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Le sindromi ipoglicemiche, revisione della diagnosi e terapia

ElenaTortato
UOC Diabetologia
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Evaluation and Management of Adult Hypoglycemic Disorders: An Endocrine Society Clinical Practice Guideline

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Objective: The aim is to provide guidelines for the evaluation and management of adults with hypoglycemic disorders, including those with diabetes mellitus.

We recommend evaluation and management of hypoglycemia only in patients in whom Whipple's triad (1⊕⊕⊕⊕).

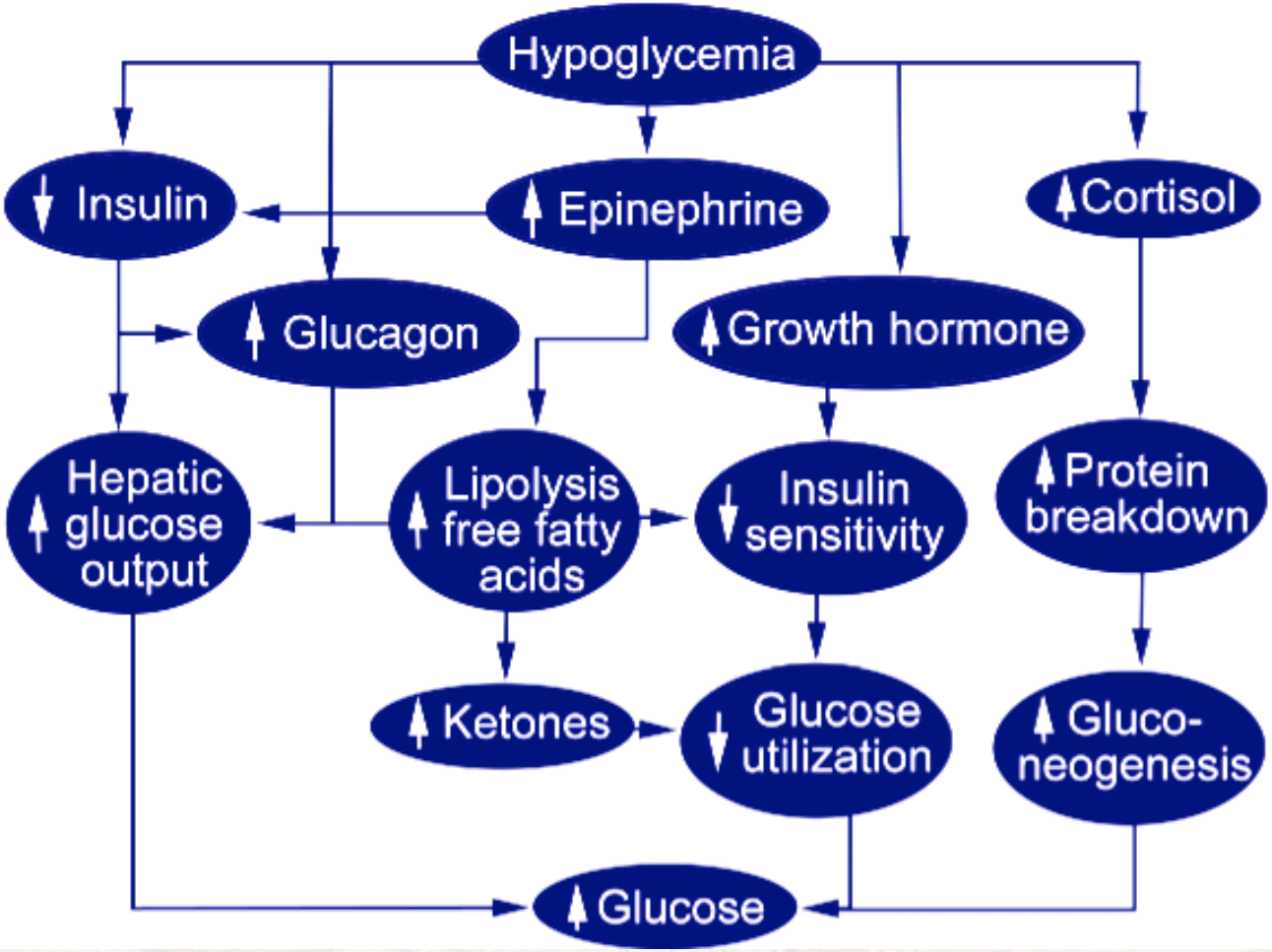
whom Whipple's triad—symptoms, signs, or both consistent with hypoglycemia, a low plasma glucose concentration, and resolution of those symptoms or signs after the plasma glucose concentration is raised—is documented. In patients with hypoglycemia without diabetes mellitus, we recommend the following strategy. First, pursue clinical clues to potential hypoglycemic etiologies—drugs, critical illnesses, hormone deficiencies, nonislet cell tumors. In the absence of these causes, the differential diagnosis narrows to accidental, surreptitious, or even malicious hypoglycemia or endogenous hyperinsulinism. In patients suspected of having endogenous hyperinsulinism, measure plasma glucose, insulin, C-peptide, proinsulin, β-hydroxybutyrate, and circulating oral hypoglycemic agents during an episode of hypoglycemia and measure insulin antibodies. Insulin or insulin secretagogue treatment of diabetes mellitus is the most common cause of hypoglycemia. We recommend the practice of hypoglycemia risk factor reduction—addressing the issue of hypoglycemia, applying the principles of intensive glycemic therapy, and considering both the conventional risk factors and those indicative of compromised defenses against falling plasma glucose concentrations—in persons with diabetes. (*J Clin Endocrinol Metab* 94: 709–728, 2009)

Allen Whipple(1881-1963)

Triade di Wipple

- Segni e Sintomi di ipoglicemia
- Riscontro di valori glicemici bassi
- Regressione dei sintomi dopo somministrazione di glucosio

Ipoglicemia



Pazienti senza diabete

IPOGLICEMIA :DEFINIZIONE

Riscontro di una concentrazione plasmatica di glucosio

< 55 mg/dl

Cryer P.E. JCM, 2009, 94:709-728

Pseudoipoglicemia

- Ritardata separazione del plasma dalla parte corpuscolata (glicolisi), provette senza inibitore della glicolisi
- Leucocitosi, eritrocitosi, leucemia

Segni e Sintomi dell'ipoglicemia

	Sintomi	Segni
Adrenergici	□ Palpitazioni □Tremore □ Ansia	□ Tachicardia □ Pallore □ Aumento della pressione arteriosa differenziale
Colinergici	□Sudorazione □Parestesie □ Fame	
Neuroglucopenici	□ Debolezza □ Cefalea □ Disturbi visivi □ Difficoltà di concentrazione □ Vertigini □ Agitazioe e irritabilità □ Disturbi cognitivi □ Visione offuscata	□ Ipotermia □ Deficit neurologici □ Convulsioni □ Coma

