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Top Ten

IN GASTROENTEROLOGIA

17-18 MARZO 2017

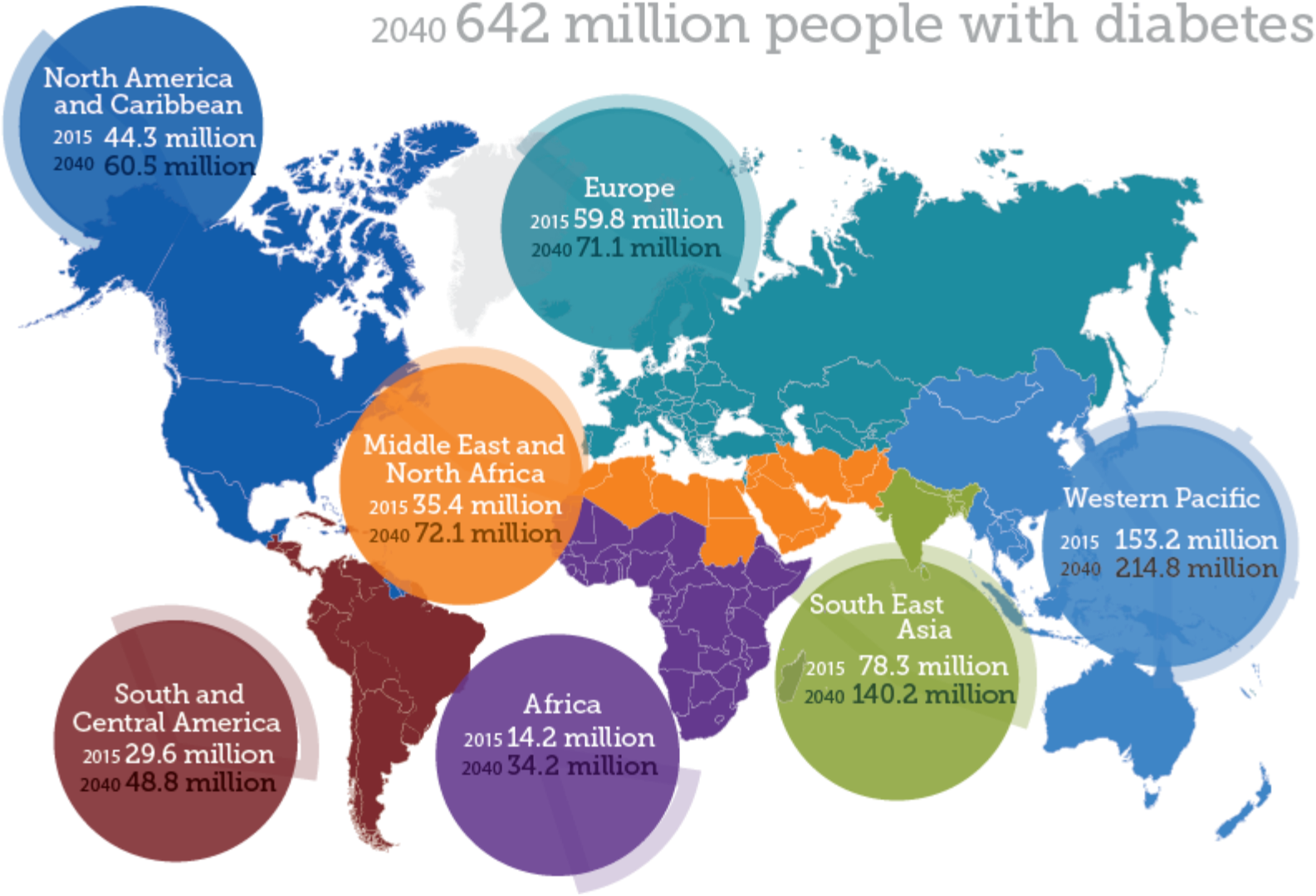
ISEO (BS)

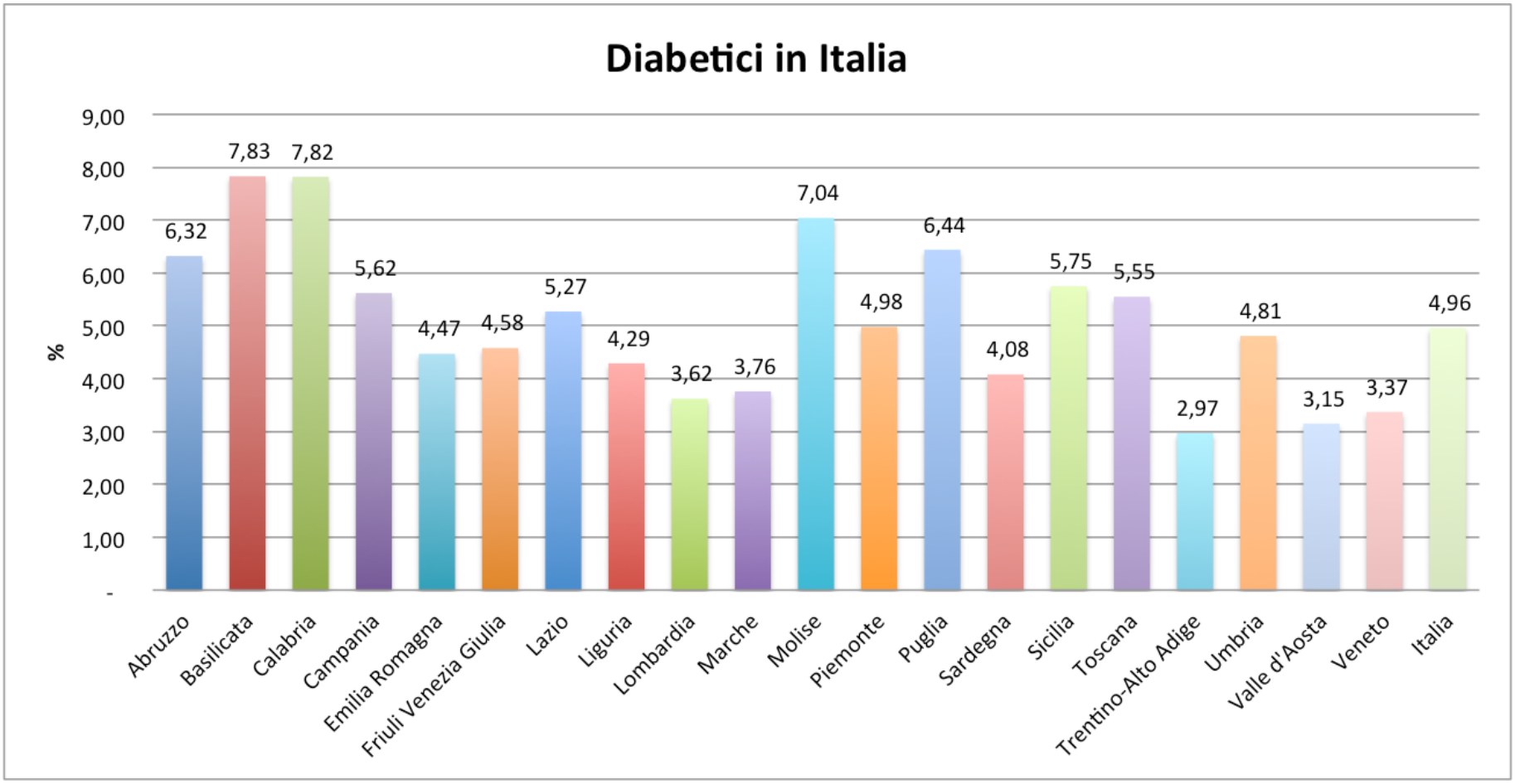
Iseo Lago Hotel - Via Colombera, 2

Diego Foschi

Chirurgia bariatrica: aspetti metabolici e risultati clinici

Worldwide 2015 415 million people with diabetes
2040 642 million people with diabetes




Diabetici in Italia
%
9,00
8,00
7,00
6,00
5,00
4,00
3,00
2,00
1,00
-
6,32
7,83
7,82
5,62
4,47
4,58
5,27
4,29
3,62
3,76
7,04
4,98
6,44
4,08
5,75
5,55
2,97
4,81
3,15
3,37
4,96
Abruzzo
Basilicata
Calabria
Campania
Emilia Romagna
Friuli Venezia Giulia
Lazio
Liguria
Lombardia
Marche
Molise
Piemonte
Puglia
Sardegna
Sicilia
Toscana
Trentino-Alto Adige
Umbria
Valle d'Aosta
Veneto
Italia

REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN

DIABETES PREVENTION PROGRAM RESEARCH GROUP*

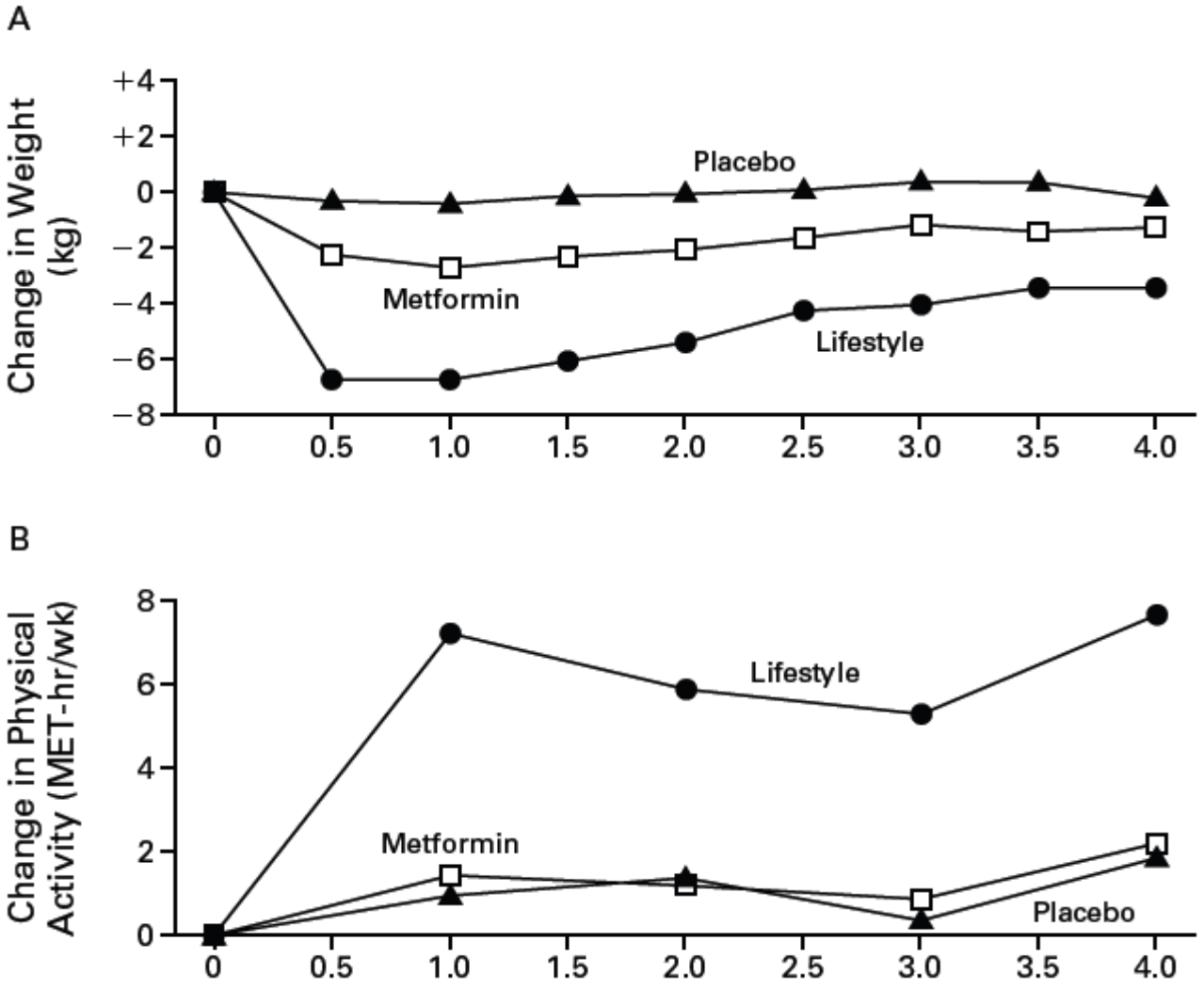
Weight loss: -7/10%

Healthy eating

Increased physical activity
> 150 min/week

REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN

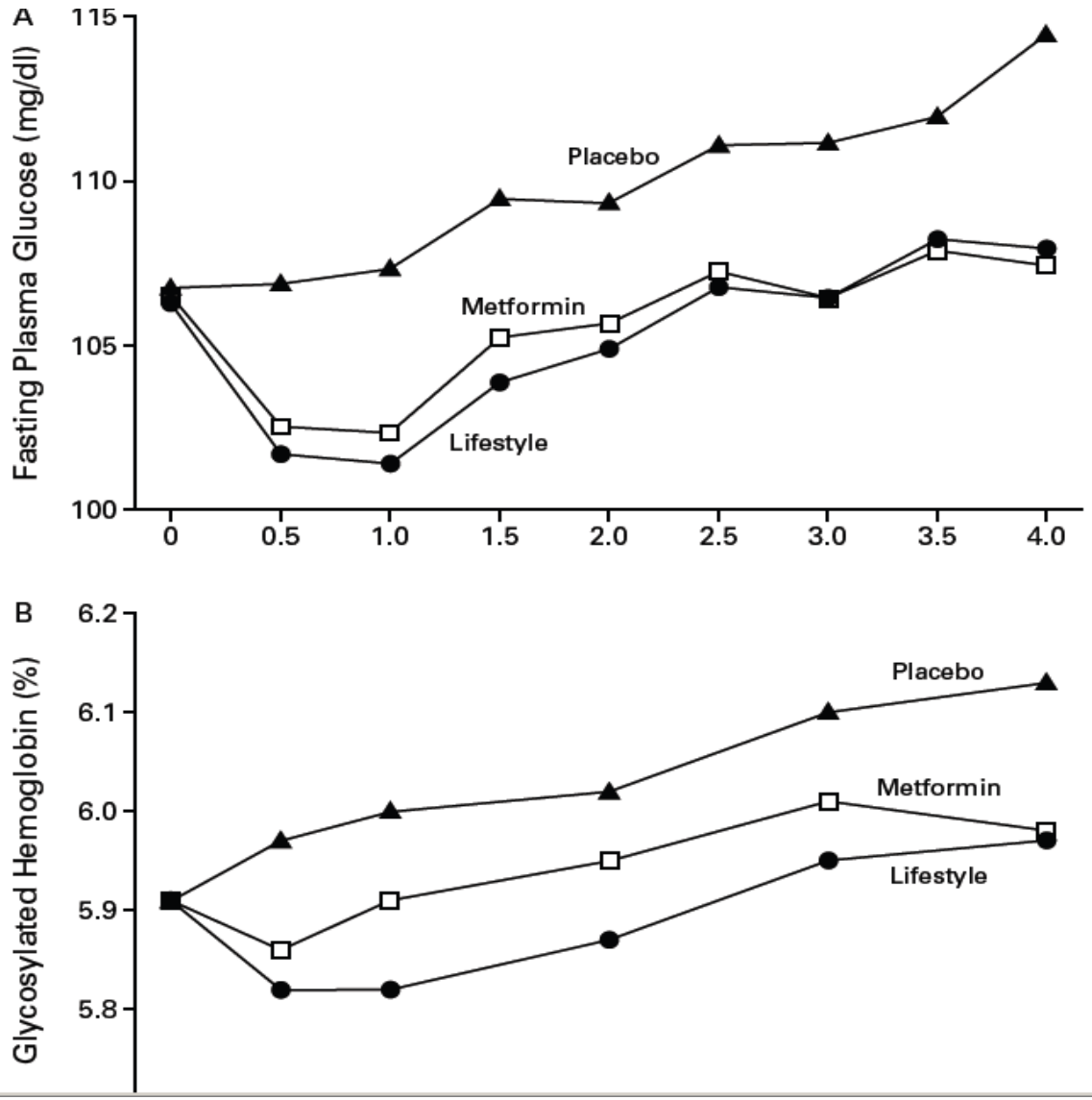
DIABETES PREVENTION PROGRAM RESEARCH GROUP*



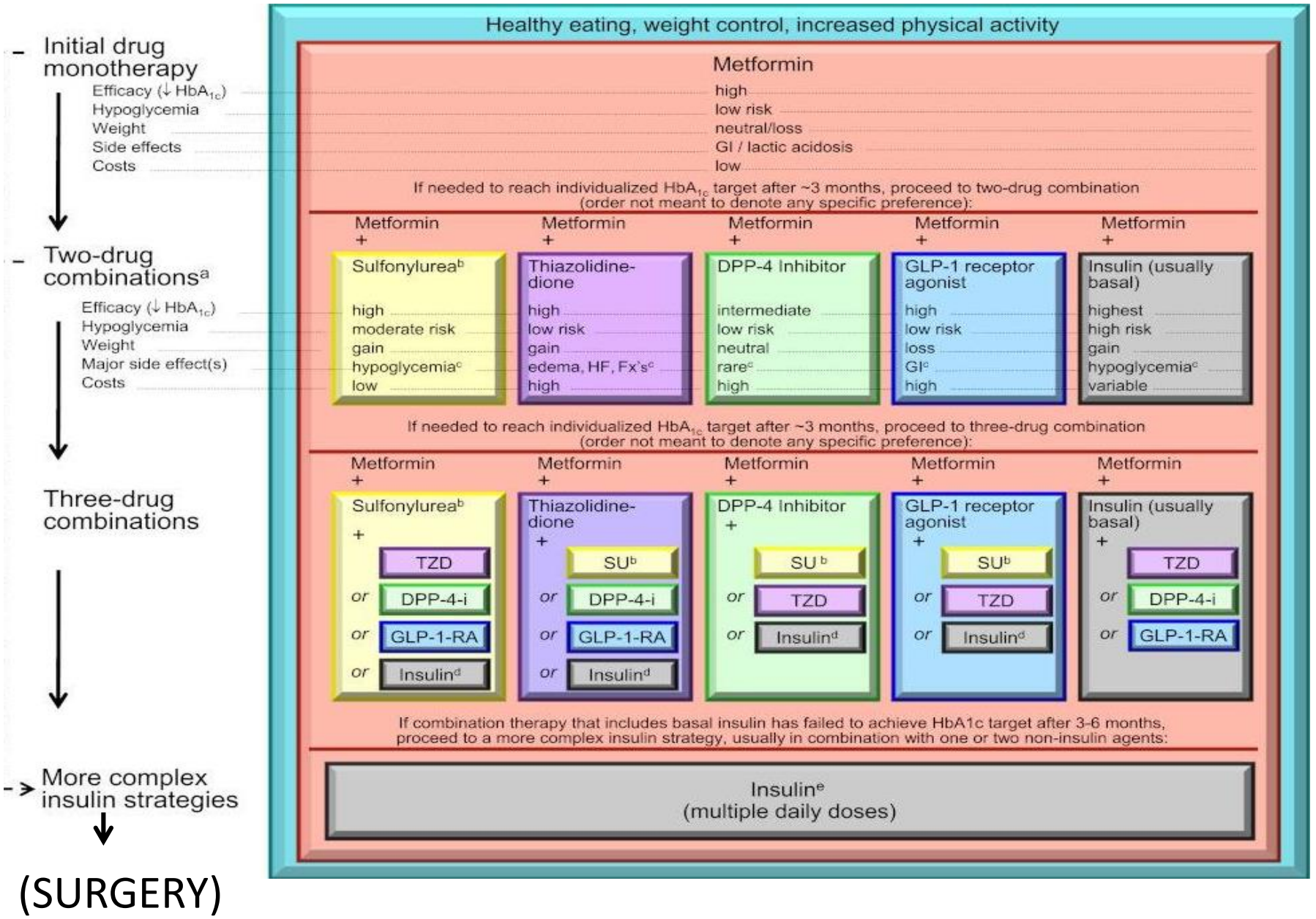
N Eng J Med, 2002

REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN

DIABETES PREVENTION PROGRAM RESEARCH GROUP*



Strategia di trattamento del DMT2



DMT2 : analisi dei costi

Tabella 1 – Parametri epidemiologici, parametri per costi diretti sanitari e parametri per costi indiretti associati al trattamento del diabete

Parametri epidemiologici	Stima Puntuale	MIN	MAX	Distribuzione	FONTE
Popolazione residente al 1 Gennaio 2012 in Italia	59.394.207	-	-		[10]
Prevalenza Diabete 2012	5,5%	4,9%	5,8%	BETA	[1, 3, 11]
Pazienti in trattamento farmacologico	79,8%	70%	88%	BETA	[1, 12]
Pazienti trattati OT	77%	76%	77%	BETA	[1, 13]
Pazienti trattati BOT	11%	10%	11%	BETA	[1, 13]
Pazienti trattati BBT	13%	13%	13%	BETA	[1, 13]

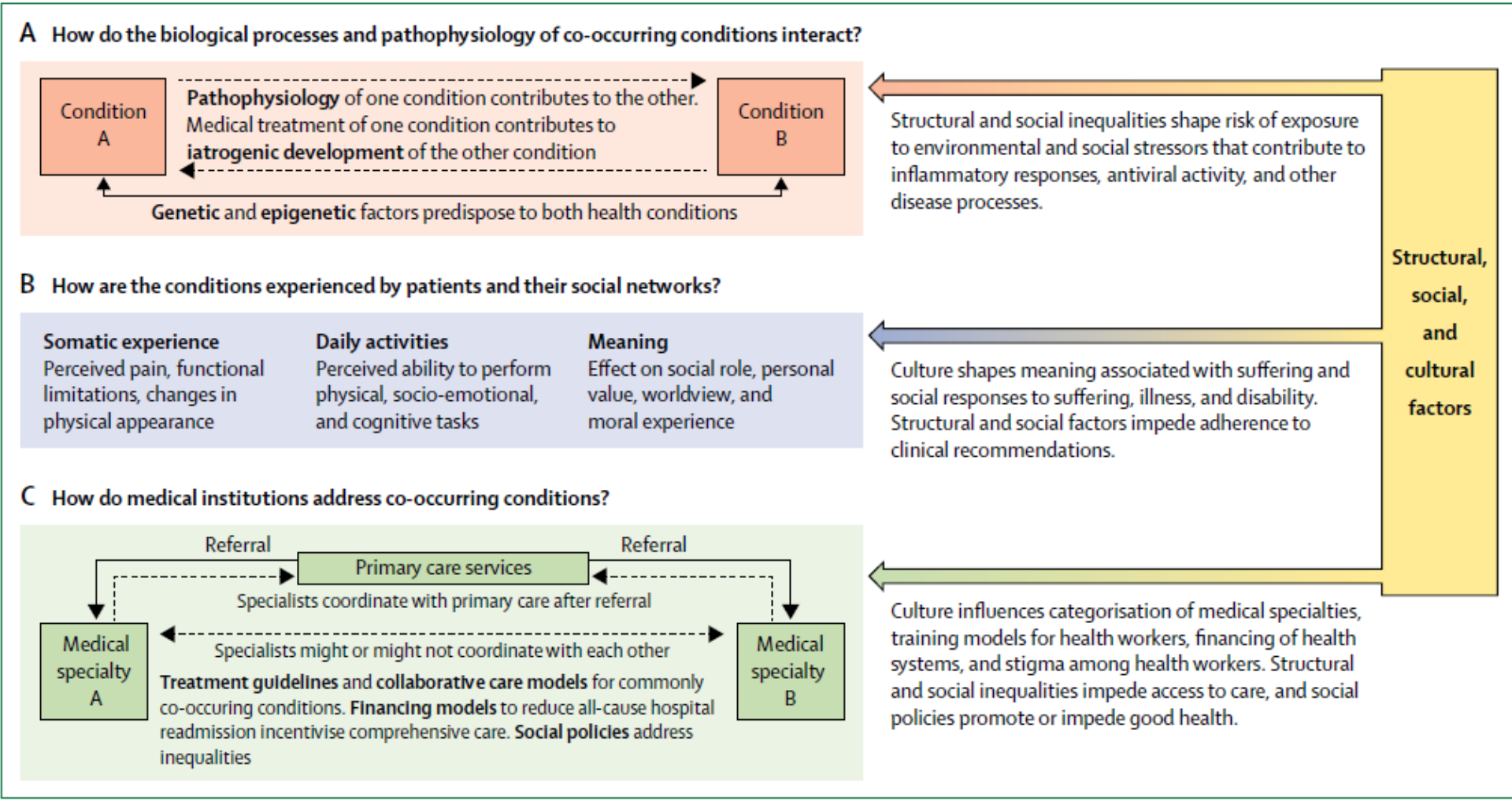
F S Mennini 2014

DMT2 : analisi dei costi in Italia

Voce di costo	Spesa Terapia Orale	Spesa Terapia Basal-Oral	Spesa Terapia Basal/Bolus	Totale
Costo dei farmaci IC 95% (MIN-MAX)	€ 1,59 (€1,39- €1,81)	€ 0,22 (€0,19-€0,25)	€ 0,27 (€0,23-€0,31)	€ 2,09 (€1,84-€2,34)
Costo ospedalizzazioni IC 95% (MIN-MAX)	€ 3,83 (€3,09-€4,64)	€ 0,53 (€0,42-€0,64)	€ 0,65 (€0,52-€0,79)	€ 5,05 (€4,1-€6,0)
Costo specialistica IC 95% (MIN-MAX)	€ 0,84 (€0,73-€0,97)	€ 0,12 (€0,1-€0,13)	€ 0,14 (€0,12-€0,17)	€ 1,11 (€0,95-€1,26)
Costo monitoraggio IC 95% (MIN-MAX)	€ 0,69 (€0,14-€1,27)	€ 0,21 (€0,09-€0,5)	€ 0,40 (€0,34-€0,47)	€ 1,31 (€0,67-€1,95)
Costo eventi ipoglicemici IC 95% (MIN-MAX)	€ 0,006 (€0,01-€0,01)	€ 0,001 (€0,0007-€0,001)	€ 0,001 (€0,0009-€0,0012)	€ 0,008 (€0,007-€0,009)
Totale IC 95% (MIN-MAX)	€ 6,95 (€5,88-€8,17)	€ 1,07 (€0,73-€1,42)	€ 1,47 (€1,28-€1,69)	€ 9,58 (€8,09- €11,07)
Assenza dal lavoro IC 95% (MIN-MAX)			€ 1,62 (€1,50-€1,74)	
Pensionamento anticipato IC 95% (MIN-MAX)			€ 9,06 (€8,39-€9,72)	
Totale IC 95% (MIN-MAX)			€10,68 (€9,94- €11,42)	
Costi Totali causati dal diabete IC 95% (MIN-MAX)			**€ 20,26 (€18,03- €22,52)**	

