Minore incidenza di I.V.U., polmonite, iperpiressia
- Non differenze per quanto riguarda la mortalità

Per la NE nel diabetico, l'utilizzo di diete-formula patologia specifiche è associato con un migliore equilibrio glicometabolico rispetto a quello ottenibile con diete-formula standard. L'utilizzo di diete-formula patologia specifiche, infatti, si associa a:

- minore incremento della glicemia postprandiale: - 18 mg/dL (CI: 9-26 mg/dL);
- più basso picco glicemico: - 29 mg/dL (CI: 15-42 mg/dL);
- ridotta AUC glicemica.

FATTORI CHE INFLUENZANO L'ANDAMENTO GLICEMICO IN DIABETICI CHE RICEVONO NE

- Modalità di somministrazione (continua, in boli, ciclica)

TERAPIA INSULINICA E NUTRIZIONE ENTERALE CONTINUA

Clinical Observation

Evaluation of Glycemic Control Using NPH Insulin Sliding Scale Versus Insulin Aspart Sliding Scale in Continuously Tube-Fed Patients

Nutrition in Clinical Practice
Volume 24 Number 6
December/January 2009 718-722

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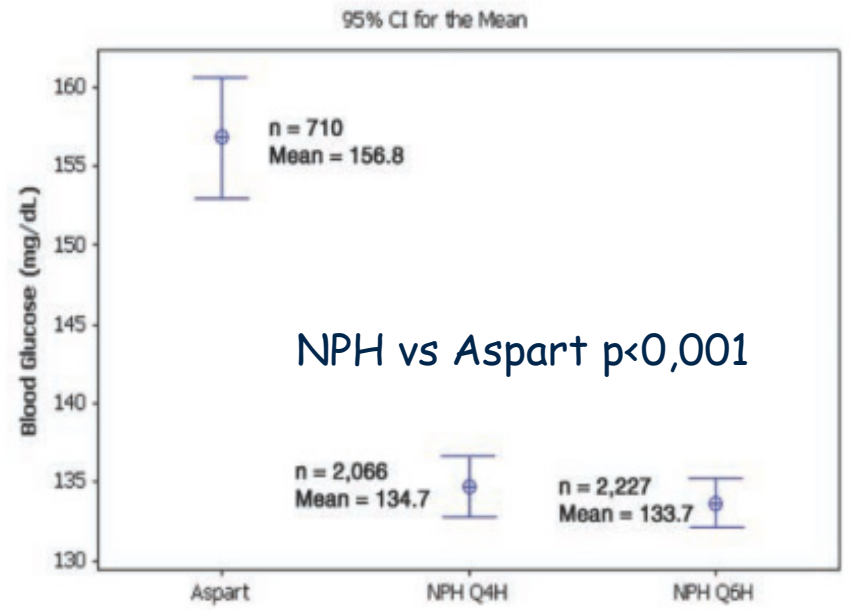

Figure 1. Mean blood glucose values in enterally fed patients receiving nutrition.

Table 4. Achievement of Blood Glucose Values in Target Range in Enterally Fed Patients Receiving Insulin

Insulin	No. of Blood Glucose Values/Total (%)
Aspart	93/710 (13)
NPH every 4 h	520/2,066 (25)
NPH every 6 h	524/2,227 (24)

NPH vs Asp p<0,001

NPH, neutral protamine Hagedorn.

TR: 80-110 mg/dL

Table 5. Achievement of Blood Glucose Values in Acceptable Range in Enterally Fed Patients Receiving Insulin

Insulin	No. of Blood Glucose Values/Total (%)
Aspart	524/710 (74)
NPH every 4 h	1,745/2,066 (84)
NPH every 6 h	1,942/2,227 (87)

NPH vs Asp p<0,001

NPH, neutral protamine Hagedorn.

AR: 60-180 mg/dL

Clinical Observation

Comparison of 70/30 Biphasic Insulin With Glargine/Lispro Regimen in Non–Critically Ill Diabetic Patients on Continuous Enteral Nutrition Therapy