Persone senza diabete

- Il riscontro di un valore di glucosio plasmatico inequivocabilmente normale (>70 mg/dl) durante un episodio sintomatico, indica che i sintomi non sono d'attribuire all'ipoglicemia

Cryer P.E. JCM, 2009, 94:709-728

Classificazioni delle ipoglicemie

Ipoglicemia a digiuno
Insulinoma
Tumori extrapancreatici

one grave
ettore

Intolleranza al fruttosio
Ipersensibilità alla leucina

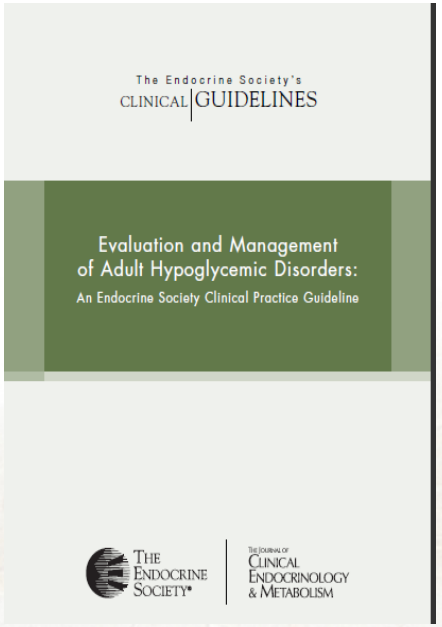


TABLE 1. Causes of hypoglycemia in adults

Ill or Medicated individual

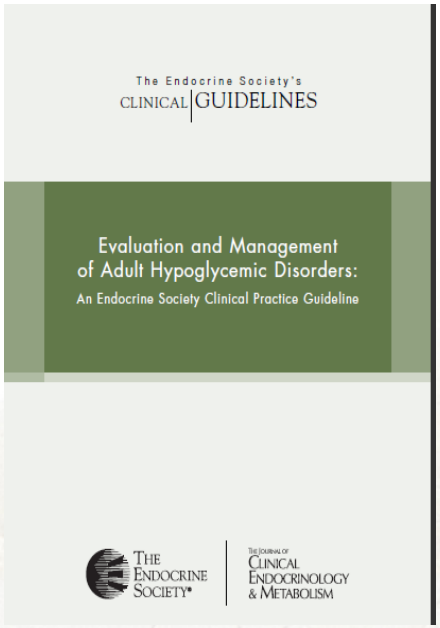
1. Drugs
   - Insulin or insulin secretagogue
   - Alcohol
   - Others (Table 2)
2. Critical illnesses
   - Hepatic, renal, or cardiac failure
   - Sepsis (including malaria)
   - Inanition
3. Hormone deficiency
   - Cortisol
   - Glucagon and epinephrine (in insulin-deficient diabetes mellitus)
4. Nonislet cell tumor

Seemingly well individual

- Insulinoma
- Functional β-cell disorders (nesidioblastosis)
  - Noninsulinoma pancreatogenous hypoglycemia
  - Post gastric bypass hypoglycemia
- Insulin autoimmune hypoglycemia
  - Antibody to insulin
  - Antibody to insulin receptor
- Insulin secretagogue
- Other

6. Accidental, surreptitious, or malicious hypoglycemia

Cryer P.E. JCM, 2009, 94:709-728



EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS

Alcool

- L'alcool inibisce la gluoneogenesi
- L'ipoglicemia indotta dall'alcool si presenta dopo 12-72 ore

Ill or Medicated individual

TABLE 2. Drugs other than antihyperglycemic agents and alcohol reported to cause hypoglycemia (24)

Moderate quality of evidence (⊕⊕⊕◯)
- Cibenzoline
- Gatifloxacin
- Pentamidine
- Quinine
- Indomethacin
- Glucagon (during endoscopy)

Low quality of evidence (⊕⊕◯◯)
- Chloroquineoxaline sulfonamide
- Artesunate/artemisin/artemether
- IGF-I
- Lithium
- Propoxyphene/dextropropoxyphene

Very low quality of evidence (⊕◯◯◯)
- Drugs with >25 cases of hypoglycemia identified
  - Angiotensin converting enzyme inhibitors
  - Angiotensin receptor antagonists
  - β-Adrenergic receptor antagonists
  - Levofloxacin
  - Mifepristone
  - Disopyramide
  - Trimethoprim-sulfamethoxazole
  - Heparin
  - 6-Mercaptopurine
- Drugs with <25 cases of hypoglycemia identified (see Ref. 24)