F S Mennini 2014

Modello sindemico di DMT2 e Obesità



E. Mendenhall, 2017

1

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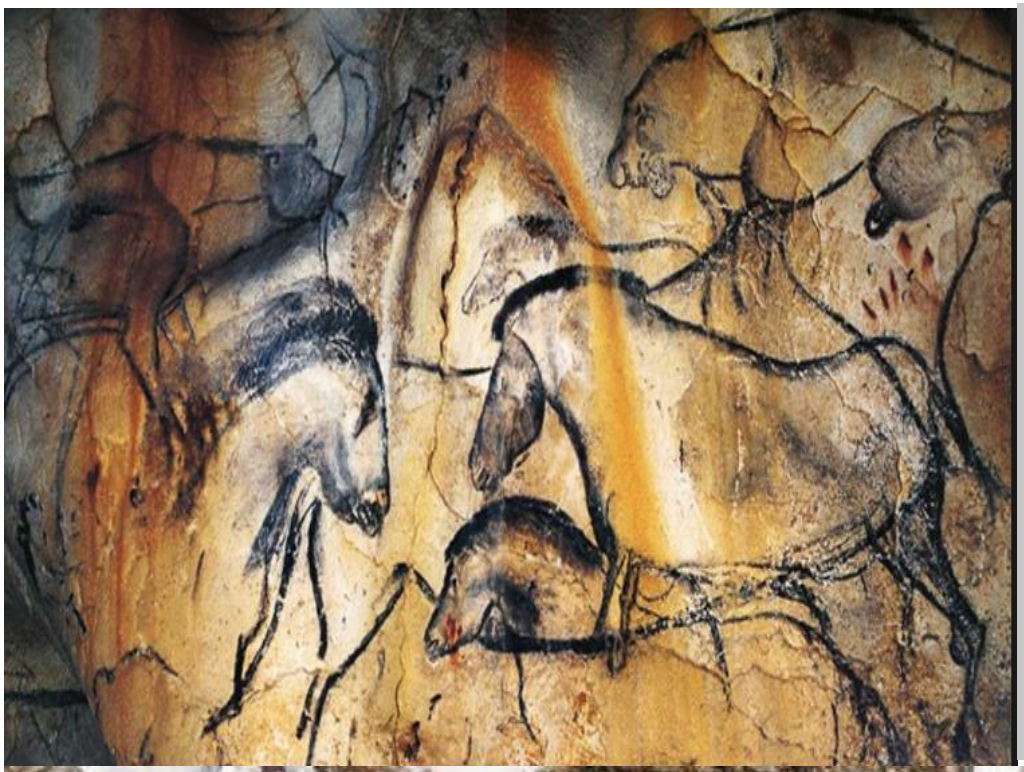
- L’associazione fra obesità e diabete rappresenta una sindemia difficilmente contrastabile nell’attuale contesto socio-sanitario.
- I costi diretti e indiretti del DMT2 sono stimati a 20 miliardi di euro/anno
- La definizione di un trattamento efficiente ed efficace del DMT2 è una necessità per il nostro SSN

FATTORI AMBIENTALI : IL RUOLO DELLA DIETA



era	mill	periodo	denominazione	avvenimenti
quaternario	10	olocene	postglaciale	depositi post-glaciali, conoidi recenti allo sbocco dei torrenti alpini, morene allo sbocco delle valli
	100	pleistocene superiore	wurm	ultima glaciazione
	180		interglaciale riss-wurm	deposito di stratificazione completamente decalcificata
	250		riss	
	400	pleistocene medio	interglaciale mindel-riss	depositi riconoscibili per il caratteristico colore rosso, dovuti alla disgregazione dei porfidi
	450		mindel	
	550		interglaciale gunz-mindel	conoide allo sbocco della Valsugana a formare il terrazzo tra Cittadella e Bassano e dell'Astico a formare il terrazzo dell'alta pianura Vicentina
	600		gunz	
	750	pleistocene inferiore	interglaciale donau-gunz	
	800		donau	
cenozoica		pliocene superiore		

Table 2 Energy return rates upon encounter from foraged foods. Data adapted from (Hawkes *et al*, 1982; Lee, 1979; O'Connell & Hawkes, 1984; Simms, 1987)

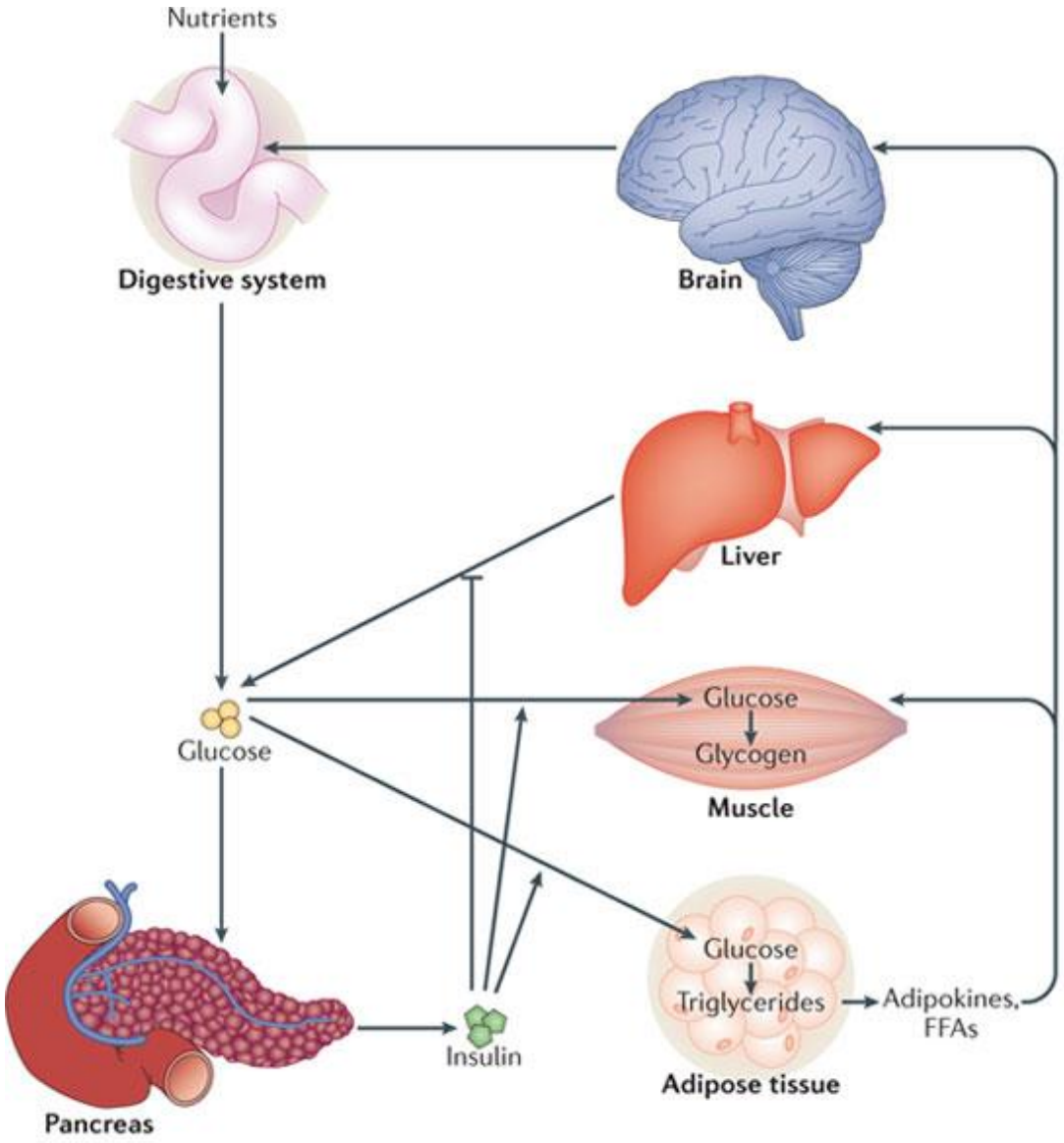
Food	*Food type*	*Return rate (kcal/h)*
Collared peccary	Animal	65 000
Antelope, deer, bighorn sheep	Animal	16 000 – 32 000
Jack rabbits	Animal	13 500 – 15 400
Cottontail rabbits, gophers	Animal	9000 – 10 800
Paca	Animal	7000
Coati	Animal	7000
Squirrel (large)	Animal	5400 – 6300
Roots	Plant	1200 – 6300
Fruits	Plant	900 – 6000
Armadillo	Animal	5900
Snake	Animal	5900
Bird	Animal	4800
Seeds	Plant	500 – 4300
Lizard (large)	Animal	4200
Squirrel (small)	Animal	2800 – 3600
Honey	Plant	3300
Ducks	Animal	2000 – 2700
Insect larvae	Animal	1500 – 2400
Fish	Animal	2100
Palm heart	Plant	1500
Acorns	Plant	1500
Pine nuts	Plant	800 – 1400 +
Mongongo nuts	Plant	1300
Grass seeds	Plant	100 – 1300

LA DIETA PRIMITIVA

Table 1 Quantitatively determined proportions of plant and animal food in hunter-gatherer diets. Adapted from Kaplan *et al* (2000)

Population	*Location*	*Latitude*	*Animal food (%)*	*Plant food (%)*	*Reference*
Aborigines (Arhem Land)	Australia	12S	77	23	McArthur (1960)
Ache	Paraguay	25S	78	22	Hill *et al* (1984)
Anbarra	Australia	12S	75	25	Meehan (1982)
Efe	Africa	2N	44	56	Dietz *et al* (1982)
Eskimo	Greenland	69N	96	4	Sinclair (1953); Krogh & Krogh (1913)
Gwi	Africa	23S	26	74	Silberbauer (1981); Tanaka (1980)
Hadza	Africa	3S	48	52	Blurton Jones *et al* (1997); Hawkes *et al* (1989)
Hiwi	Venezuela	6N	75	25	Hurtado & Hill (1986); Hurtado & Hill (1990)
!Kung	Africa	20S	33	67	Lee (1968)
!Kung	Africa	20S	68	32	Yellen (1977)
Nukak	Columbia	2N	41	59	Politis G (1996)
Nunamiut	Alaska	68N	99	1	Binford (1978)
Onge	Andaman Islands	12N	79	21	Rao *et al* (1989); Bose (1964)

Regolazione del trasporto del glucosio



D.Leto, 2012

RUOLO DELLA GENETICA NELLA PATOGENESI DEL DIABETE MELLITO DI TIPO II

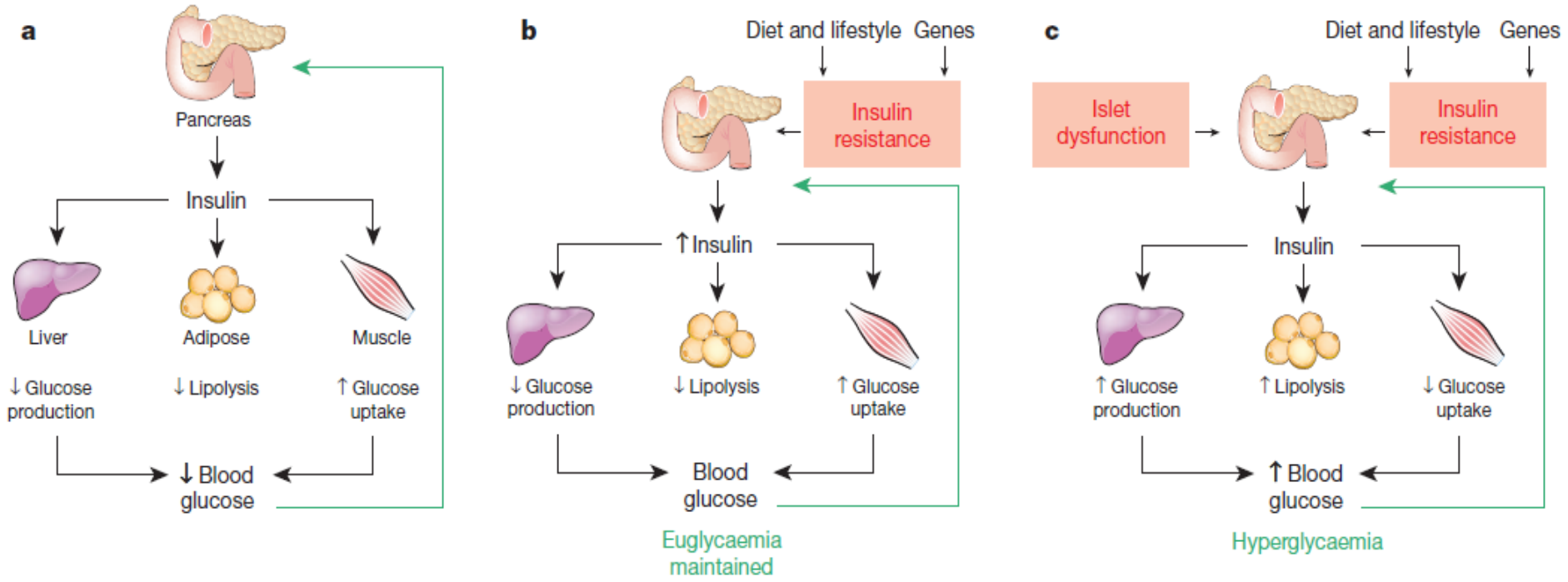
PROBE_ID	GENE Symbol	P-value[a]	% Change	DEFINITION
ILMN_1679357	DEFA1/DEFA3	1.08E-03	−46%	Defensin, alpha 1/definsin alpha 3.
ILMN_1692223	LCN2	4.37E-03	−46%	Lipocalin 2 (oncogene 24p3).
ILMN_1725661	DEFA1/DEFA3	1.16E-03	−45%	Defensin, alpha 1/defensin alpha 3
ILMN_1693262	DEFA1/DEFA3	1.65E-03	−45%	Defensin, alpha 1/defensin alpha 3
ILMN_1806056	CEACAM8	3.73E-03	−45%	Carcinoembryonic antigen-related cell adhesion molecule 8.
ILMN_1688580	CAMP	1.76E-04	−41%	Cathelicidin antimicrobial peptide.
ILMN_1723035	OLR1	8.09E-03	−37%	Oxidized low density lipoprotein (lectin-like) receptor 1.
ILMN_1762713	C19ORF59	6.53E-03	−29%	Chromosome 19 open reading frame 59.
ILMN_1690546	PPP3CC	6.21E-03	26%	Protein phosphatase 3 catalytic subunit, gamma isoform.
ILMN_1805271	ZNF721	6.81E-03	26%	Zinc finger protein 721.
ILMN_1813400	CBR4	8.96E-03	26%	Carbonyl reductase 4.
ILMN_1702858	ADHFE1	3.78E-03	27%	Alcohol dehydrogenase, iron containing, 1.
ILMN_1748476	NOP5/NOP58	2.49E-03	28%	Nucleolar protein NOP5/NOP58.
ILMN_1661940	CAMTA1	4.40E-03	28%	Calmodulin binding transcription activator 1.
ILMN_1656111	MYLIP	3.83E-03	29%	Myosin regulatory light chain interacting protein.
ILMN_1797893	PFAAP5	5.93E-03	31%	Phosphonoformate immuno-associated protein 5.
ILMN_1679045	SBDS	6.03E-03	39%	Shwachman-Bodian-Diamond syndrome.