Nutrition in Clinical Practice
Volume 26 Number 6
December 2011 714-717

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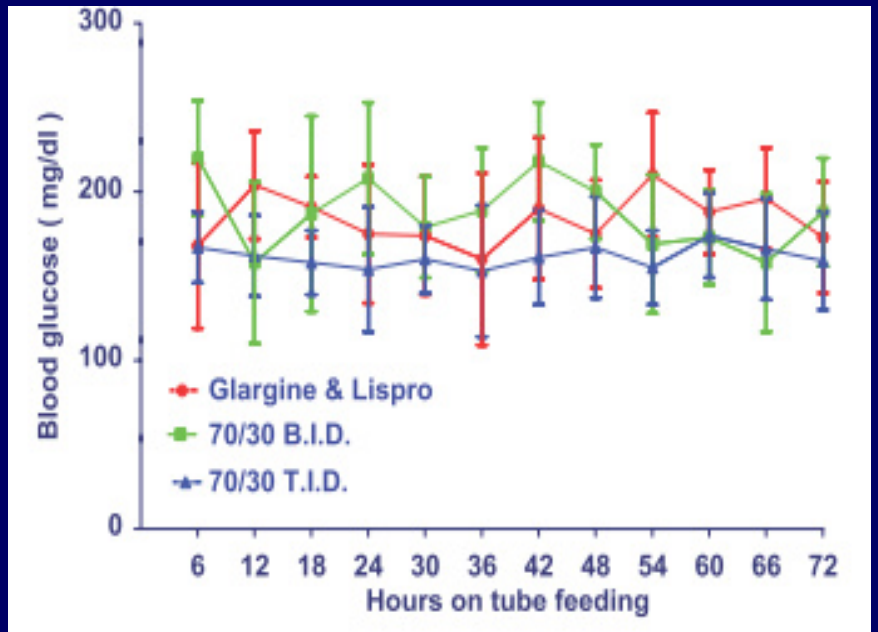

Figure 1. Glycemic control in diabetic patients receiving continuous enteral nutrition therapy for 72 hours. Results are expressed as mean ± SD.

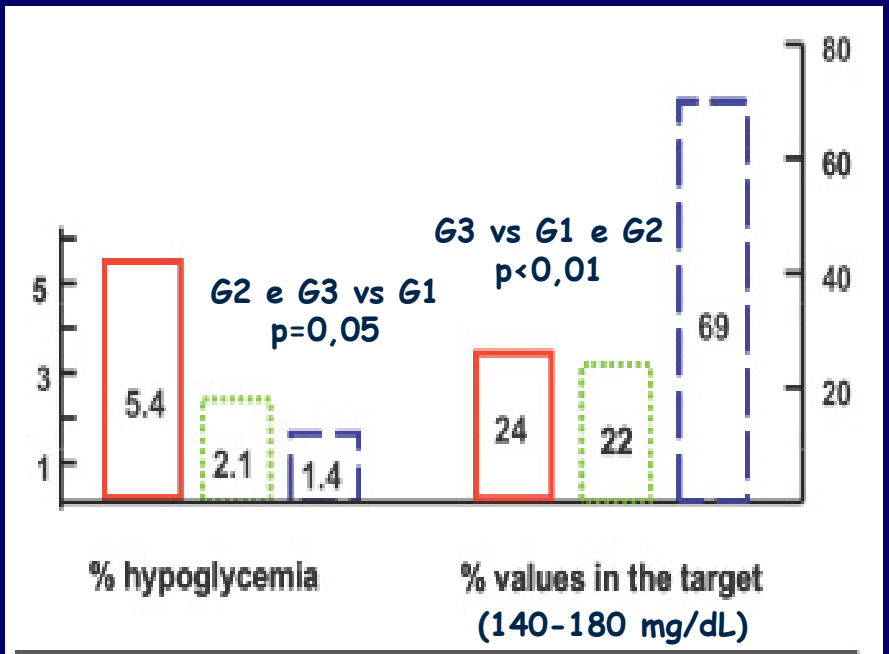

Figure 2. Percentage of hypoglycemic values and values in the target range in group 1 (red, solid line), group 2 (green, dotted line), and group 3 (blue, dashed line).

Insulin Glargine in Continuous Enteric Tube Feeding

In comparison with the traditional long-acting insulins, i.e., NPH and Ultralente (1–3), insulin glargine, a novel insulin analogue has been documented to decrease the number of hypoglycemic episodes while achieving an adequate glycemic control. The decline in hypoglycemic events, especially nocturnal, is attributed to the ability of insulin glargine to attain a steady-state plasma insulin concentration without a peak for ~24 h on a subcutaneous (SC) administration of a single dose (4). Therefore, insulin glargine may achieve an effect similar to that obtained by continuous intravenous (IV) or SC infusion of regular insulin in subjects requiring continuous enteral or parenteral alimentation. However, documentation of the use of glargine in similar circumstances is lacking. In this article, we studied a subject in whom insulin glargine monotherapy attained and maintained desirable glycemic control while receiving continuous enteral feeding.

Letters

R.A., a 60-year-old white man with type 2 diabetes of 2 years' duration, underwent radical surgery and was receiving radiation therapy for management of a squammous cell carcinoma of the oral cavity. Postoperatively, he manifested recurrent aspiration on several attempts at oral feeding and therefore was being administered continuous enteral tube feeding. His HbA_1 before surgery was 7.5% with capillary blood glucose readings between 180 and 250 mg/dl (10–14 mmol/l). It was determined that the subject would require enteral nutritional support for a prolonged period of time, even after discharge from the hospital within a week after surgery. Therefore, due to ease of administration, SC insulin glargine was initiated with 24 units at 9:00 P.M. instead of continuous IV or SC infusion administration. The dose of insulin glargine was gradually increased by 2–4 units at intervals of 3 days (even at home via telephone counseling) to attain blood sugars between 100 and 140 mg/dl (5.6–7.8 mmol/l) determined at 6-h intervals. Within 3 weeks, the optimal glycemic control, between 80 and 140 mg/dl, as reflected by most home blood glucose readings, was achieved with 45 units insulin glargine. There was no single hypoglycemic event during the period. The same insulin dose continued for the next 3 months while monitoring blood glucose levels. The maintenance of optimal glycemic control was further confirmed by an HbA_1 concentration of 6.1% at 6 months.