Cryer P.E. JCM, 2009, 94:709-728

Ill or Medicated individual

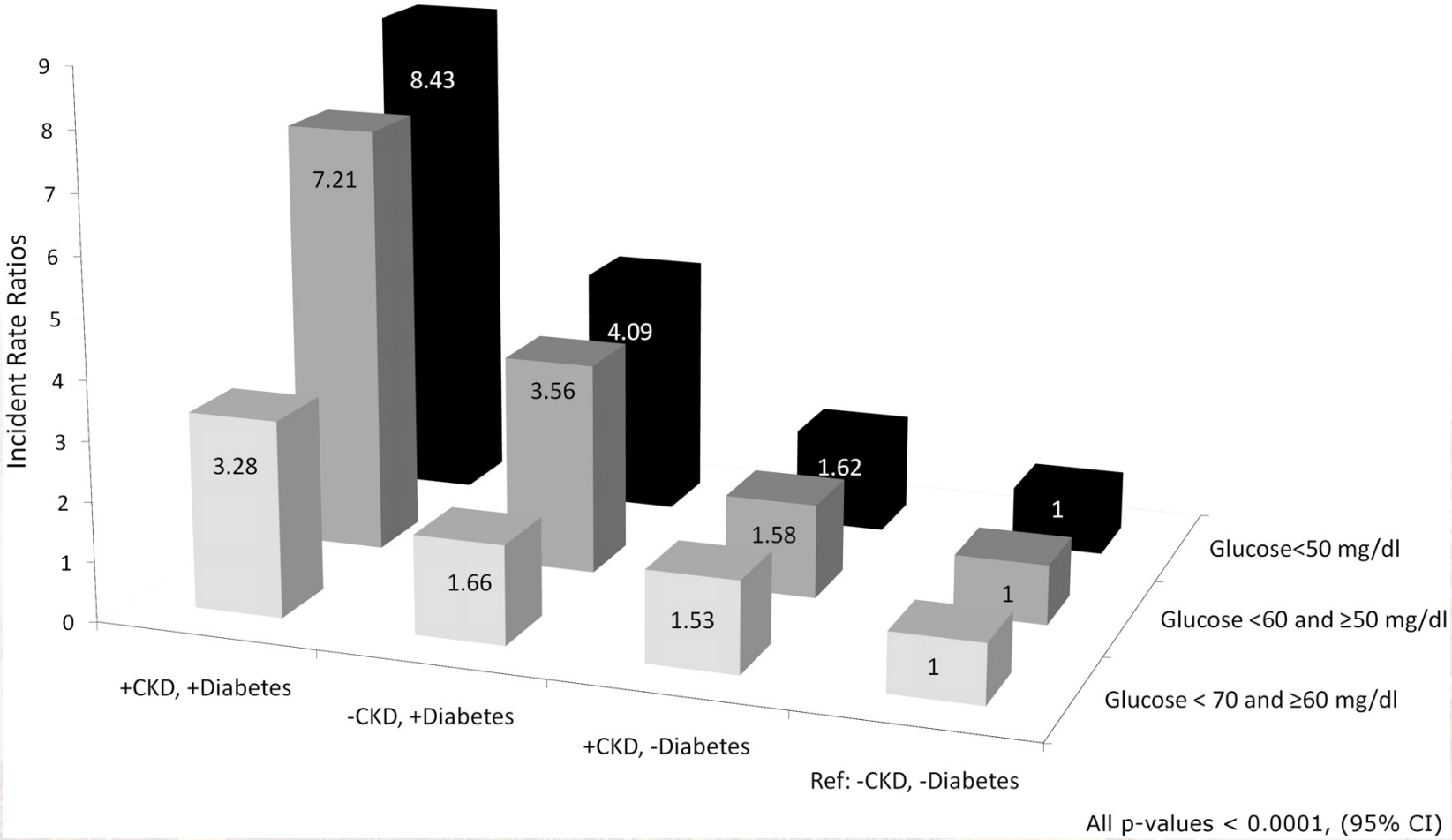
Insufficienza epatica

- Diminuzione della glicogenolisi
- Diminuzione della gluconeogenesi
- Difetti genetici nei percorsi glicometabolici
- Metabolismo dei farmaci compromesso (glibenclamide, glipizide)

Insufficienza renale

- Secondo organo deputato alla gluconeogenesi
- Ridotta clearance dei farmaci escreti per via renale o dei loro metaboliti (ad esempio, l'insulina, metabolita della glibenclamide

Risk for hypoglycemia of varying severity and expressed as an adjusted incidence rate ratio in veterans classified by presence or absence of chronic kidney disease (CKD) and diabetes.



Moen M F et al. CJASN 2009;4:1121-1127

III or Medicated individual

Endocrinopatie

Insufficienza corticosurrenalica

Deficit di GH

Ipopituitarismo (deficit combinato di ACTH e GH)

III or Medicated individual

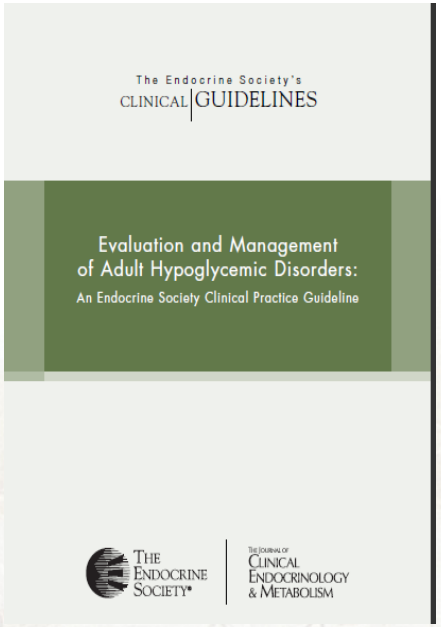
Neoplasm

- Mesenchymal tumors,
- hepatocellular carcinoma,
- adrenocortical tumors,
- carcinoid tumors,
- leukemia, and lymphomas

Most of these tumors secrete pro-IGF –II molecule

Some also secrete Glucagon- like peptide(GLP-1) and Somatostatin

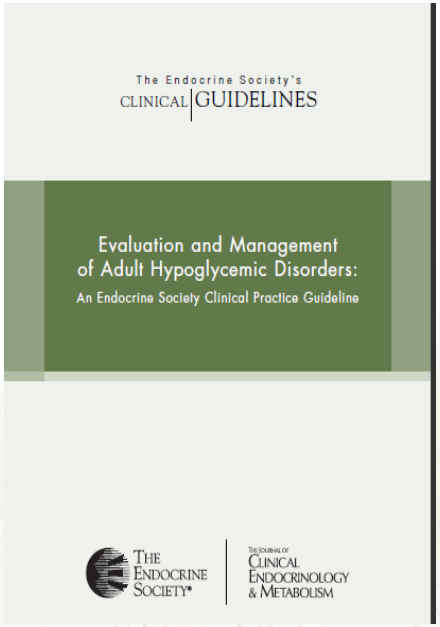
EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS



When the cause of the hypoglycemic disorder is not evident, ***i.e.*** **in a seemingly well individual**, the differential diagnosis narrows to two general categories:

- accidental, surreptitious, or even malicious hypoglycemia
- endogenous hyperinsulinism. (1⊕⊕⊕○)

Seemingly well individual



Endogenous hyperinsulinemia

- Insulinoma
- Non Insulinoma Pancreatogenous Hypoglycemia Syndrome: NIPHS. (1st report 1999,)
- Post gastric bypass hypoglycemia
- Autoimmune, insulin autoantibodies, *extremely rare*
- Beta-cell stimulating autoAb, *extremely rare*

Insulin segretagogue

INSULINOMA

- The incidence is approximately 1 in 250,000 patient-years.

- It may occur in all ethnic groups and at any age and has a slight predominance in women

- Less than 10% of patients have malignant insulinomas, have multiple tumors, or have the multiple endocrine neoplasia, type 1 (MEN-1) syndrome.

NIPHS

• The noninsulinoma pancreatogenous hypoglycemia syndrome (NIPHS) is characterized by spells of neuroglycopenia due to endogenous hyperinsulinemic hypoglycemia typically, but not invariably, after a meal .

• There is a predominance in men.
The pancreatic abnormality is diffuse islet involvement with nesidioblastosis

• Radiological localization procedures are invariably negative.

• Confirmation of islet hyperfunction depends on a positive selective arterial calcium stimulation test.

Post gastric bypass hypoglycemia

Some persons who have undergone Roux-en-Y gastric bypass for obesity have endogenous hyperinsulinemic hypoglycemia most often due to pancreatic islet nesidioblastosis.

The precise mechanisms of hypoglycemia remain to be determined

Diabetes. 2011 Sep;60(9):2308-14.

Gastric bypass surgery enhances glucagon-like peptide 1-stimulated postprandial insulin secretion in humans.

Salehi M, Prigeon RL, D'Alessio DA.