[a], Paired T-test pre- and post-surgery.

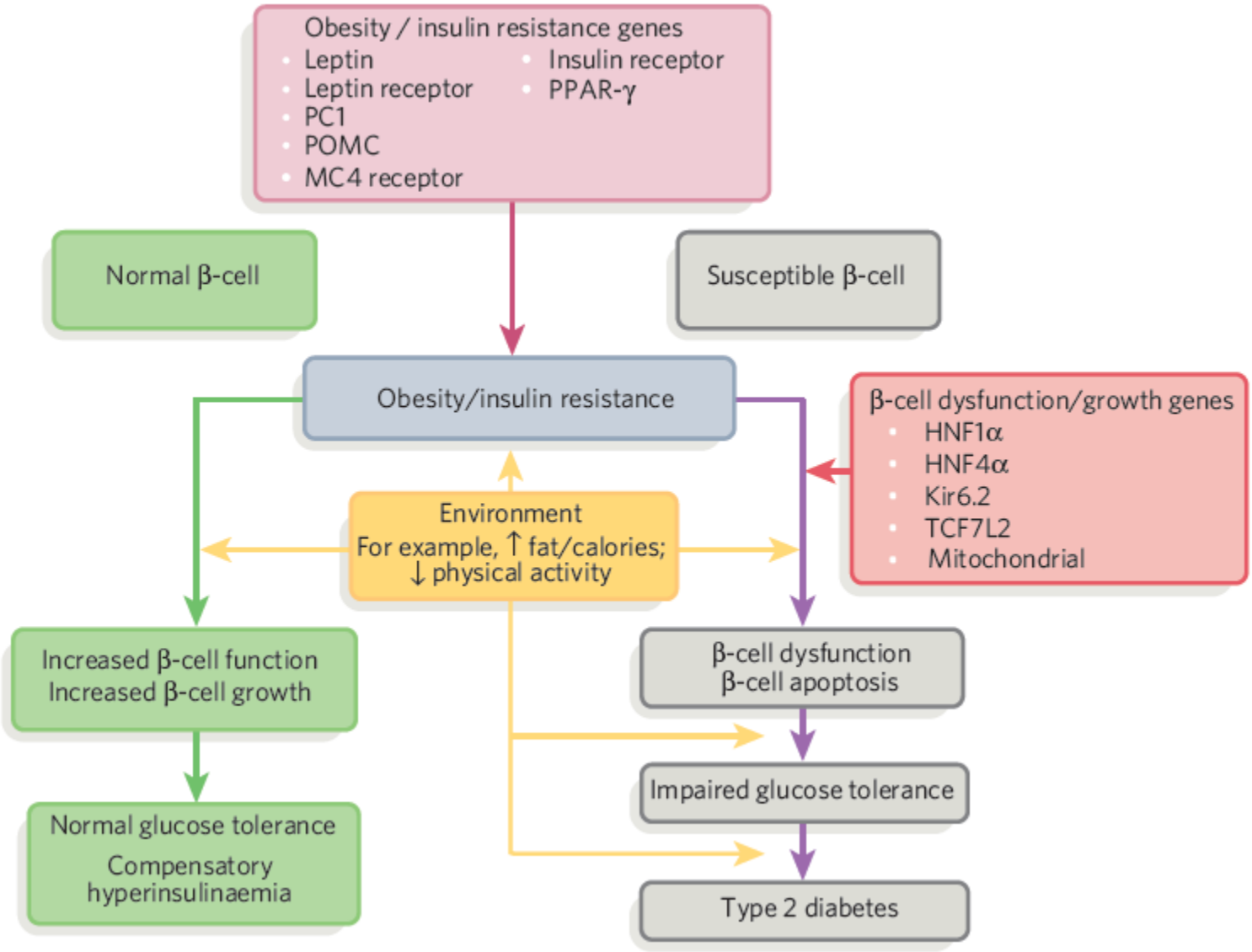
Cooperation between brain and islet in glucose homeostasis and diabetes

Michael W. Schwartz[1], Randy J. Seeley[2], Matthias H. Tschöp[3], Stephen C. Woods[4], Gregory J. Morton[1], Martin G. Myers[5] & David D'Alessio[2]