This case study illustrates that SC administration of insulin glargine is able to attain and maintain desirable glycemic control in subjects who require continuous enteral (or parenteral) alimentation without inducement of hypoglycemia. This beneficial effect could be attributed to its unique profile of achieving steady, peakless insulin concentrations. Therefore, it could replace IV or SC continuous infusion of regular insulin during hospitalization, especially on the general ward, and at home because of its ease of administration and convenience.

DARCY PUTZ, MD
UDAYA M. KABADI, MD

Diabetes Care, 2002

Acta Diabetol (2005) 42:182–186
DOI 10.1007/s00592-005-0200-4

ORIGINAL

G. Fatati · E. Mirri · S. Del Tosto · M. Palazzi · A.L. Vendetti · R. Mattei · A. Puxeddu

Use of insulin glargine in patients with hyperglycaemia receiving artificial nutrition

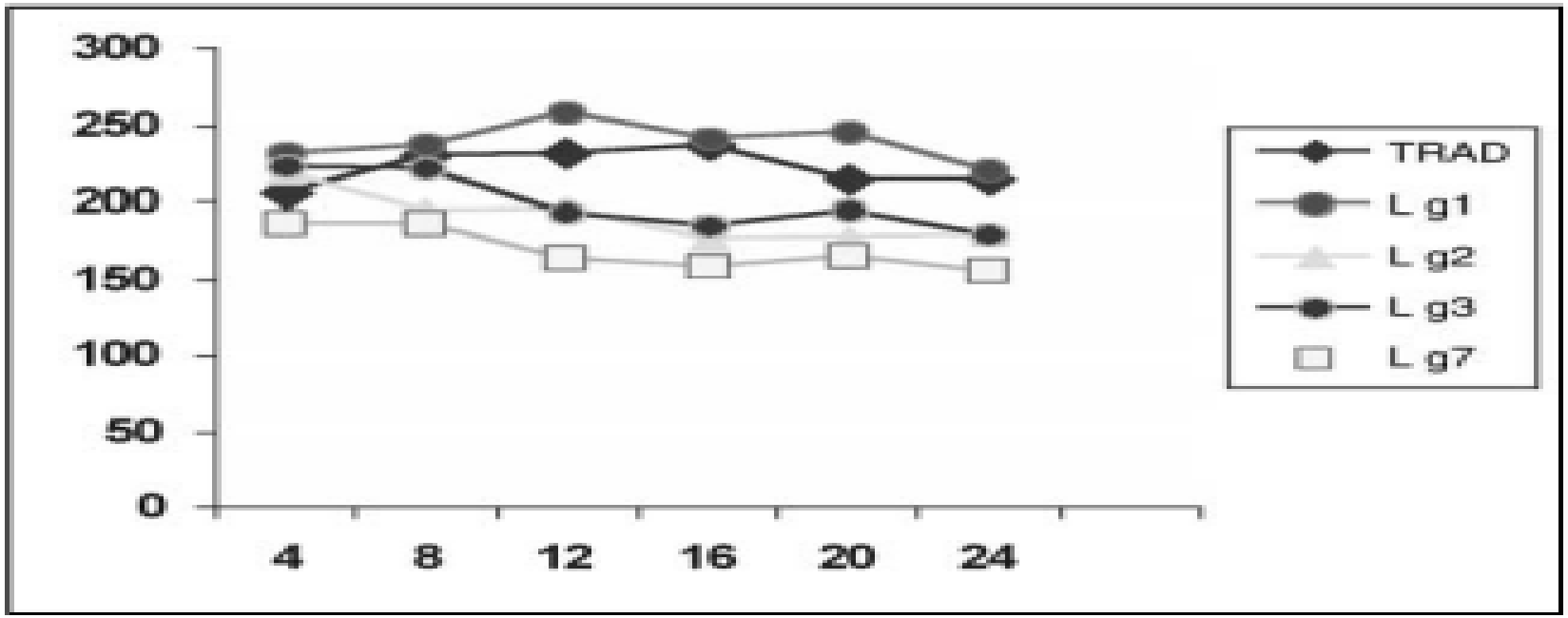

Fig. 1 Mean glycaemic values in EN patients. *Trad*, mean 3 preceding days; *Lg1*, 1st day glargine; *Lg2*, 2nd day glargine; *Lg3*, 3rd day glargine; *Lg7*, 7th day glargine

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DIABETES RESEARCH AND CLINICAL PRACTICE