Department of Medicine, Division of Endocrinology, University of Cincinnati, Cincinnati, Ohio, USA. salehim@uc.edu

Abstract

OBJECTIVE: Gastric bypass (GB) surgery is associated with postprandial hyperinsulinemia, and this effect is accentuated in postsurgical patients who develop recurrent hypoglycemia. Plasma levels of the incretin glucagon-like peptide 1 (GLP-1) are dramatically increased after GB, suggesting that its action contributes to alteration in postprandial glucose regulation. The aim of this study was to establish the role of GLP-1 on insulin secretion in patients with GB.

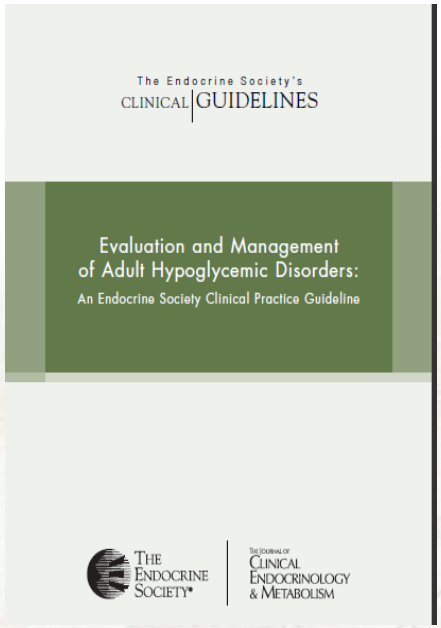
RESEARCH DESIGN AND METHODS: Twelve asymptomatic individuals with previous GB (Asym-GB), 10 matched healthy nonoperated control subjects, and 12 patients with recurrent hypoglycemia after GB (Hypo-GB) had pre- and postprandial hormone levels and insulin secretion rates (ISR) measured during a hyperglycemic clamp with either GLP-1 receptor blockade with exendin-(9-39) or saline.

RESULTS: Blocking the action of GLP-1 suppressed postprandial ISR to a larger extent in Asym-GB individuals versus

CONCLUSIONS

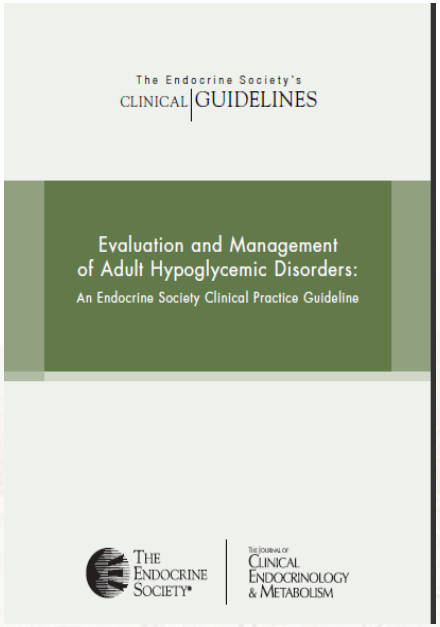
Increased GLP-1-stimulated insulin secretion contributes significantly to hyperinsulinism in GB subjects. However, the exaggerated effect of GLP-1 on postprandial insulin secretion in surgical subjects is not significantly different in those with and without recurrent hypoglycemia.

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS



Review the history, physical findings, and all available laboratory data seeking clues to specific disorders—drugs, critical illnesses, hormone deficiencies, nonislet cell tumors (1⊕⊕⊕○)

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS

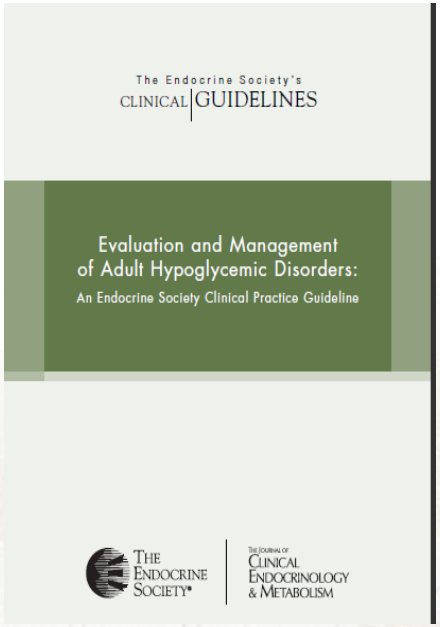


In a seemingly well individual

Measure plasma glucose, insulin, C-peptide, proinsulin, and b-hydroxybutyrate concentrations and screen for oral hypoglycemic agents, during an episode of spontaneous hypoglycemia, and observe the plasma glucose response to iv injection of 1.0 mg glucagon. .

Also, measure insulin antibodies. (1⊕⊕⊕○)

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS



When a spontaneous hypoglycemic episode cannot be observed, formally recreate the circumstances in which symptomatic hypoglycemia is likely to occur,*i.e.* during a fast of up to 72 h or after a mixed meal. (1⊕⊕⊕○)

OGTT should never be used for evaluation of suspected postprandial hypoglycemia

TABLE 4.

Suggested protocol for a prolonged diagnostic fast

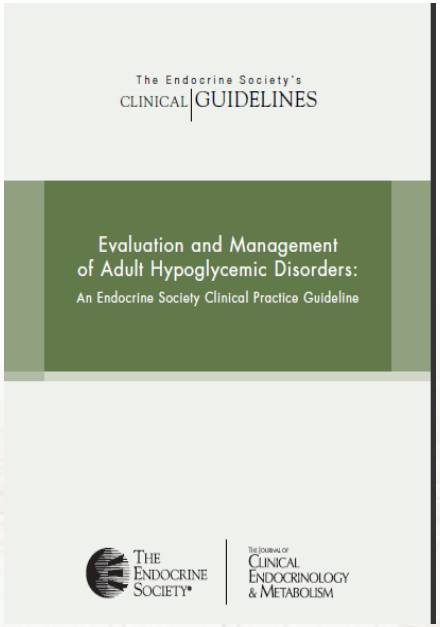
Date the onset of the fast as the time of the last food intake. Discontinue all nonessential medications.
Allow the patient to drink calorie-free beverages. Ensure that the patient is active during waking hours.
Collect samples for plasma glucose, insulin, C-peptide, proinsulin, and β-hydroxybutyrate every 6 h until the plasma glucose concentration is less than 60 mg/dl (3.3 mmol/liter); at that point the frequency of sampling should be increased to every 1 to 2 h.
Samples for plasma insulin, C-peptide, and proinsulin should be sent for analysis only in those samples in which the plasma glucose concentration is less than 60 mg/dl (3.3 mmol/liter).
End the fast when the plasma glucose concentration is less than 45 mg/dl (2.5 mmol/liter) and the patient has symptoms and/or signs of hypoglycemia (or if 72 h have elapsed without symptoms). The decision to end the fast before 72 h should not be based on a low plasma glucose concentration alone, in the absence of symptoms or signs, because some healthy individuals, especially women and children, have low glucose levels during prolonged fasting. Alternatively, the fast can be ended when the plasma glucose concentration is less than 55 mg/dl (3.0 mmol/liter) without symptoms or signs if Whipple's triad was documented unequivocally on a prior occasion.
A low plasma glucose concentration is a necessary, albeit not in itself sufficient, finding for the diagnosis of hypoglycemia. Therefore, the decision to end the fast should be based on laboratory-measured plasma glucose concentrations, not those estimated with a point-of-care glucose monitor. If it is judged necessary to treat urgently because of severe symptoms, obtain samples for all of the following before administering carbohydrates.
At the end of the fast, collect samples for plasma glucose, insulin, C-peptide, proinsulin, β-hydroxybutyrate, and oral hypoglycemia agents, and then inject 1.0 mg of glucagon iv and measure plasma glucose 10, 20, and 30 min later. (Insulin antibodies should be measured, but not necessarily during hypoglycemia.)