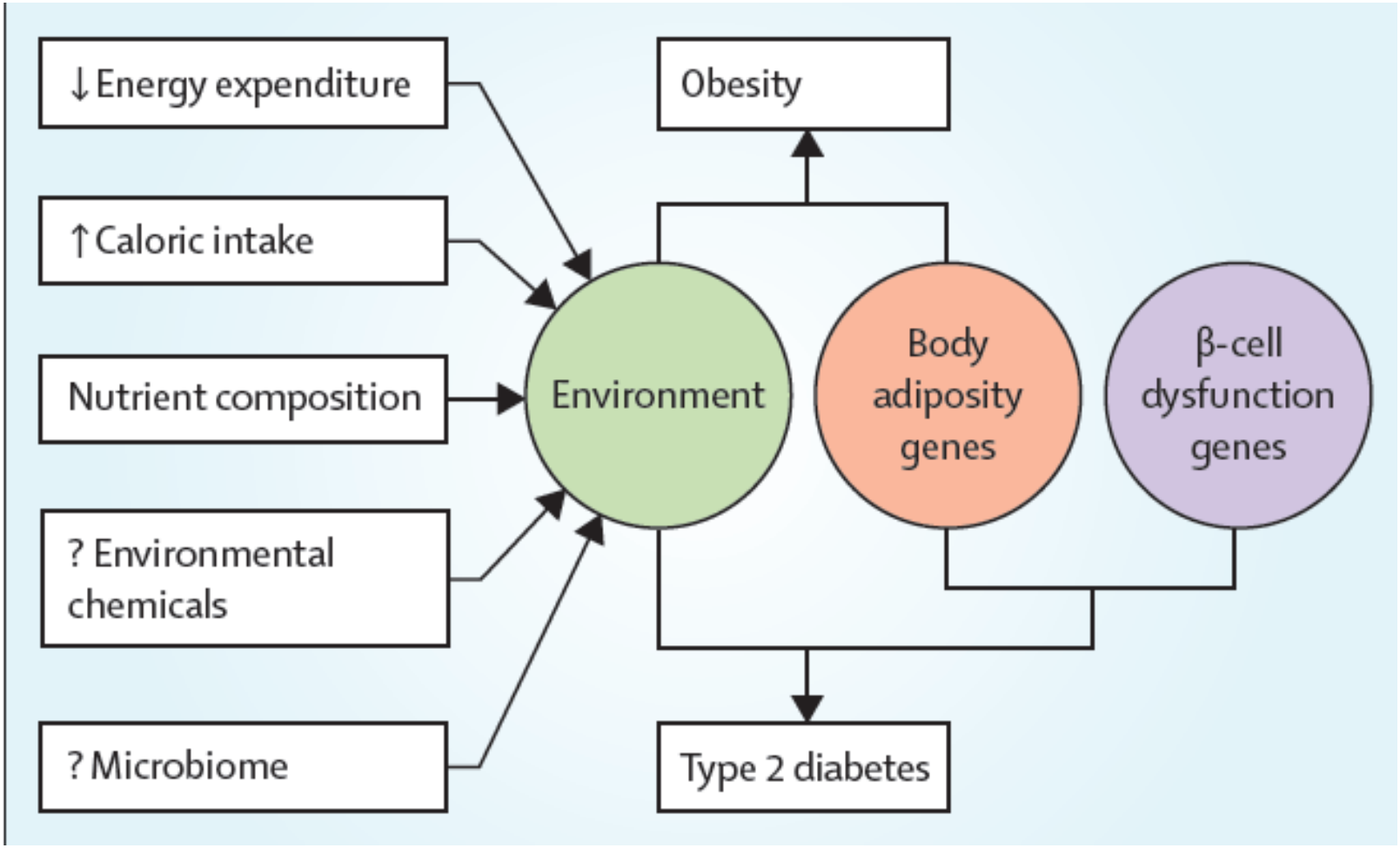
Traditional glucose homeostasis model



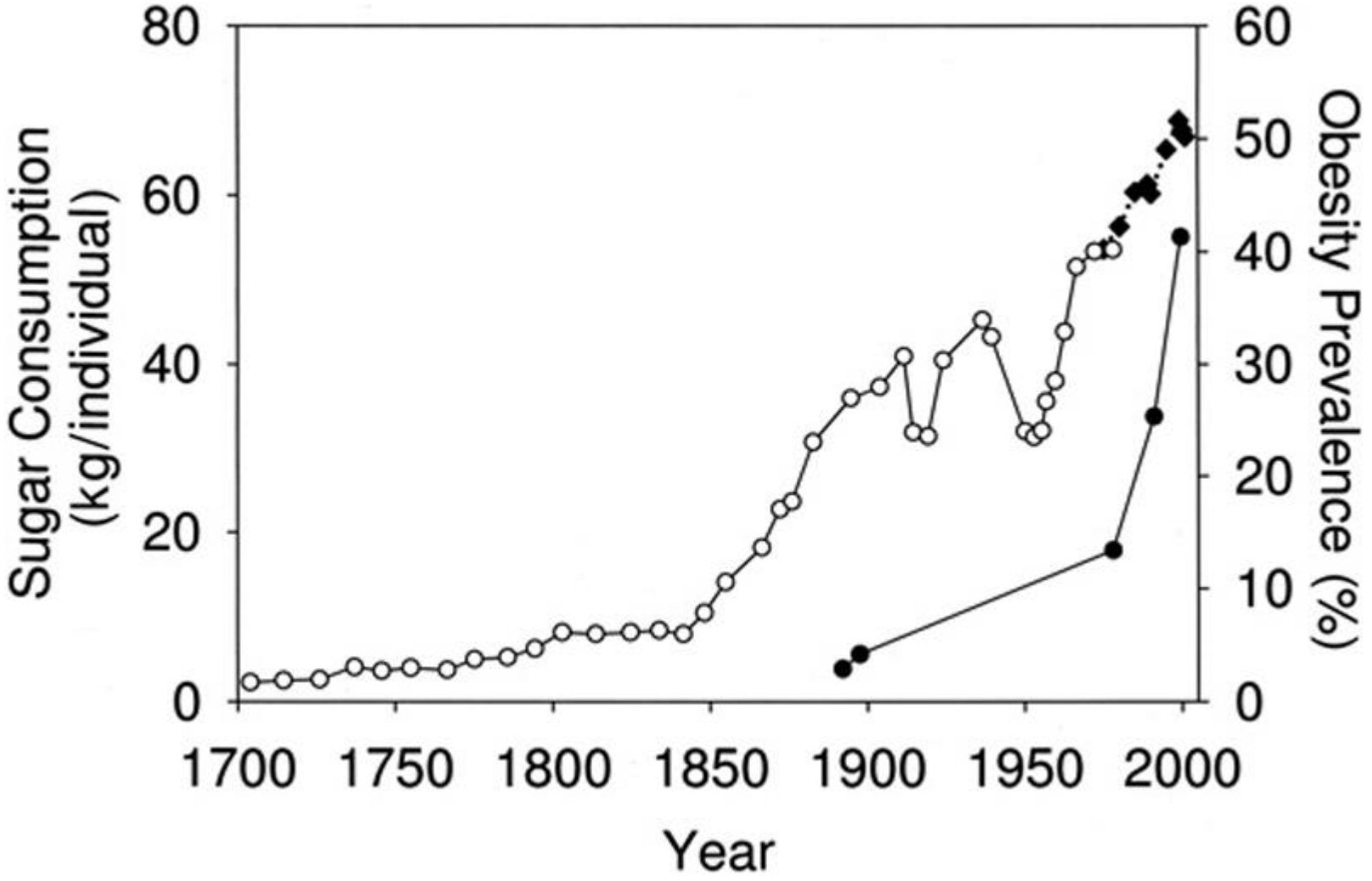
GENETICA. INSULINO-RESISTENZA E DISFUNZIONE β-CELLULA



FISIOPATOLOGIA DEL DIABETE MELLITO DI TIPO II



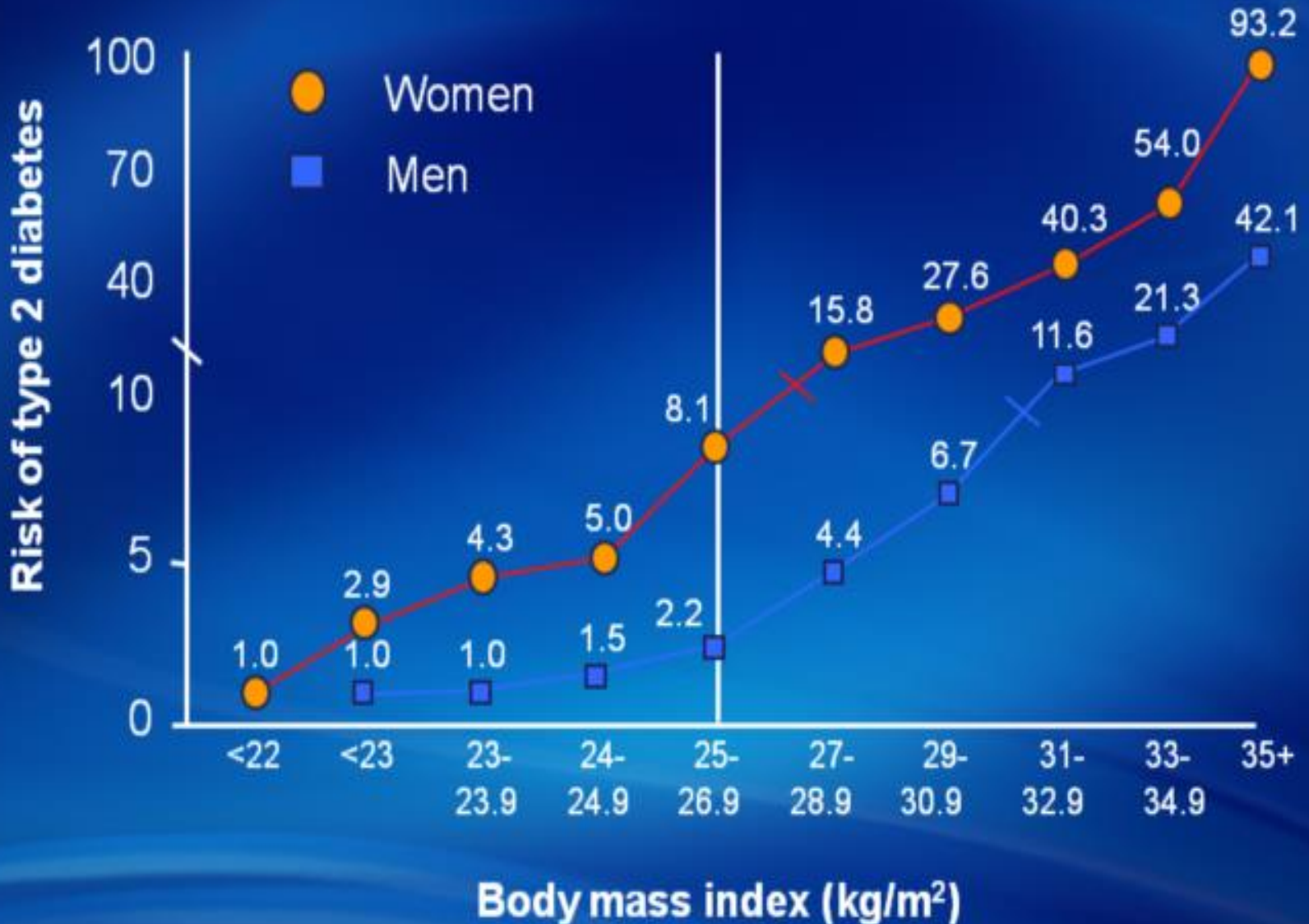
Fattori ambientali : la dieta



R J Johnson, 2007

- L’associazione fra DMT2 e Obesità riconosce una base genetica per ciascuna delle due malattie
- Fattori ambientali e comportamentali favoriscono la comparsa della diabesità
- Il tratto comune è rappresentato dall’Insulino-resistenza
- L’estrinsecazione fenotipica del DMT2 richiede l’esaurimento assoluto o relativo della funzione beta-insulare

The relationship between BMI and the risk of developing type 2 diabetes



ANNALS OF SURGERY
Vol. 222, No. 3, 339–352

Who Would Have Thought It?

An Operation Proves to Be the Most Effective Therapy for Adult-Onset Diabetes Mellitus

Walter J. Pories, M.D., Melvin S. Swanson, Ph
Stuart B. Long, B.S., Patricia G. Morris, B.S.N
Hisham A. Barakat, Ph.D., Richard A. deRam
Jeanette M. Dolezal, Ph.D., and Lynis Dohm,

patient, who presented on November 16, 1980, the day of surgery, with a plasma glucose level of 495 mg/dL and required 90 U of insulin before and during the operation. By the next day, her sliding-scale insulin requirement had decreased to 8 U, and, after the sixth postoperative day (November 22, 1980), she required no additional antidiabetic therapy and was maintaining her euglycemia.

Initially, we ascribed the remission of diabetes to weight loss resulting from food restriction. Postoperative patients do not eat much, especially with a small gastric pouch and a limited outflow through the 1-cm gastrojejunostomy. Our initial patients received no food by mouth for 4 days and received only 30 mL of a high-protein supplement every 4 hours, supplemented by water, during the next 2 weeks after surgery. With time, additional observation, and reflection, however, it became apparent that attributing the remission solely to weight loss was not logical.

Remissione di DMT2 dopo Chirurgia tempo di latenza e dieta

Authors	Source	Subjects (n)	BMI (kg/m²)	Diabetes /IGT	Time since operation	Diabetes improvement/ remission/ IGT reversal	Type of operation
Pories WJ et al.	Ann Surg 1987	141	⊠40	88/53	10 days	100%	RYGB
Rubino F et al.	Ann Surg 2004	6	⊠40	6	3 weeks	100%	RYGB
Cohen R et al.	Surg Obes Relat Dis 2006	37	<35	37	6 months	97%	RYGB
Smith BR et al.	Am Surg 2008	59	⊠40	59	1 month	42%	RYGB
Laferrère B et al.	Diabetes Care 2007	8	>35	8	1 month	100%	RYGB
Laferrère B et al.	JCEM 2008	9	⊠35	9	1 month	100%	RYGB
TOTAL 207/53 RYGB							
Mingrone et al.	Diabetologia 1997	7	⊠40	7	3 months	100%	BPD
Mingrone et al.	Diabetes 1999	2	21/20.1	2	3 weeks	100%	BPD
Guidone C et al.	Diabetes 2006	10	⊠40	10	1 week–1 month	100%	BPD
Mari A et al.	Diabetologia 2006	20	⊠40	11/9	1 week	100%	BPD
Scopinaro N et al.	Obes Surg 2008	443	⊠40	443	1–2 months	74%	BPD
Briatore L et al.	Obesity 2008	9	⊠40	9	1 month	100%	BPD
Salinari S et al.	Diabetes Care 2009	9	⊠40	9	1 month	100%	BPD
Chiellini C et al.	Diabetologia 2009	5	<35	5	1 month	100%	BPD
TOTAL 496/9 BPD							

G. Mingrone, 2009

Weight and Type 2 Diabetes after Bariatric Surgery: Systematic Review and Meta-analysis

Henry Buchwald, MD, PhD,[a] Rhonda Estok, RN, BSN,[b] Kyle Fahrbach, PhD,[b] Deirdre Banel, BA,[b] Michael D. Jensen, MD,[c] Walter J. Pories, MD,[d] John P. Bantle, MD,[e] Isabella Sledge, MD, MPH[b]

Table 6 Efficacy Outcomes for Weight Reduction in Diabetic Patients: Meta-Analyses

	Total				Gastric Banding			
	t (N)	Mean Change (95% CI)	Q-pval	I^2	t (N)	Mean Change (95% CI)	Q-pval	I^2
Total Diabetic Patients[b]								
Absolute weight (kg)	9 (452)	**−40.55 (−51.92, −29.19)****	<.001	87%	3 (23)	**−17.28 (−26.65, −7.92)**	.702	0%
BMI (kg/m²)	11 (723)	**−13.57 (−17.00, −10.15)****	<.001	95%	4 (111)	**−8.34 (−10.61, −6.08)**	.167	41%
% EBWL	7 (540)	**64.42 (58.96, 69.89)****	<.001	94%	1 (88)	**51.90 (48.35, 55.45)**	—	—
Treatment Arms with Outcome at <2 y								
Absolute weight (kg)	5 (147)	**−38.22 (−54.18, −22.21****	<.001	81%	2 (6)	**−22.03 (−37.42, −6.63)**	.721	0%
BMI (kg/m²)	7 (344)	**−13.99 (−18.71, −9.26)****	<.001	90%	2 (6)	**−7.61 (−11.44, −3.78)**	.785	0%
% EBWL	5 (421)	**67.10 (62.27, 71.93)****	<.001	91%	—	—	—	—
Treatment Arms with Outcome at ≥2 y								
Absolute weight (kg)	4 (305)	**−42.88 (−61.35, −24.42)****	<.001	92%	1 (17)	**−14.50 (−26.28, −2.72)**	—	—
BMI (kg/m²)	4 (379)	**−12.86 (−8.33, −7.38)****	<.001	98%	2 (105)	**−8.37 (−11.94, −4.79)***	.04	76%
% EBWL	2 (119)	**58.01 (45.48, 70.54)****	<.001	91%	1 (88)	**51.90 (48.35, 55.45)**	—	—

	Gastric Bypass[a]				Biliopancreatic Diversion/Duodenal Switch			
	t (N)	Mean Change (95% CI)	Q-pval	I^2	t (N)	Mean Change (95% CI)	Q-pval	I^2
Total Diabetic Patients[b]								
Absolute weight (kg)	3 (161)	**−42.65 (−50.94, −34.35)***	.05	67%	3 (268)	**−56.30 (−66.41, −46.18)****	.009	79%
BMI (kg/m²)	4 (341)	**−16.14 (−16.86, −15.42)**	.826	0%	3 (271)	**−16.47 (−26.06, −6,89)****	<.001	95%
% EBWL	6 (452)	**66.74 (62.58, 70.89)****	<.001	88%	—	—	—	—
Treatment Arms with Outcome at <2 y								
Absolute weight (kg)	2 (130)	**−38.71 (−55.37, −22.06)***	.016	83%	1 (11)	**−65.50 (−81.63, −49.37)**	—	—
BMI (kg/m²)	3 (310)	**−16.04 (−16.81, −15.26)**	.813	0%	2 (28)	**−15.56 (−32.22, 1.10)****	<.001	97%
% EBWL	5 (421)	**67.10 (62.27, 71.93)****	<.001	91%	—	—	—	—
Treatment Arms with Outcome at ≥2 y								
Absolute weight (kg)	1 (31)	**−46.20 (−49.89, −42.51)**	—	—	2 (257)	**−53.79 (−65.05, −42.53)***	.016	83%
BMI (kg/m²)	1 (31)	**−16.80 (−18.80, −14.80)**	—	—	1 (243)	**−18.10 (−19.12, −17.08)**	—	—
% EBWL	1 (31)	**64.70 (58.26, 71.14)**	—	—	—	—	—	—

t = number of treatment groups; N = number of patients evaluated; CI = confidence interval; Q-pval = *P* value for test of homogeneity of effects; I^2 = the percentage of total variation across studies that is due to heterogeneity rather than chance; BMI = body mass index; EBWL = excess body weight lost.

BOLD font indicates a statistically significant preoperative versus postoperative difference within the surgery category:

[a]Two treatment arms perform gastric bypass with an additional Silastic ring gastroplasty.

Table 8 Overview of Weight Loss, Surgical Procedure, and Diabetes Resolution

	Total	Gastric Banding	Gastroplasty	Gastric Bypass	BPD/DS
% EBWL	55.9	46.2	55.5	59.7	63.6
% Resolved overall	78.1	56.7	79.7	80.3	95.1
% Resolved <2 y	80.3	55.0	81.4	81.6	94.0
% Resolved ≥2 y	74.6	58.3	77.5	70.9	95.9

%EBWL = percent excess body weight loss; BPD/DS = biliopancreatic diversion/duodenal switch.

3

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Top Ten
IN GASTROENTEROLOGIA

- Il rischio di DMT2 è correlato al B.M.I.
- Ogni intervento, medico o chirurgico, capace di ridurre il BMI in associazione a un corretto stile di vita è in grado di controllare la comparsa del DMT2
- Alcuni interventi chirurgici sono in grado agire indipendentemente dalla riduzione di peso

INDICAZIONI STORICHE ALLA CHIRURGIA DEL DIABETE

- DMT2
  - B.M.I. > 40, senza altra complicanza dell'obesità
  - B.M.I. > 35, con altra complicanza dell'obesità
  - B.M.I. > 30* [NICE, CG 189,2014)

OBBIETTIVI DELLA CHIRURGIA METABOLICA

- Controllo glicemico
  - glicemia preprandiale : 80-130 mg/dl
  - glicemia postprandiale: < 180 mg/dl
  - HbA1C < 6.5% -7%
- Controllo ipertensione
  - P.A. sistolica : <130-140 mmHg
  - P.A. diastolica: < 80-90 mmHg
- Controllo dislipidemia
  - Chol. non-HDL < 130 mg/dl
  - Chol-LDL < 100 mg/dl
  - Trigliceridi < 150 mg/dl

Indicazioni alla Chirurgia metabolica

- DMT2
- Paziente giovane (< 55 anni)
- HbA1C > 7%
- Glicemia preprandiale > 150 mg/dl
- Glicemia postprandiale > 175 mg/dl
- B.M.I. > 30 Kg/ m^2
- Breve storia clinica
- Lunga aspettativa di vita
- Presenza di ipertensione, dislipidemia, sindrome ovaio policistico, acantosi nigricans
- Resistenza alla terapia medica (no insulina)