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www.elsevier.com/locate/diabres

Correspondence

Insulin glargine in enteric tube feeding

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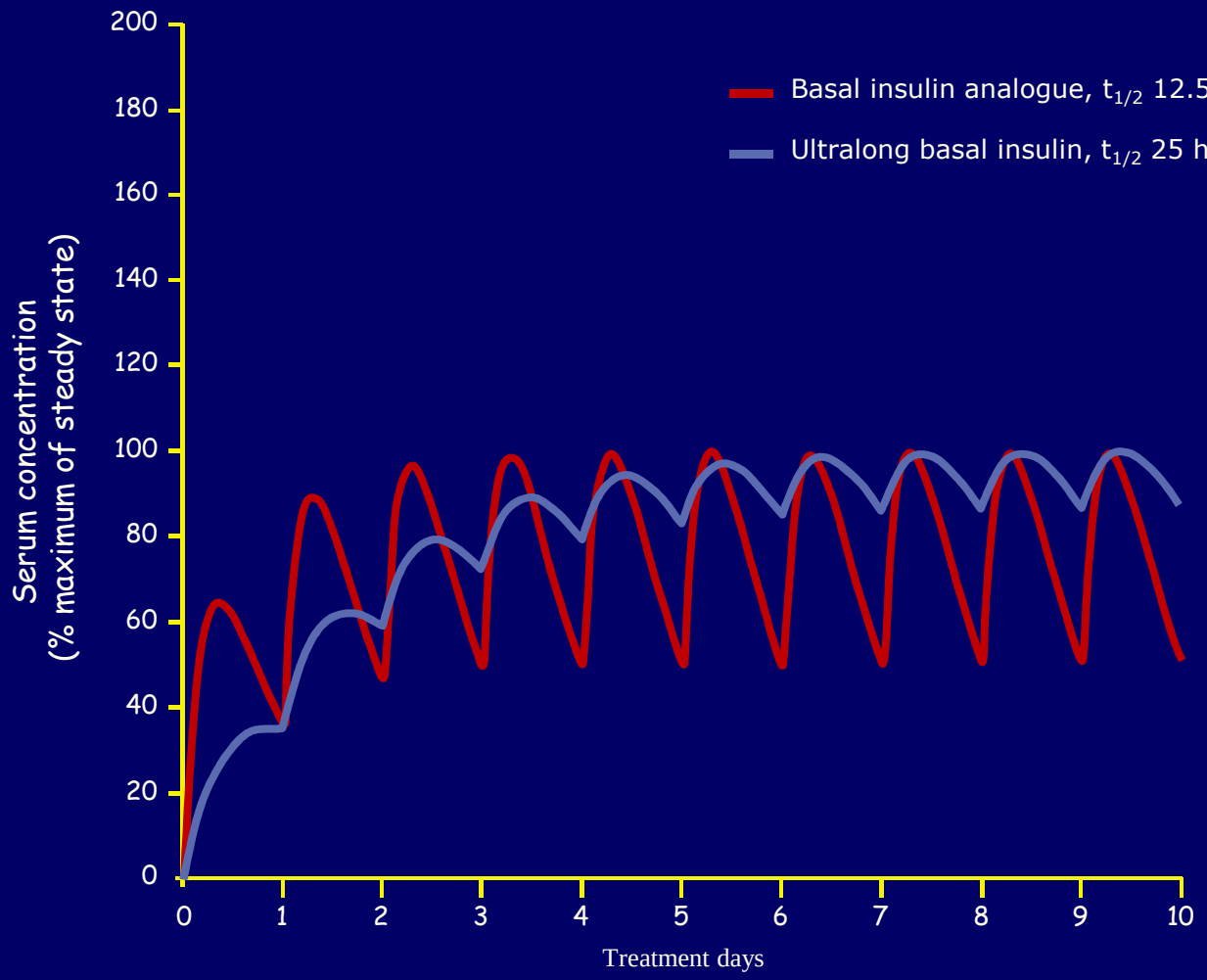
This case study supports the use of once-daily insulin glargine as a safe and effective treatment option for an elderly patient with significant neurological disabilities and limited medical and nursing assistance. The patient remained asymptomatic and with a quality of life consistent with living at home with her family, without experiencing troublesome and dangerous hypoglycaemic episodes.