TABLE 5.

Suggested protocol for a mixed-meal diagnostic test

Perform the test after an overnight fast. Hold all nonessential medications.
Use a mixed meal similar to that which the patient reports has caused symptoms (or use a commercial formula mixed meal).
Collect samples for plasma glucose, insulin, C-peptide, and proinsulin before ingestion and every 30 min through 300 min after ingestion of the meal.
Observe the patient for symptoms and/or signs of hypoglycemia and ask the patient to keep a written log of all symptoms, timed from the start of meal ingestion. If possible, avoid treatment until the test is completed.
A low plasma glucose concentration is a necessary, albeit not in itself sufficient, finding for a diagnosis of hypoglycemia. Therefore, the mixed-meal test should be interpreted on the basis of laboratory-measured plasma glucose concentrations, not those estimated with a point-of-care glucose monitor. If it is judged necessary to treat before 300 min because of severe symptoms, obtain samples for all of the following before administering carbohydrates.
Samples for plasma insulin, C-peptide, and proinsulin should be sent for analysis only in those samples in which plasma glucose is less than 60 mg/dl (3.3 mmol/liter), and a sample for measurement of oral hypoglycemic agents should be obtained, if Whipple's triad is demonstrated. In that case, antibodies to insulin should also be measured.

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS



The findings of symptoms, signs, or both with
glucose < 55 mg/dl (3.0 mmol/liter),
insulin ≥ 3.0 μU/ml (18 pmol/liter)
C-peptide ≥ 0.6 ng/ml (0.2 nmol/liter)
proinsulin ≥ 5.0 pmol/liter
document endogenous hyperinsulinism.(1⊕⊕⊕○)

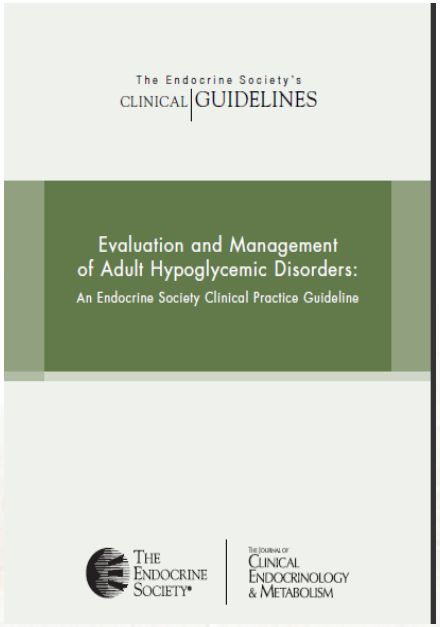
Ratios employing insulin and glucose have no diagnostic utility

TABLE 3. Patterns of findings during fasting or after a mixed meal in normal individuals with no symptoms or signs despite relatively low plasma glucose concentrations (*i.e.* Whipple's triad not documented) and in individuals with hyperinsulinemic (or IGF-mediated) hypoglycemia or hypoglycemia caused by other mechanisms.

Symptoms, signs, or both	Glucose (mg/dl)	Insulin (μU/ml	C-peptide (nmol/liter)	Proinsulin (pmol/liter)	β-Hydroxy -butyrate (mmol/liter)	Glucose increase after glucagon (mg/dl)	Circulating oral hypo-glycemic	Antibody to insulin	Diagnostic inter-pretation
No	< 55	< 3	< 0.2	< 5	> 2.7	< 25	No	No	Normal
Yes	< 55	» 3	< 0.2	< 5	≤ 2.7	> 25	No	Neg (Pos)	Exogenous insulin
Yes	< 55	≥ 3	≥ 0.2	≥ 5	≤ 2.7	> 25	No	Neg	Insulinoma, NIPHS, PGBH
Yes	< 55	≥ 3	≥ 0.2	≥ 5	≤ 2.7	> 25	Yes	Neg	Oral hypo-glycemic agent
Yes	< 55	» 3	» 0.2[a]	» 5[a]	≤ 2.7	> 25	No	Pos	Insulin autoimmune
Yes	< 55	< 3	< 0.2	< 5	≤ 2.7	> 25	No	Neg	IGF[b]
Yes	< 55	< 3	< 0.2	< 5	> 2.7	< 25	No	Neg	Not insulin (or IGF)-mediated

Neg, negative; Pos, positive; PGBH, post gastric bypass hypoglycemia.
a Free C-peptide and proinsulin concentrations are low.
b Increased pro-IGF-II, free IGF-II, IGF-II/IGF-I ratio.

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS

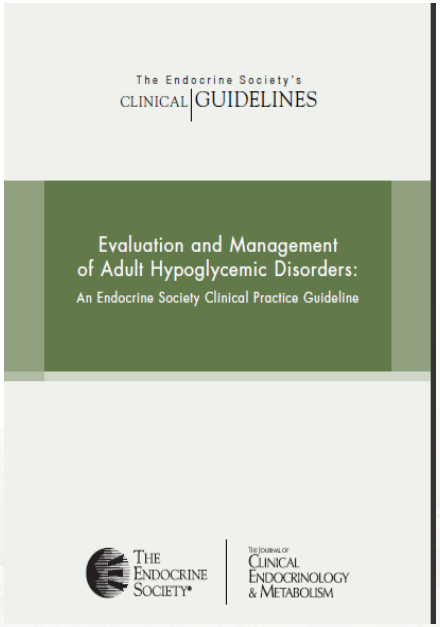


In a patient with documented fasting or postprandial endogenous hyperinsulinemic hypoglycemia, negative screening for oral hypoglycemic agents, and no circulating insulin antibodies, conduct procedures for localizing an insulinoma. (1⊕⊕⊕○)