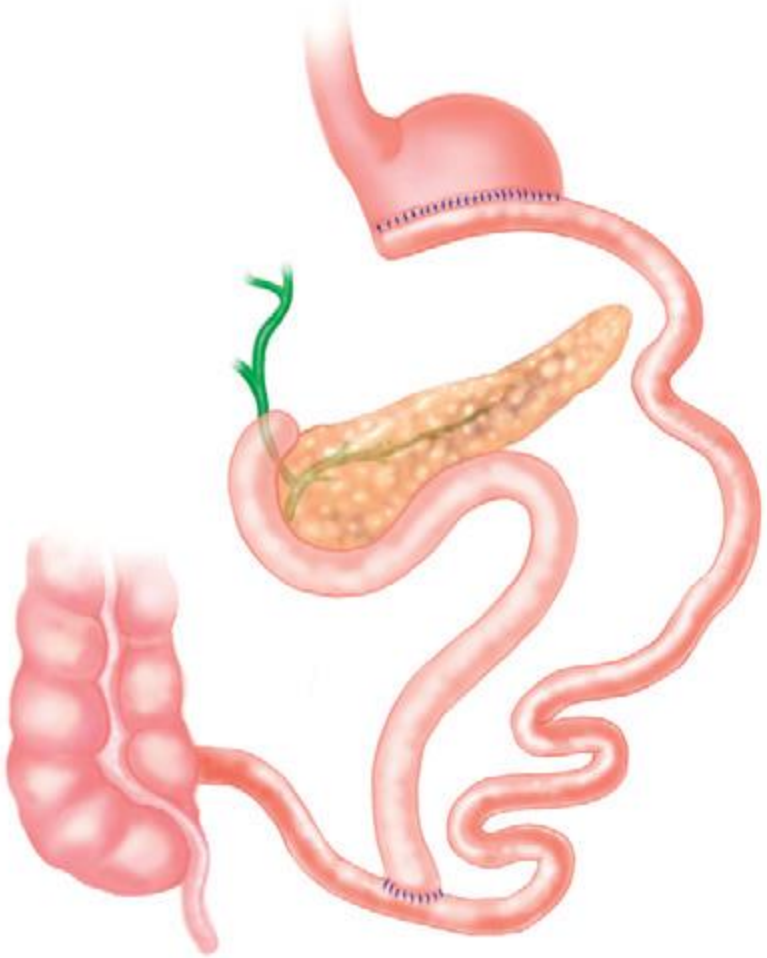
4

8^ edizione
Top Ten
IN GASTROENTEROLOGIA

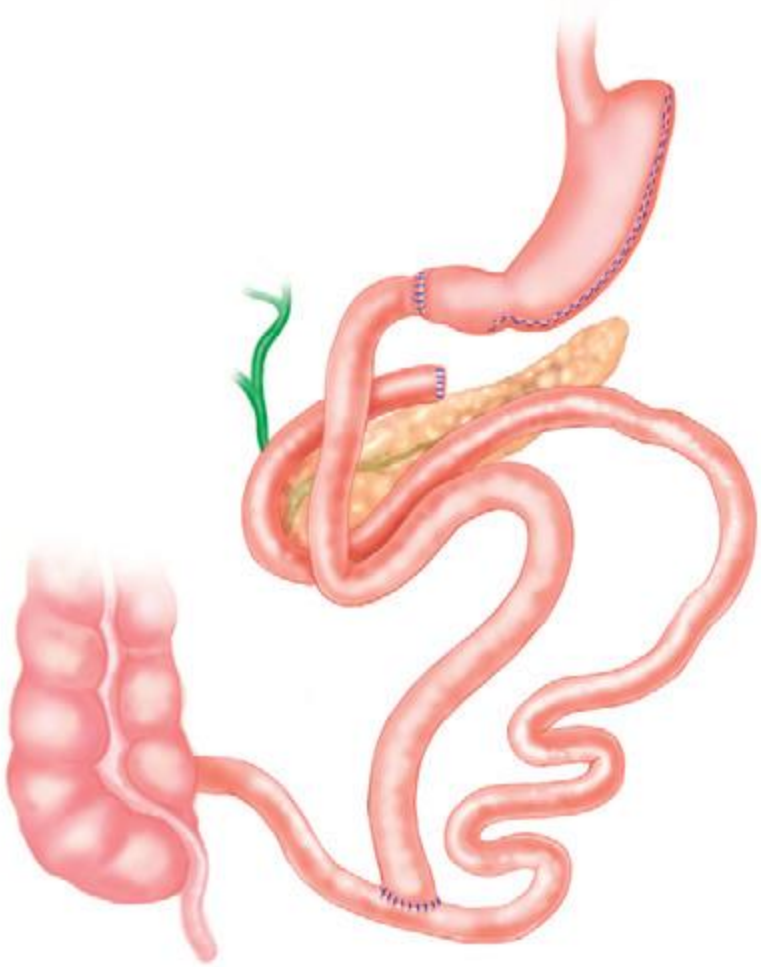
- La chirurgia del diabete mellito di tipo 2 è a tutti gli effetti “ chirurgia metabolica “, comportando la riduzione/normalizzazione della pressione arteriosa, la remissione del DMT2, la risoluzione della dislipidemia

BENDAGGIO GASTRICO REGOLABILE

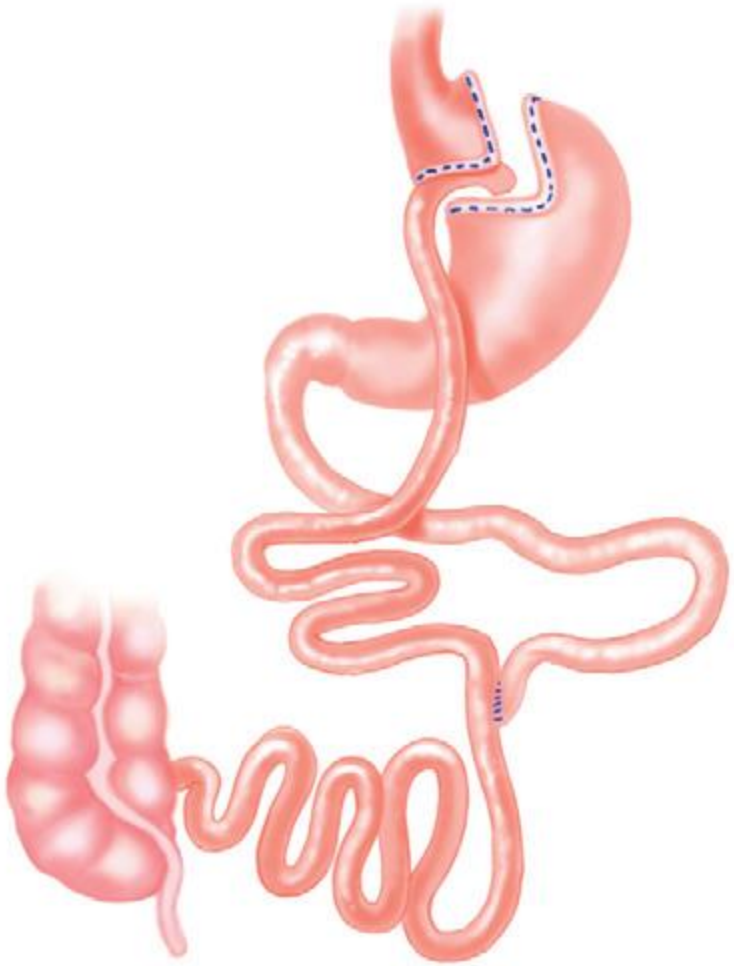
Diversione bilio-pancreatica



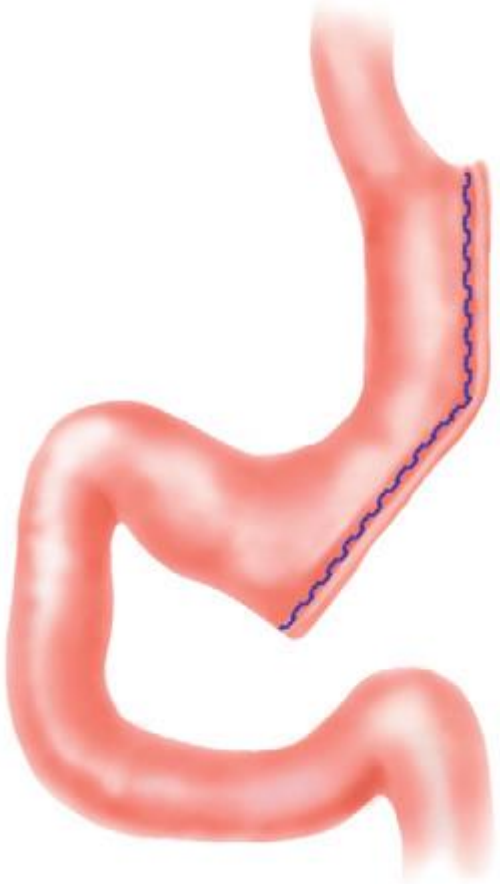
Sleeve gastrectomy-duodenal switch



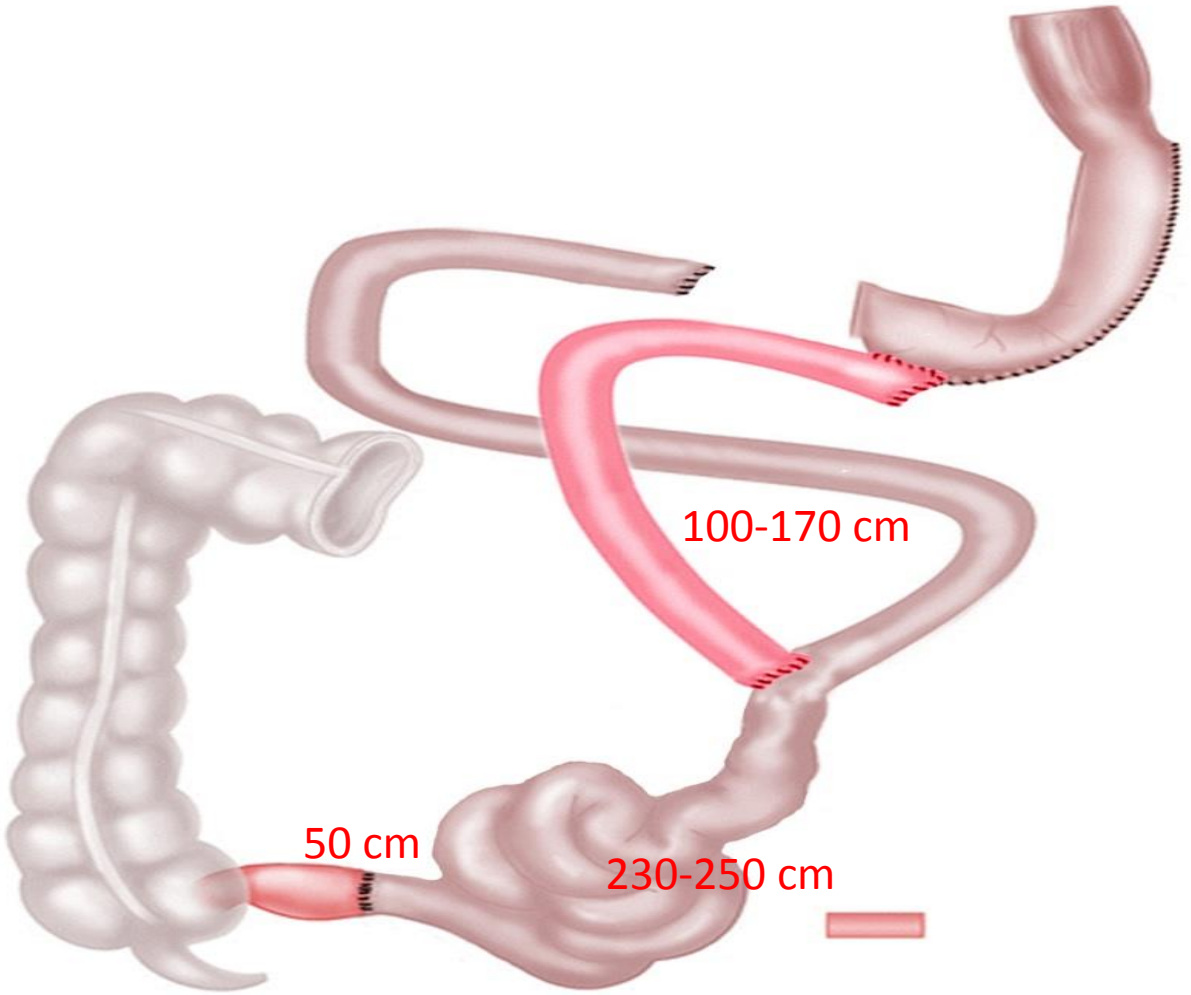
BY PASS GASTRICO ROUX-Y



Sleeve gastrectomy



Sleeve gastrectomy with d-d-ileal interposition



Gastric bypass in Type 2 diabetes with BMI < 30: weight and weight loss have a major influence on outcomes

Table 3 The 4 variables associated with remission of Type 2 diabetes (HbA1c ≤ 6%), showing the quartiles of each variable and the percentage in remission for each quartile

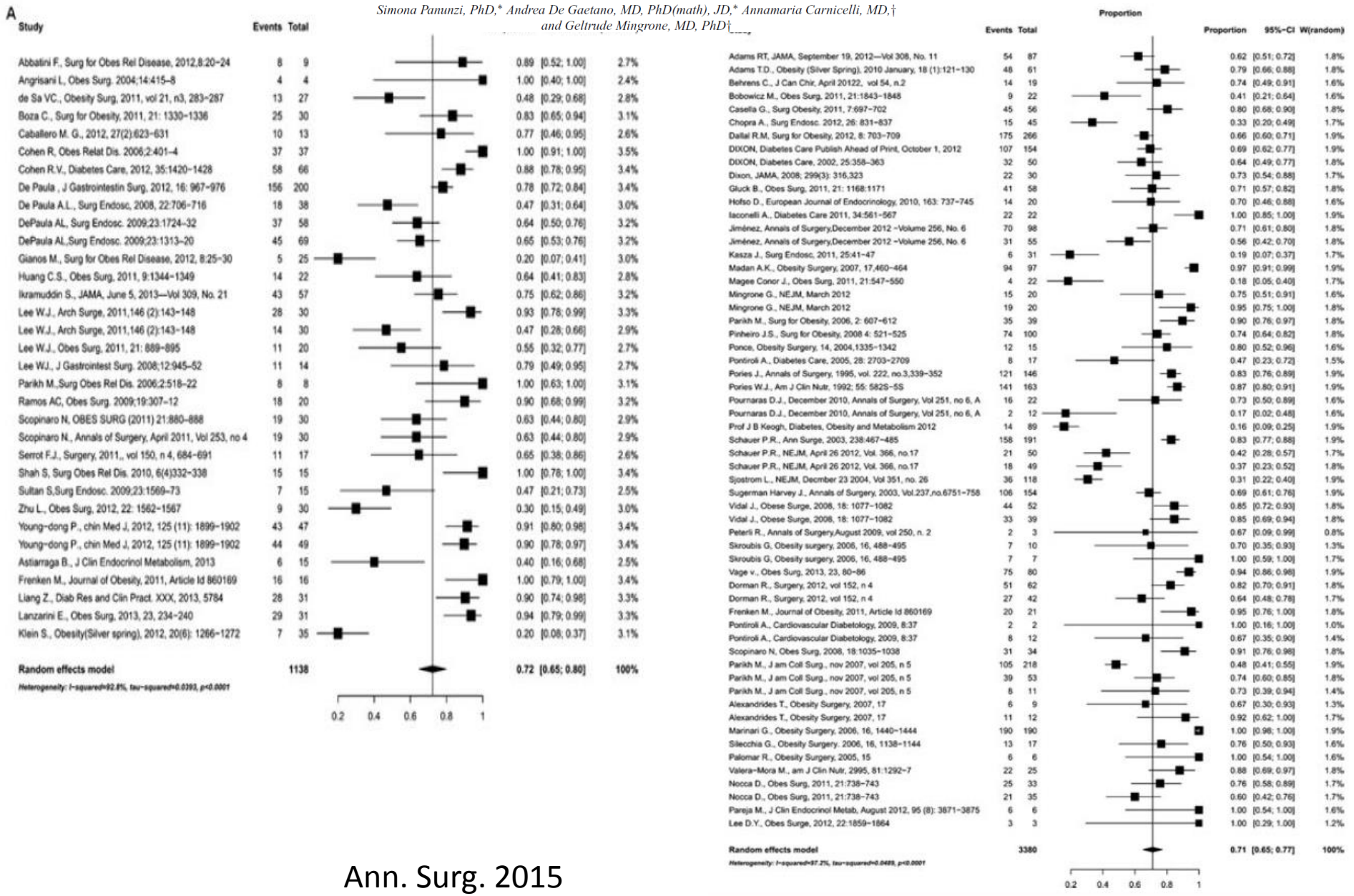
	Lowest Q	Quartile 2	Quartile 3	Highest Q
Diabetes duration (years)	< 5years	5, < 8years	8, < 10years	> 10years
% Remission	50	37.5	23.1	16.7
Baseline C-peptide (ng/ml)	< 2.0	2.0, < 2.4	2.4, < 3.3	> 3.3
% Remission	11.1	21.7	41.4	45.8
Baseline BMI (kg/m2)	< 24	24, < 26.1	26.1, < 28.6	> 28.6
% Remission	18.5	15.4	37.0	52.2
% Weight loss 1 year, (%)	< 9.1	9.1, < 14.8	14.8, < 20.5	> 20.5
% Remission	4.8	17.4	27.3	63.6

J.B. Dixon, 2012

Predictors of Remission of Diabetes Mellitus in Severely Obese Individuals Undergoing Bariatric Surgery: Do BMI or Procedure Choice Matter?