Basal insulin with an ultra-long duration of action: flatter profile in steady-state



TERAPIA INSULINICA

NUTRIZIONE ENTERALE CONTINUA

- Insulina NPH in multidose
- Insulina premiscelata in multidose
- Analogo a lunga durata di azione (glargine) in monosomministrazione + eventuale correzione estemporanea con analoghi rapidi
- Analogo a ultralunga durata di azione in monosomministrazione + insulina premiscelata fino alla titolazione della NE (almeno 72 ore) che corrisponde al raggiungimento dello steady state di tale insulina

TERAPIA INSULINICA E NUTRIZIONE ENTERALE IN BOLI

Clinical Research

A Pilot Study to Evaluate the Effectiveness of Glargine and Multiple Injections of Lispro in Patients With Type 2 Diabetes Receiving Tube Feedings in a Cardiovascular Intensive Care Unit

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*Barnes Jewish College of Nursing and Allied Health, St. Louis, Missouri; and †Washington University, St. Louis, Missouri

0884-5336/07/2205-0545$03.00/0
Nutrition in Clinical Practice 22:545–552, October 2007

N.E.: boli ogni 4 ore
Glicemia prima di ogni bolo
Target glicemico: 80-140 mg/dL
Insulina: Lispro (prima di ogni bolo): BMI<30 - 1 U.I./15 g CHO
BMI≥30 - 1 U.I./10 g CHO
Insulina Glargine in dose fissa (h20): BMI<30 - 10 U.I.
BMI≥30 - 20 U.I.

CICU Glycemic Management Research Protocol
Weight

*IRB approval Number*_____

Patient Identification Number_____

I. Tube-feedings will be given every 4 hours, 6 times each day.

II. Blood sugars will be checked before each tube feed (q 4 hrs).

III. Glargine Baseline will be given every evening. DO NOT HOLD IF NPO.

IV. Lispro - The "lispro baseline" and Sliding Scale Insulin (SSI) is to be given according to the sliding scale directions. Follow the SSI appropriate to the patient's weight.

* **After 2 blood sugars>200 mg/dL,** increase the lispro baseline by 3 units. Continue to do so until all blood sugars are <200 mg/dL.

** **After 2 blood sugars <80 mg/dL,** decrease the lispro baseline by 3 units. Do not decrease the lispro baseline below the starting dose of _____units. If the blood sugars continue to be <80 mg/dL, call the House Officer.

Starting Lispro baseline:_____ units _____(Date) _____(RD initials)

Date	Lispro baseline changed to:_____units	RN initials
	Lispro baseline changed to:_____units	
	Lispro baseline changed to:_____units	
	Lispro baseline changed to:_____units	

Figure 1. Insulin protocol.

Sliding scale lispro insulin protocol

For serum glucose level ≤100 mg/dL, give lispro after tube feeding started.

For serum glucose level >100 mg/dL, give lispro at the time of the tube feeding.

Glucose Value	For patients <60 kg	For patients 60-90 kg	For patients >90 kg
< 70 mg/dL	½ amp D50 and re-check blood glucose in 20 minutes. Call the House Officer,	½ amp D50 and re-check blood glucose in 20 minutes. Call the House Officer,	½ amp D50 and re-check blood glucose in 20 minutes. Call the House Officer,
71 – 79 mg/dL*	½ lispro baseline	½ lispro baseline	½ lispro baseline
80 – 100 mg/dL	lispro baseline	lispro baseline	lispro baseline
101-140 mg/dL	lispro baseline	lispro baseline	lispro baseline
141-170 mg/dL	1 unit lispro + lispro baseline	2 unit lispro + lispro baseline	3 units lispro + lispro baseline
171-200 mg/dL	2 units lispro + lispro baseline	4 units lispro + lispro baseline	6 units lispro + lispro baseline
201-230 mg/dL**	3 units lispro + lispro baseline	6 units lispro + lispro baseline	9 units lispro + lispro baseline
231-260 mg/dL	4 units lispro + lispro baseline	8 units lispro + lispro baseline	12 units lispro + lispro baseline
261-290 mg/dL	5 units lispro + lispro baseline	10 units lispro + lispro baseline	15 units lispro + lispro baseline
291-320 mg/dL	6 units lispro + lispro baseline	12 units lispro + lispro baseline	18 units lispro + lispro baseline
321-350 mg/dL	7 units lispro + lispro baseline	14 units lispro + lispro baseline	21 units lispro + lispro baseline
351- 380 mg/dL	8 units lispro + lispro baseline	16 units lispro + lispro baseline	24 units lispro + lispro baseline
381-400 mg/dL	9 units lispro + lispro baseline	18 units lispro + lispro baseline	27 units lispro + lispro baseline
> 400 mg/dL	Call the House Officer	Call the House Officer	Call the House Officer

* **After 2 blood sugars>200 mg/dL,** increase the lispro baseline by 3 units. Continue to do so until all blood sugars are <200 mg/dL.

** **After 2 blood sugars <80 mg/dL,** decrease the lispro baseline by 3 units. Do not decrease the lispro baseline below the starting dose of _____units. If the blood sugars continue to be <80 mg/dL, call the House Officer.

Figure 2. Sliding scale lispro insulin protocol.