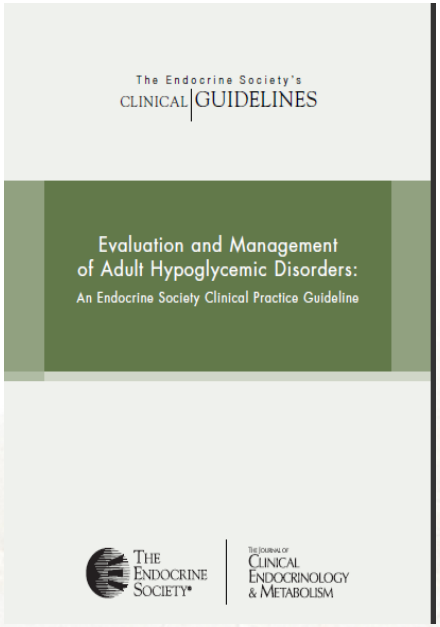
Localization of Insulinoma

- US, CT, MRI, often small and difficult to visualize but will demonstrate metastasis in malignant insulinoma (5-10%), 70-85% sensitive
- Octreoscan positive in 60-80%
- Arteriography
- Endoscopic US (positive ~90%)
- Intraoperative US, yield 98%

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITHOUT DIABETES MELLITUS



Prevention of recurrent hypoglycemia requires treatment that corrects or circumvents the hypoglycemic mechanism.



•Medical treatment with diazoxide, octreotide, or both can be used if resection of an insulinoma is not possible and in patients with a nontumor b-cell disorder, although partial pancreatectomy may be required.

•In patients with NIPHS or post gastric bypass hypoglycemia medical therapy with frequent feedings, an a-glucosidase inhibitor, diazoxide, and octreotide are occasionally effective.
Partial pancreatectomy often provides amelioration.

Case Rep Oncol. 2012 May;5(2):420-7. Epub 2012 Aug 1.

Non-islet cell tumor hypoglycemia at the second recurrence of malignant solitary fibrous tumor in the retroperitoneum and pelvis: a case report.

Hata T, Tsuruta Y, Takamori S, Shishikura Y.

Department of Surgery, Chiba Tokushukai Hospital, Funabashi, Japan.

Geriatr Gerontol Int. 2012 Oct;12(4):752-3. doi: 10.1111/j.1447-0594.2012.00842.x.

Pituitary insufficiency: A cause of hypoglycemia in an elderly diabetic patient.

Soysal P, Babacan-Yildiz G, Isik AT.

Departments of Internal Medicine Neurology Geriatric Medicine, Faculty of Medicine, Bezmialem Vakif University, Istanbul, Turkey.

Case Report Med. 2012;2012:628756. Epub 2012 Sep 16.

Recurrent meningeal hemangiopericytoma with multiple metastasis and hypoglycemia: a case report.

Chan JK, Cheuk W, Ho LC, Wen JM.

Department of Pathology, Kiang Wu Hospital, China.

Curr Drug Saf. 2012 Apr;7(2):183-5.

Moxifloxacin-induced hypoglycemia in a non-diabetic patient.

Mandavia DR, Virpariya MM, Patel TK, Tripathi CB.

Department of Pharmacology, Government Medical College and Sir Takhtsinhji General Hospital, Gujarat, India.

J Med Case Rep. 2012 Oct 2;6(1):332. [Epub ahead of print]

Diffuse nesidioblastosis with hypoglycemia mimicking an insulinoma: a case report.

Ferrario C, Stoll D, Boubaker A, Matter M, Yan P, Puder JJ.

Br J Biomed Sci. 2012;69(2):80-2.

Hypoglycaemia due to autoimmune insulin syndrome in a 78-year-old Chinese man.

Yeung CW, Mak CM, Lam KS, Tam S.

Division of Clinical Biochemistry, Queen Mary Hospital.

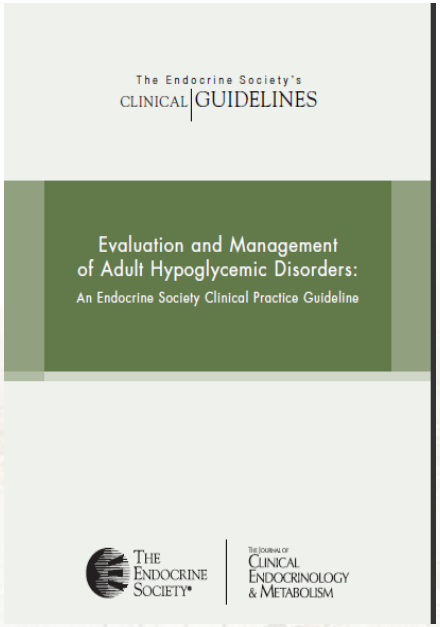
Endocrine. 2012 Aug 11. [Epub ahead of print]

Hypoglycemia due to insulin binding antibodies in a patient with insulin-treated type 2 diabetes and Graves' disease.

Wang X, Xu XL, Zhao XL, Ma XW, Yu H, Gong H, Zhang SR, Chen FL.

No. 3 People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, China 280# MoHe Road, Shanghai, 201900, People's Republic of China.

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS



We suggest that persons with diabetes become concerned about the possibility of developing hypoglycemia when the self-monitored blood glucose concentration is falling rapidly or is no greater than **70 mg/dl** (3.9 mmol/liter) (2⊕○○○).

DEFINIZIONE DI IPOGLICEMIA NEI PAZIENTI DIABETICI (ADA WORGROUP REPORT)

Diabets Care: 28,, 1245-1249; May 2005

Ipoglicemia sintomatica documentata: sintomi ipoglicemici e glicemia <70mg/dl

Ipoglicemia asintomatica: glicemia <70mg/dl e assenza di sintomi ipoglicemici

Ipoglicemia sintomatica probabile: sintomi di ipoglicemia che si risolvono con l'assunzione di zuccheri in assenza di un documentato valore glicemico

Ipoglicemia relativa: sono presenti i sintomi dell'ipoglicemia ma i valori glicemici sono superiori a 70 mg/dl

IPOGLICEMIA

Lieve

sintomi neurogenici — fame, scialorrea, sudorazione, tachicardia, palpitazioni, tremori

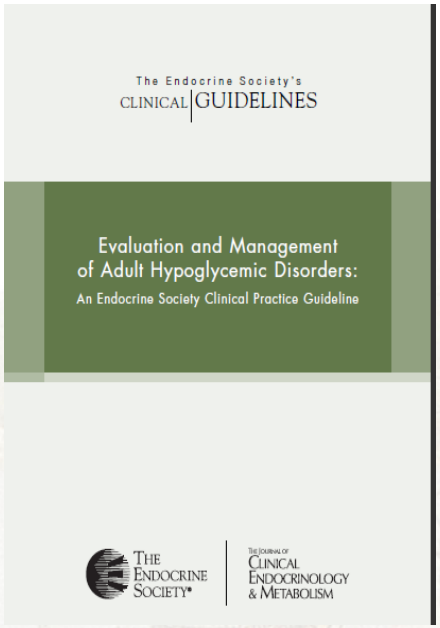
Moderata

sintomi neuroglicopenici — ansietà, irritabilità, cefalea, sonnolenza, perdita concentrazione, confusione mentale,