A Meta-analysis

Simona Panunzi, PhD, Andrea De Gaetano, MD, PhD(math), JD,* Annamaria Carnicelli, MD,† and Geltrude Mingrone, MD, PhD†*



Ann. Surg. 2015

DMT2 e Chirurgia metabolica

L’equilibrata riduzione del peso corporeo è uno degli scopi della chirurgia metabolica

Plasma insulin and glucose time courses after biliary pancreatic diversion in morbidly obese patients with and without diabetes

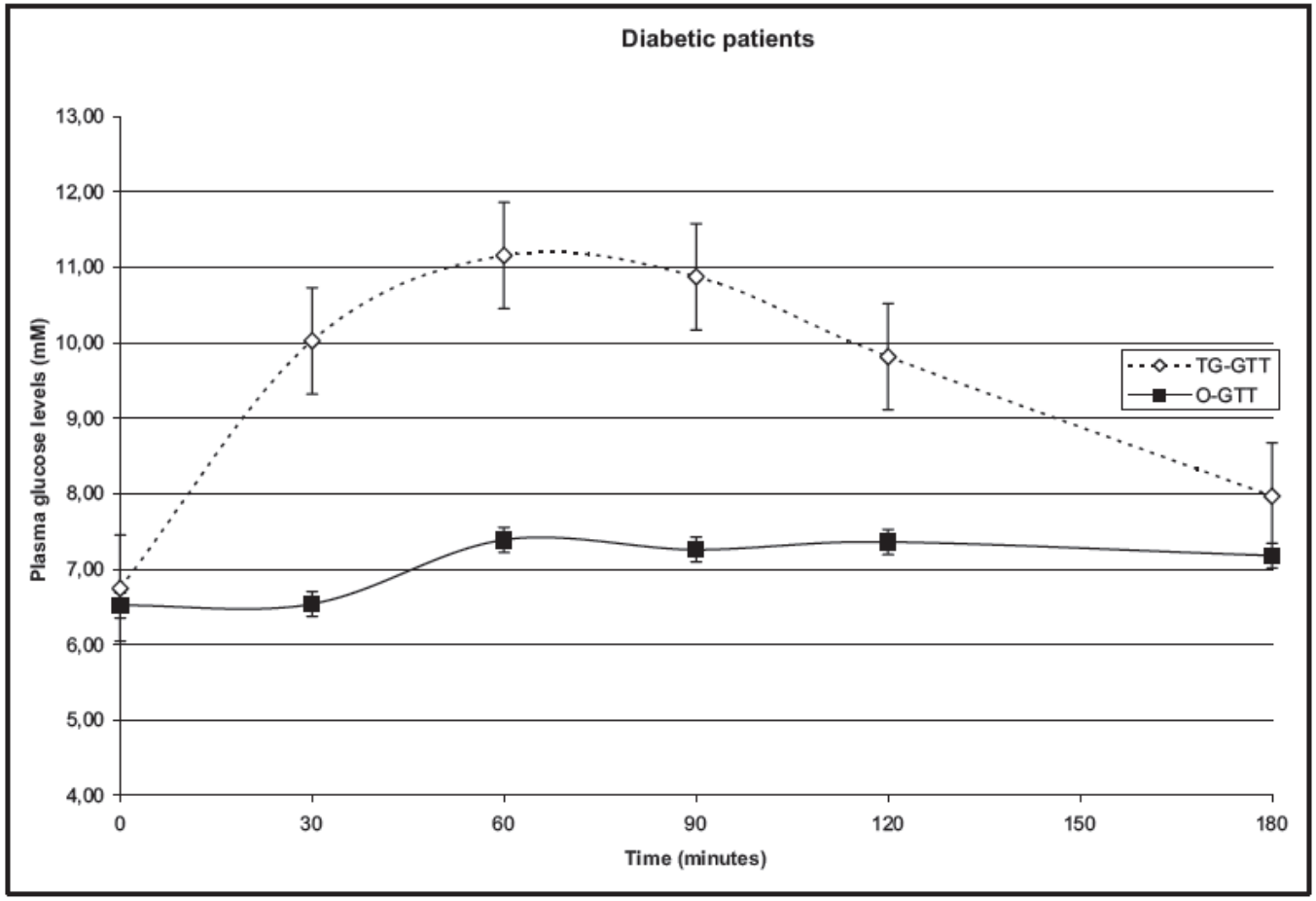


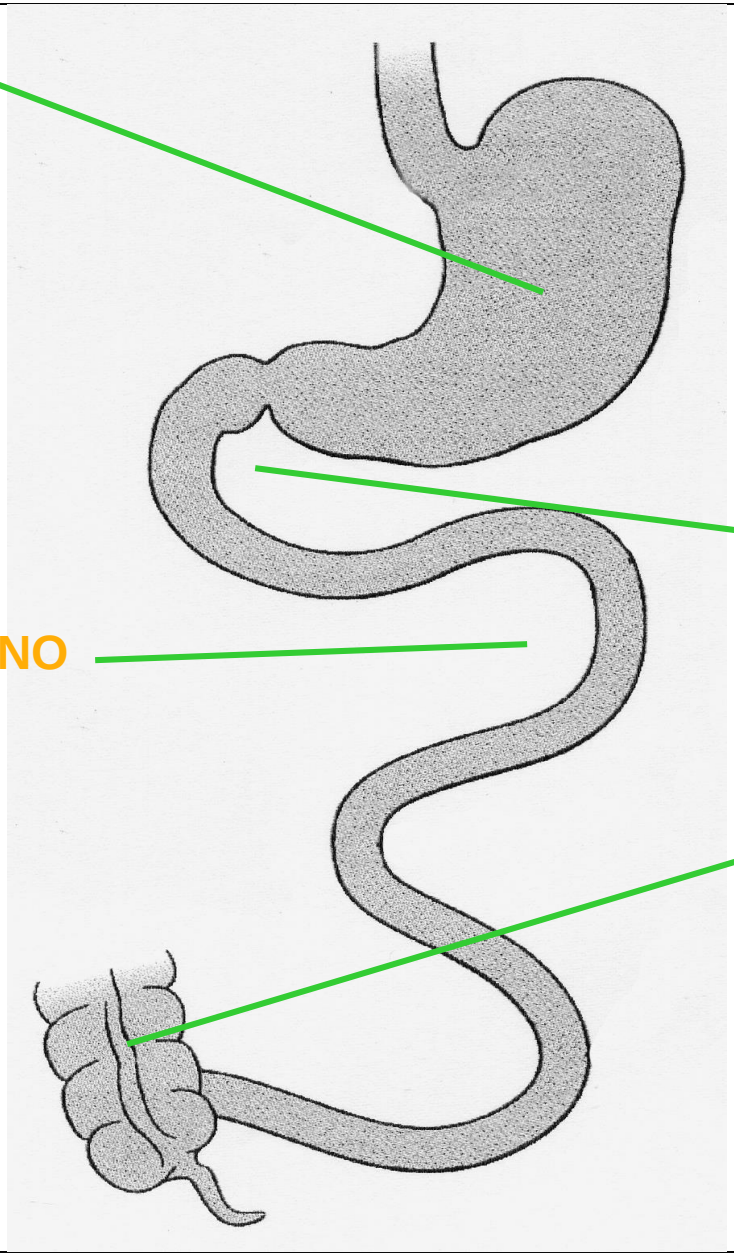
Figure 1 Diabetic patients (n = 5): time courses of plasma glucose after TG-GTT and O-GTT after BPD. Data are expressed as means ± standard error.

G.Currò, G.Navarra, 2012

DMT2 ed esclusione duodenale

- L’esclusione del duodeno dal circuito cibale esercita un effetto favorevole sul controllo della glicemia
- Il meccanismo d’azione dell’esclusione duodenale è ancora sconosciuto

Apparato endocrino gastro-intestinale



STOMACO

- *Gastrina*
- *Somatostatina*
- *VIP*
- *GRP*
- *Grelina*
- *Leptina*

DUODENO-DIGIUNO

- *Secretina*
- *GIP*
- *GLP-1*
- *Motilina*
- *CCK*

PANCREAS

- *PP*
- *NPY*
- *Galanina*
- *Amilina*
- *Enterostatine*

ILEO-COLON

- *PPY*
- *Neurotensina*
- *Oxintomodulina*
- *Sostanza P*

Effect of Weight Loss by Gastric Bypass Surgery *Versus Hypocaloric Diet on Glucose and Incretin* Levels in Patients with Type 2 Diabetes