Table 3
Blood sugar control for each population

Blood sugar	Retrospective population (n = 24)	Protocol population (n = 28)	*p* Value
Mean blood sugar	225.1 ± 72 mg/dL	148.9 ± 51 mg/dL	<.0001
≤79 mg/dL	12 (1.7%)	49 (4.14%)	.02
80–140 mg/dL	58 (8.3%)	576 (48.60%)	.01
≥141 mg/dL	632 (90%)	559 (47.20%)	<.0001

Table 4
Blood sugar control for patients receiving corticosteroids

Blood sugar	Retrospective population (n = 7)	Protocol population (n = 17)	*p* Value
Mean blood sugar	224.6 ± 73 mg/dL	150.8 ± 88 mg/dL	<.0001
≤79 mg/dL	11 (3.5%)	32 (4.7%)	.0223
80–140 mg/dL	34 (10.9%)	367 (53.7%)	.5372
≥141 mg/dL	266 (85.5%)	284 (41.6%)	<.0001

DIABETES RESEARCH AND CLINICAL PRACTICE 103 (2014) 426–429

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

Glycaemic control in insulin requiring diabetes patients receiving exclusive enteral tube feeding in an acute hospital setting

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- NE x 20 ore + insulina premiscelata (30/70) all'inizio della nutrizione
- NE somministrata in 3 boli di 4 ore ciascuno + analogo rapido prima di ogni bolo e analogo lento (Glargine) alla sera
- NE continua + analogo lento (1 o 2 dosi/die)

Table 1 – Comparison of demographic data and measures of glucose control for the three study groups.

	20 h feed group ($n = 18$)	Intermittent feed group ($n = 13$)	Continuous feed group ($n = 15$)	
Sex	10 m 8 f	8 m 5 f	9 m 6 f	
Age (years) (SD)	77 (8)	70 (15)	67 (12)	
BMI (kg/m^2) (SD)	Not available	27 (3)	27 (6)	
Diabetes type	Type 2 $n = 16$ Type1 $n = 1$ Post pancreatectomy $n = 1$	Type 2 $n = 11$ Type 1 $n = 1$ Post pancreatectomy $n = 1$	Type 2 $n = 11$ Type 1 $n = 4$	
Previous diabetes treatment	Oral hypoglycaemic agent $n = 2$ Insulin $n = 15$ New diagnosis $n = 1$	Oral hypoglycaemic agent $n = 8$ Insulin $n = 3$ New diagnosis $n = 2$	Oral hypoglycaemic agent $n = 6$ Insulin $n = 8$ Diet $n = 1$	
Outcome	Discharge $n = 15$ Hospital mortality $n = 3$	Discharge $n = 4$ Progress to diet $n = 5$ Hospital mortality $n = 4$	Discharge $n = 1$ Progress to diet $n = 9$ Hospital mortality $n = 5$	
				p For difference across groups
Mean glucose during feed mmol/L (SD)	12.6 (5.4)	12.5 (4.2)	12.1 (5.0)	0.465
Mean glucose between feed mmol/L (SD)	10.6 (4.2)	10.1 (4.1)	–	0.271
% Hypoglycaemia during feed (SD)	4 (13)	0	7 (13)	0.004
% Hypoglycaemia between feed (SD)	14 (36)	5 (7)	–	0.069
Daily glucose variability expressed as standard deviation (SD)	3.1 (1.6)	4.1 (1.6)	4.2 (2.0)	0.164

Murphy, 2014

TERAPIA INSULINICA

NUTRIZIONE ENTERALE IN BOLI

- Schema basal-bolus

TERAPIA INSULINICA E NUTRIZIONE ENTERALE CICLICA (diurna o notturna)

- Insulina NPH + piccola dose di analogo rapido
- Insulina premiscelata

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Raccomandazioni sul trattamento insulinico in Nutrizione Artificiale

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NUTRIZIONE ENTERALE E TRATTAMENTO INSULINICO

R: Il trattamento insulinico deve essere scelto in relazione alle modalità di somministrazione della NE. Livello di Prova V, Forza B