Grave — convulsioni, coma

Il paziente necessita dell'aiuto di terzi per risolvere l'ipoglicemia

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS

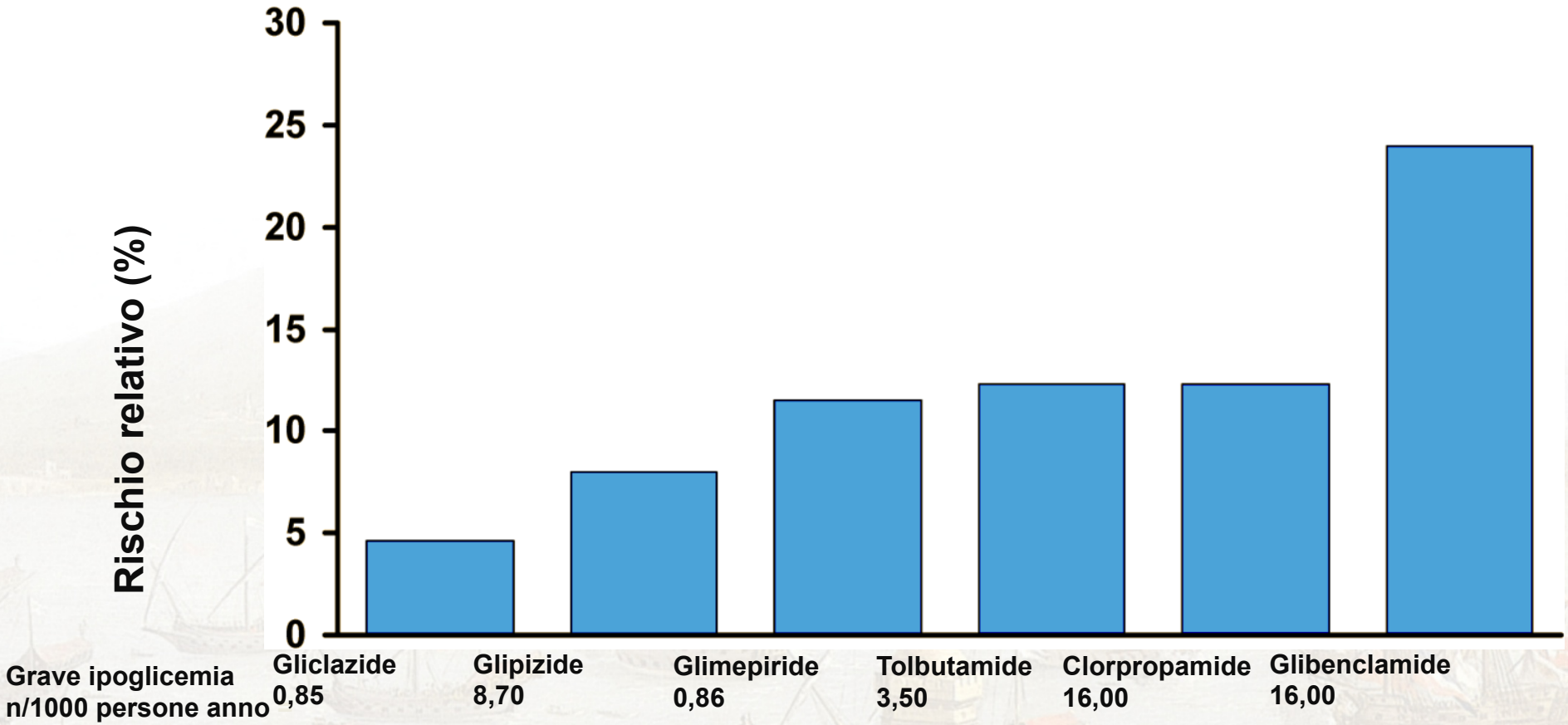


We recommend that the prevention of hypoglycemia in diabetes involve addressing the issue in each patient contact and, if hypoglycemia is a problem, making adjustments in the regimen based on review and application of the principles of intensive glycemic therapy—diabetes self management (1⊕⊕⊕○).

ECCESSO D' INSULINA

Eccesso assoluto: utilizzo d'insuline o farmaci segretagoghi con un profilo farmacocinetico imperfetto

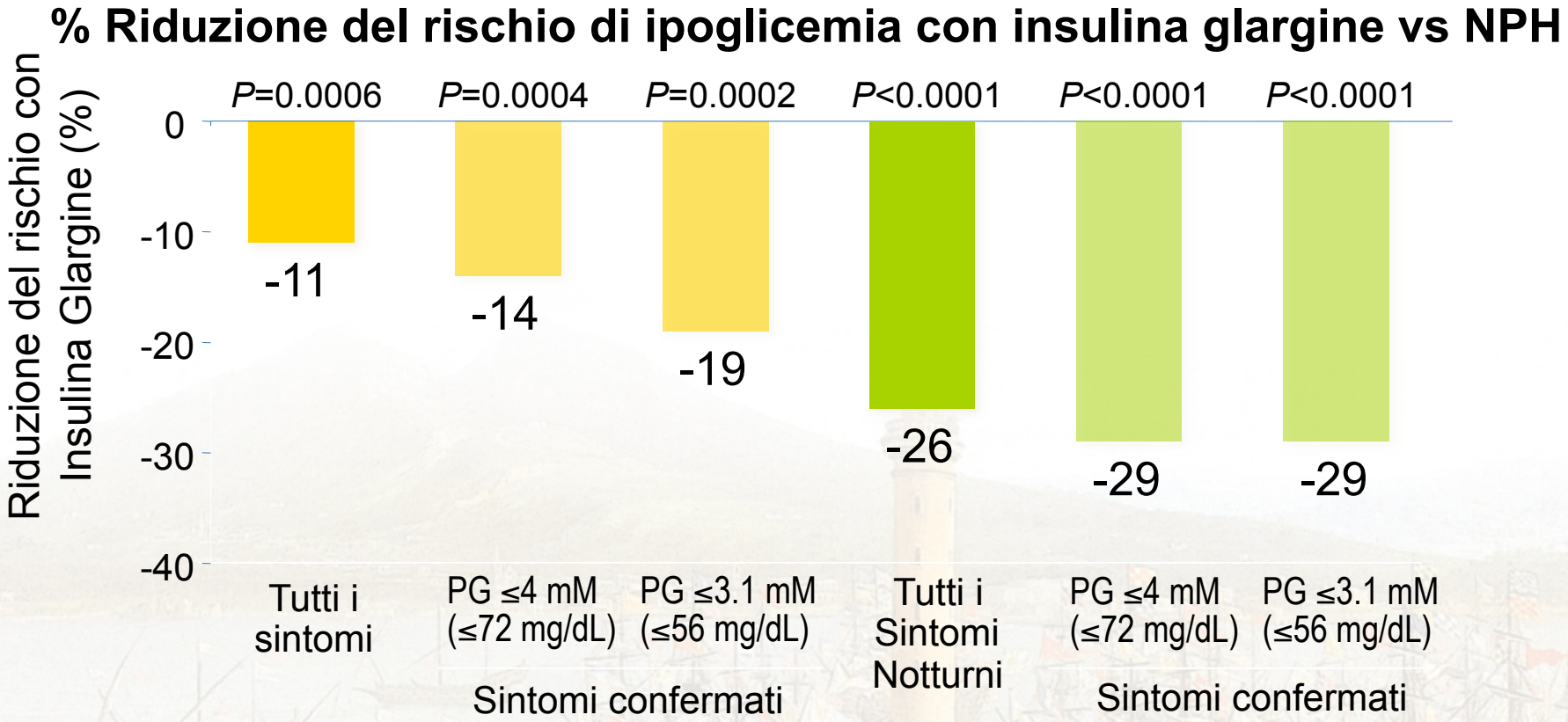
Rischio di ipoglicemia con le diverse sulfaniluree