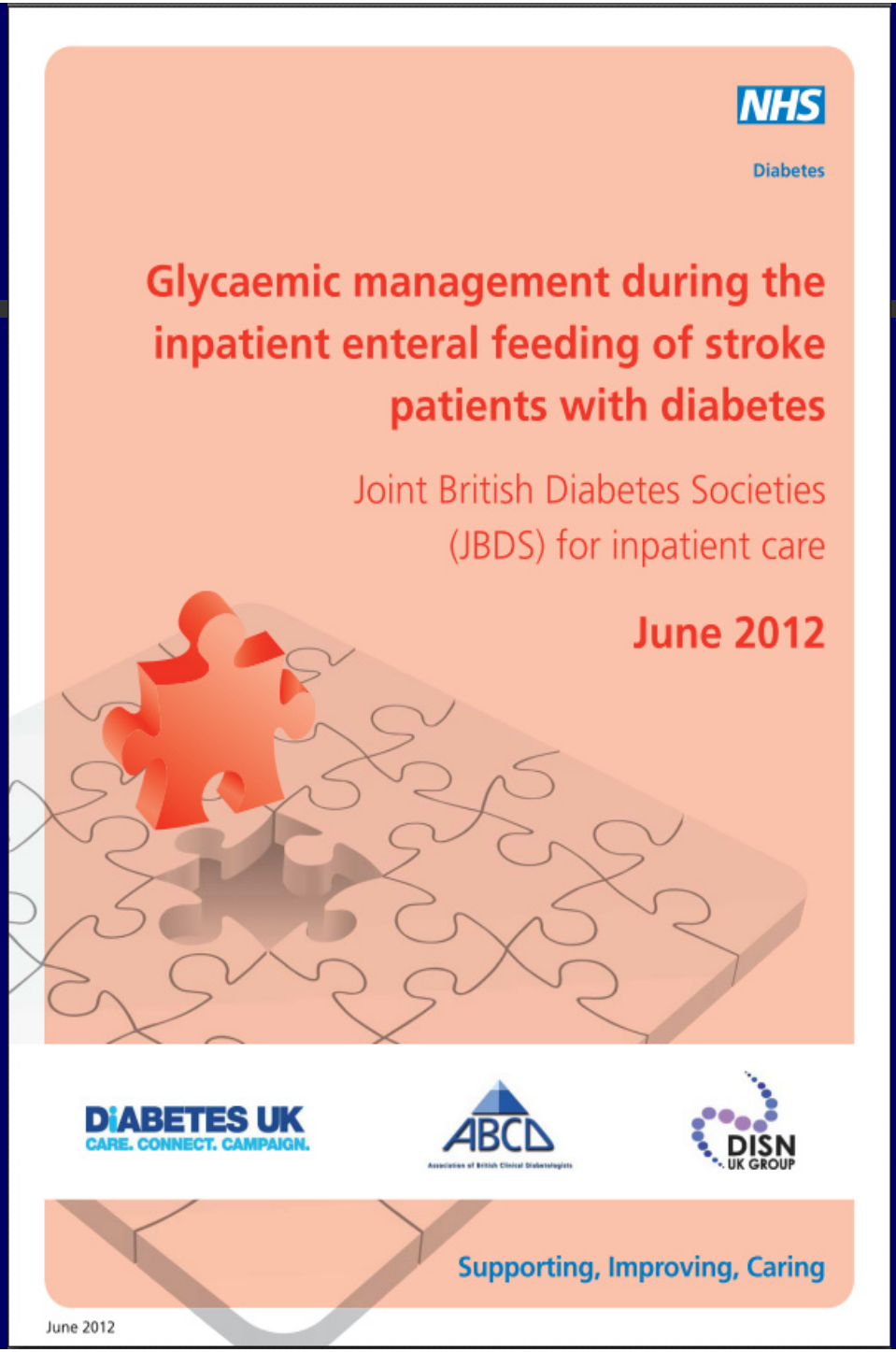
R: Se le miscele per NE vengono somministrate in continuo può essere utilizzato un analogo a lunga durata d'azione sottocute per correggere l'iperglicemia. Livello di Prova V, Forza B

R: In caso di NE ciclica che preveda un tempo di 10-12 ore, come quella notturna, è utilizzabile insulina ad azione intermedia con una piccola dose di insulina rapida. Livello di Prova V, Forza B

R: Se si utilizza una metodica intermittente deve essere utilizzato uno schema insulinico con boli o basal bolus. Livello di Prova V, Forza B

K: La somministrazione in continuo a basso flusso delle miscele per la NE è preferibile anche nelle persone con iperglicemia.

K: L'utilizzo di una pompa peristaltica riduce al minimo i rischi delle oscillazioni glicemiche.



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Summary of recommendations

- Premixed human insulin at start and midpoint of feed, or isophane insulin at start and, if necessary, the midpoint of feed are recommended first line options for glycaemic management of patients with poorly controlled type 2 diabetes during enteral feeding.
- Administration of soluble human insulin at the time of feed commencement is recommended for a bolus feeding regimen. For those patients prescribed Glargine or Detemir on admission to hospital and receiving continuous feeding with CBG>12 mmol/l, soluble human insulin may be administered at the start and, if necessary, midpoint of the feed.

Table 1

Giving insulin to a patient with type 1 diabetes

• Factors to consider – Age Type of insulin regimen Level of usual diabetes control Type and duration of feed
• Continue subcutaneous basal analogue insulin if VRIII utilised at any point
• If patient receiving VRIII, when VRIII to be stopped, continue subcutaneous basal analogue insulin and titrate accordingly
• If hyperglycaemia persists during feeding consider splitting basal analogue insulin if feed continuous, or the addition of human soluble or rapid-acting analogue insulin at start of feed and at six hourly intervals making sure to avoid rest period
• If hyperglycaemia persists during bolus feed give human soluble insulin or rapid-acting analogue insulin with feed bolus
• Monitor regularly - if patient experiences hypoglycaemia during rest period patient may require a reduction in the basal insulin dose

VRIII: variable rate intravenous insulin infusion

Appendix 2 –

Calculating the insulin dose according to a weight based equation

Below is an example of a locally-used formula to calculate insulin dose from carbohydrate content of feed and rate of feed administration[35].