*<50 mg/dl

Tayek J. *Diabetes Obes Metab* 2008; 10:1128-1130

Metanalisi: minor rischio di ipoglicemia con Glargine vs NPH



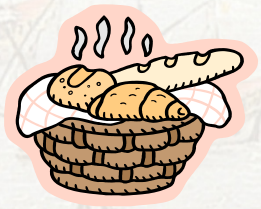
Ipo gravi – 46%

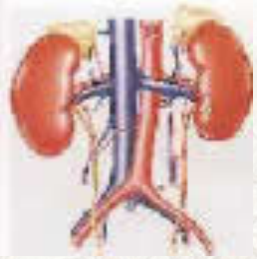
Rosenstock J et al. Diabetes Care 2005; 28:950-55

ECCESSO D' INSULINA

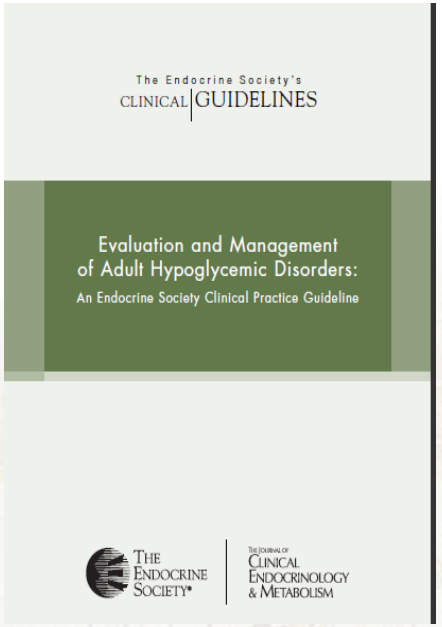
Eccesso assoluto: utilizzo d' insuline o farmaci segretagoghi con un profilo farmacocinetico imperfetto

Eccesso relativo: interazione con altri fattori:

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS

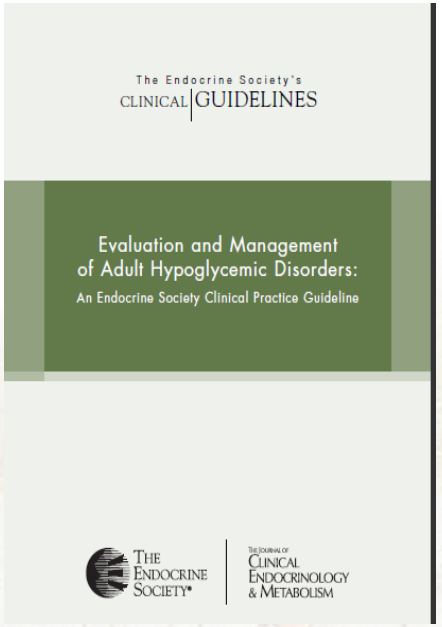


Although persons with diabetes are not spared the risk for the same hypoglycemic disorders as those without diabetes.

FATTORI DI RISCHIO D' IPOGLICEMIA

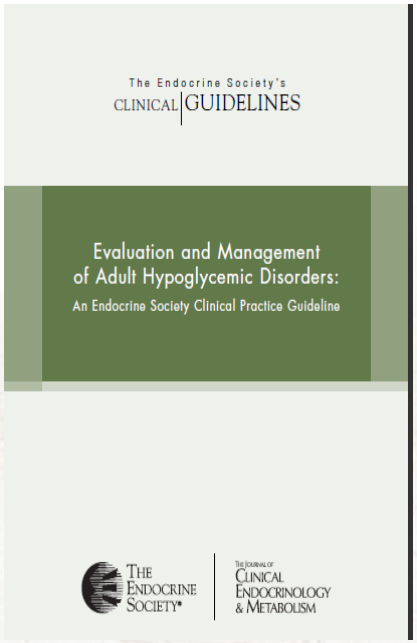
- Deficit totale d'insulina
- Terapia troppo intensiva
- Recente esercizio fisico
- Storia di ipoglicemia o ipoglicemie asintomatiche
- Insufficienza renale

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS



With a history of hypoglycemia unawareness we recommend a 2- to 3-wk period of scrupulous avoidance of hypoglycemia (1⊕⊕○○).

EVALUATION AND MANAGEMENT OF HYPOGLYCEMIA IN PERSONS WITH DIABETES MELLITUS



We recommend that urgent treatment of hypoglycemia should be accomplished by ingestion of carbohydrates if that is feasible, or by parenteral glucagon or glucose if it is not feasible (1⊕⊕⊕⊕).

Correzione dell'Ipoglicemia

Raccomandazioni

Il glucosio (15 g) per os è il trattamento di scelta per l'ipoglicemia lieve-moderata, sebbene qualsiasi forma di carboidrati contenenti glucosio possa essere utilizzata a tale scopo, in dosi equivalenti; gli effetti del trattamento dovrebbero essere evidenti entro 15 minuti dall'ingestione. (Livello della prova VI, Forza della raccomandazione B)

Il glucosio ev in soluzioni ipertoniche (dal 20 al 33%) è il trattamento di scelta delle ipoglicemie gravi in presenza di accesso venoso. Qualora questo non sia disponibile è indicato l'utilizzo di glucagone per via intramuscolare o sottocutanea. (Livello della prova VI, Forza della raccomandazione B)

GRAZIE !

Reactive **hypoglycemia** is controversial

- low postprandial plasma glucose levels alone are not sufficient
- 10% to 30% of normal individuals undergoing oral GTT have plasma glucose <50 mg/Dl, with no symptoms
- Only patients with severe (eg, loss of consciousness, traumatic injury or accident) attributed to postprandial **hypoglycemia** require further workup.