1. **Calculating the initial insulin requirement and dose**

Before we can attempt to calculate the initial insulin requirement for patients starting on enteral feeding a few points and calculations must first be taken into account.

a. **Total carbohydrate intake from enteral feed**
That is the total carbohydrate intake expected from the enteral feed over the **duration of feed** (e.g. 16, 20, 24 hrs). This is calculated as:

[Infusion rate (ml/hour)] x [carbohydrate content (g/100 ml)] x [duration of feeding] ÷100

b. **Carbohydrate-to-insulin ratio (CIR)**
This is how many grams of carbohydrate/glucose are covered by 1 unit of insulin. The blood glucose rise from enteral feeds is much more than would occur for normal meals: therefore, 1 unit of insulin will cover less of a carbohydrate load.

i. If not usually on insulin use a CIR value of 10.

ii. If usual **Total Daily Insulin Dose (TDID)** less than 40 units use a value of **8**.

iii. If usual **Total Daily Insulin Dose (TDID)** more than 40 units use a value of **6**.

c. **Daily nutritional insulin requirement**
This is the daily insulin required to cover the enteral feed over the duration of feeding (e.g. 16, 20, 24 hrs). This is calculated as:

[Total carbohydrate intake from feed] **divided by** [Carbohydrate-to-insulin ratio]

Appendix 2 –
Calculating the insulin dose according to a weight based equation

This number of units is then divided into to two doses: the first to be given at the start of the feed and the other given at the midpoint of the feed.

Example: Calculating insulin dose from cardohydrate feed content

Type 2 diabetes patient 68 kg. Not previously on insulin
Carbohydrate content of feed (g/100 ml) = 12.3
Intended infusion rate of enteral feed (ml/hour) = 75
Intended duration of feed (hrs per day) = 20

Not previously on insulin - therefore CIR = 10

$$\text{Total Humulin M3 dose} = \frac{12.3 \times 75 \times 20}{10 \times 100} = 18.45 \text{ units/24 hrs}$$

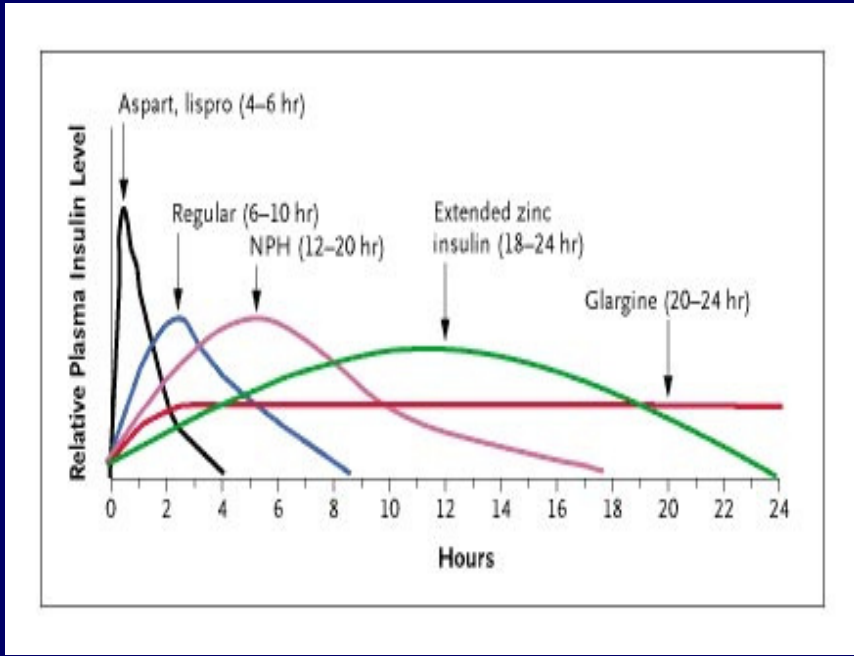
d. **Daily basal insulin requirement**

For patients with type 1 diabetes, with poor glycaemic control despite twice daily insulin, the patient may require additional basal insulin (e.g. Lantus or Levemir) to meet the basal glucose target levels. This daily basal insulin requirement may be roughly calculated as:

Daily basal insulin requirement = [Body weight] x [0.1 - 0.2 units/kg]

TERAPIA INSULINICA IN CORSO DI NUTRIZIONE ENTERALE

- In caso di somministrazione a flusso continuo, utilizzare analogo lento a lunga durata.
- In caso di somministrazione per boli ripetuti, utilizzare analogo rapido prima di ogni bolo + analogo lento a lunga durata (basal-bolus).
- In caso di somministrazione ciclica (diurna o notturna), utilizzare insulina NPH + analogo rapido o insulina premiscelata.



" Prima di venire qui ero confuso
su questo argomento.
Dopo la vostra lezione sono ancora
confuso, ma a un livello superiore."

Enrico Fermi

Grazie per l'attenzione