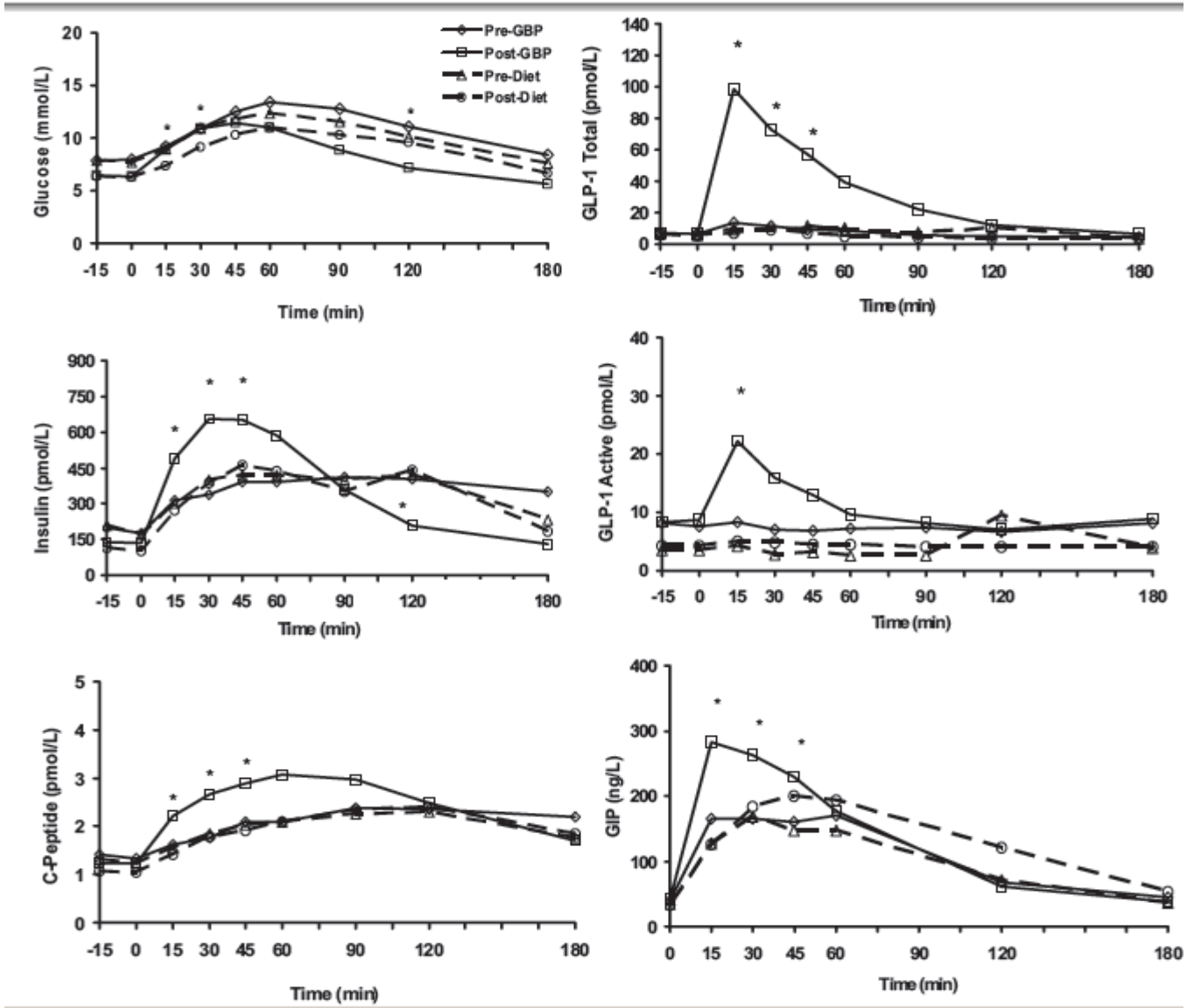
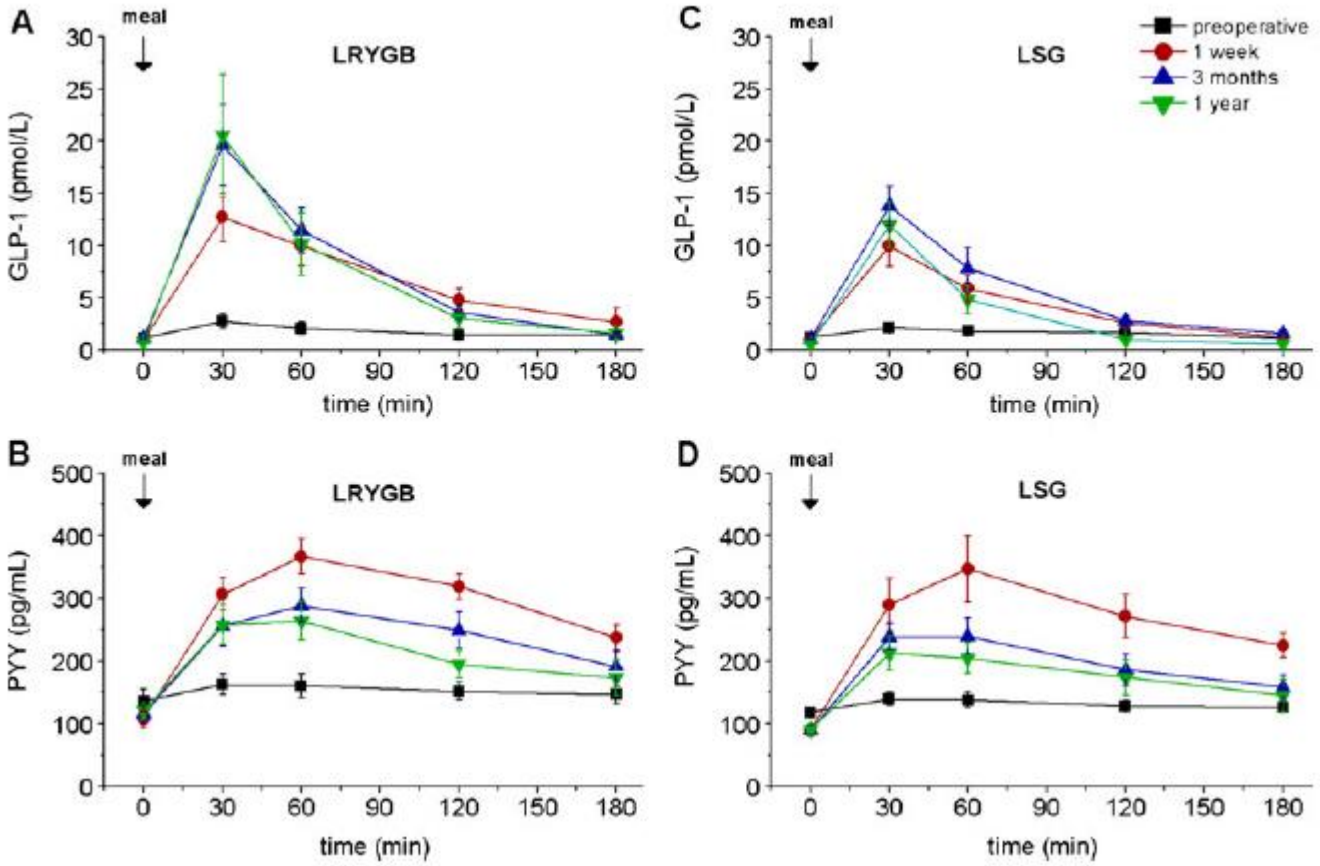
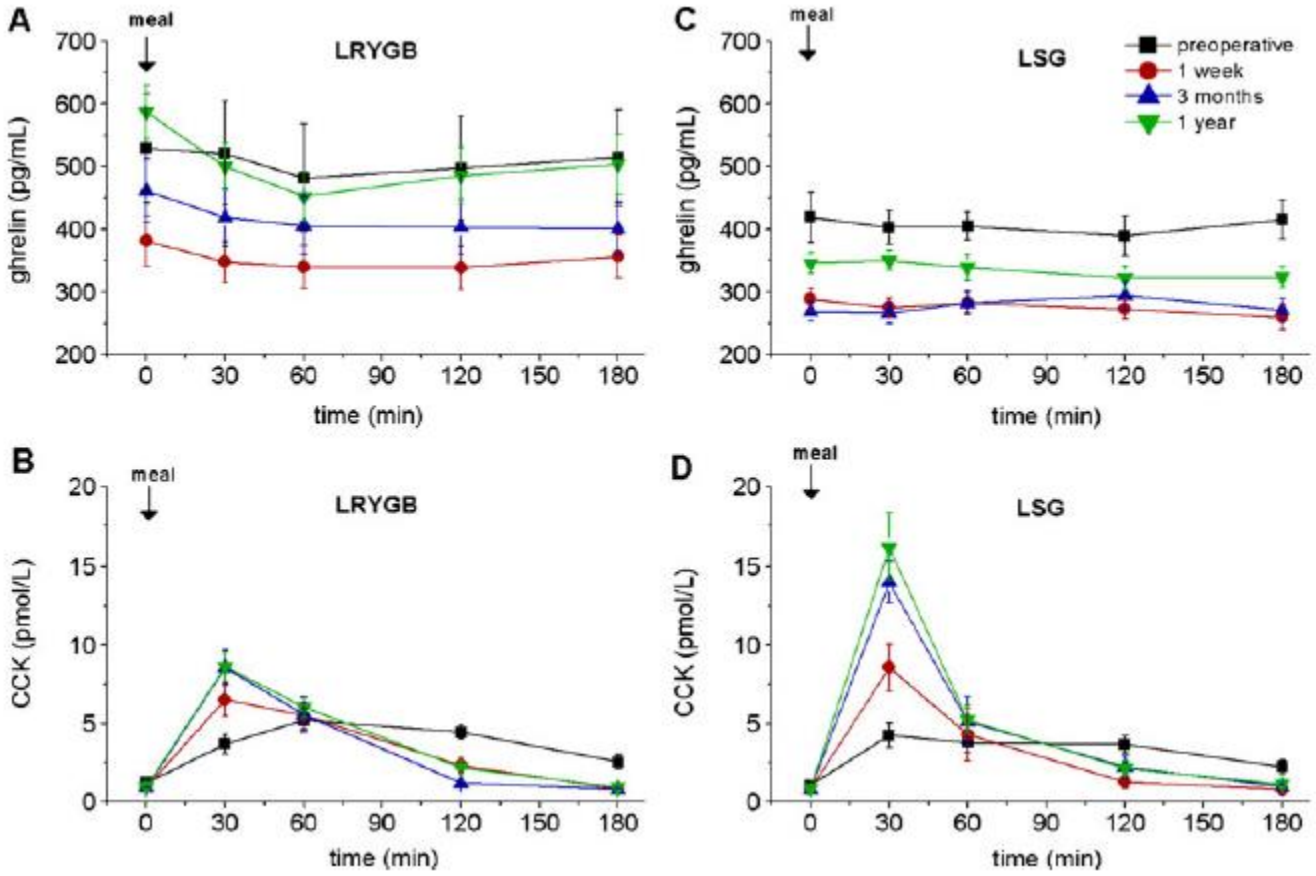


FIG. 1. Glucose, insulin, C peptide, glucagon, total and active GLP-1 and GIP levels during the OGTT in patients before (*diamond) and after (square) GBP*

B. Laferrère,2008



R Peterli, 2012



R.Peterli, 2012

Ruolo delle incretine nella chirurgia bariatrica

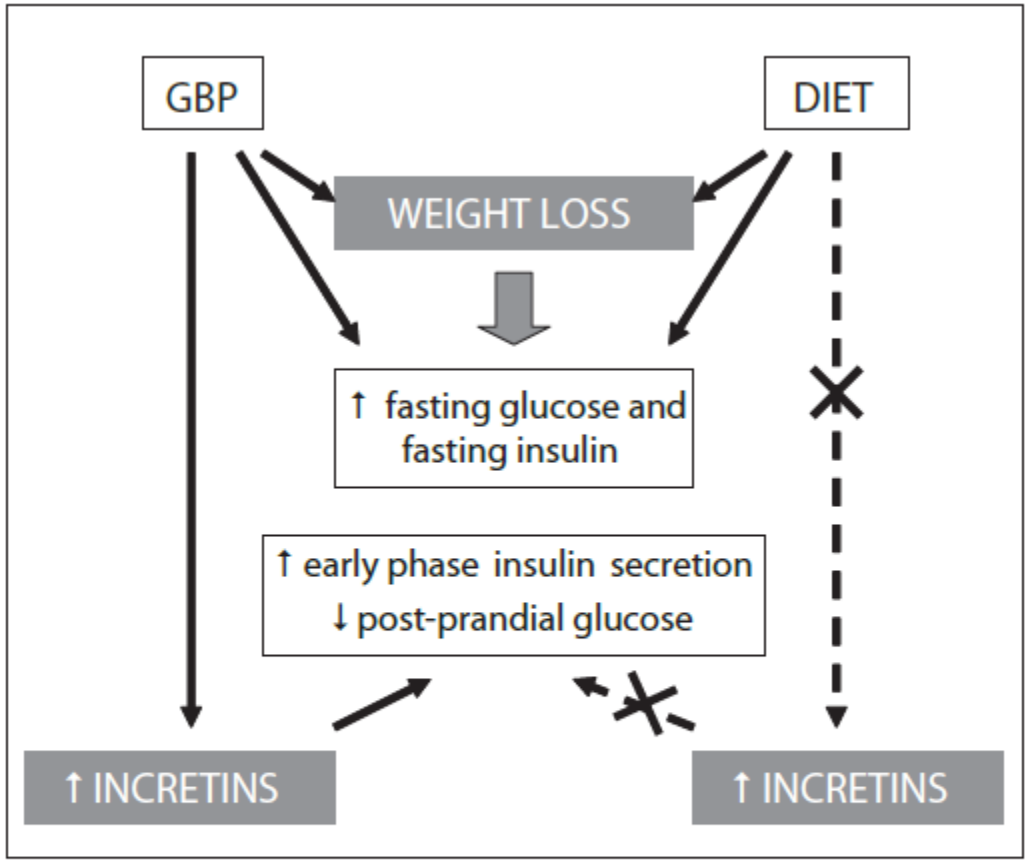


Fig. 2. Model of the mechanisms of diabetes control after weight loss by gastric bypass surgery (GBP) and diet. Both diet and GBP induce weight loss and decrease similarly fasting glucose and insulin. GBP, but not diet increases incretin levels and effect, improves early phase insulin secretion and decreases post-prandial glucose.

Chirurgia metabolica ed incretine

- L’aumento della secrezione di GLP-1 a livello enterico è l’elemento chiave per ottenere l’incremento della secrezione insulinica.
- Le modificazioni di PYY, FGF-19 e altri entero-ormoni hanno significato complementare.

5

8^ edizione
Top Ten
IN GASTROENTEROLOGIA

- I meccanismi d’azione della chirurgia metabolica sono rappresentati da:
- Riduzione dell’insulino-resistenza per effetto bariatrico
- Effetto incretinico indiretto per esclusione del transito duodenale
- Effetto incretinico diretto per stimolazione di GLP1-2, PYY, FGF-19 ed altre enterochine

Criteri di valutazione della terapia del DMT2

Table 1—*Summary of consensus definitions and recommendations*

Definitions
- Partial remission
  - Hyperglycemia below diagnostic thresholds for diabetes
  - At least 1 year's duration
  - No active pharmacologic therapy or ongoing procedures
- Complete remission
  - Normal glycemic measures
  - At least 1 year's duration
  - No active pharmacologic therapy or ongoing procedures
- Prolonged remission
  - Complete remission of at least 5 years' duration

How do we define cure of diabetes?

J.B. Buse et al, 2009

RISULTATI DELLA TERAPIA MEDICA DEL DMT2

Criterio	n.pazienti	n. casi	Incidenza (7 anni)
Remissione parziale	587.341	1.615	1.47%
Remissione completa	593.216	140	0.14%
Remissione prolungata	170.356	6	0.007%

A.J. Karter
Diabetes Care, 2014

RISULTATI DELLA TERAPIA CHIRURGICA DEL DMT2

Autore	N	Follow-up	Intervento	Rem.	Δ Kg
JB Dixon 2008	60	2 anni	LAGB	73%	-21.1
G Mingrone 2012	60	2 anni	RY-GBP BPD	7 95%	-43 -46
PR Schauer 2012	150	1 anno	LSG RY-GBP	37% 42%	-25.1 -29.4
S Ikrammudin 2013	120	1 anno	RY-GBP	49%	-26.1
AP Courcoulas 2014	69	1anno	LAGB	25%	-18
F Halperin 2014	38	1 anno	RY-GBP	58%	-27.8
PR Schauer 2014	150	3 anni	LSG RY-GBP	24% 38%	-21.3 -26.2
SA Ding 2015	40	1 anno	LAGB	33%	-13.7
AP Courcoulas 2015	61	3 anni	LAGB RY-GBP	29% 40%	-14.9 -24.6

The NEW ENGLAND JOURNAL of MEDICINE

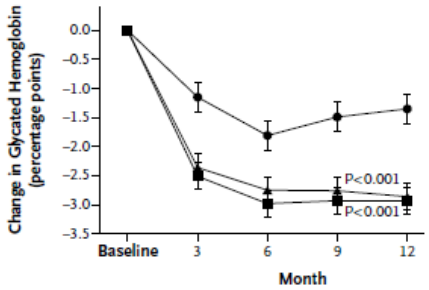
ESTABLISHED IN 1812 APRIL 26, 2012 VOL. 366 NO. 17

Bariatric Surgery versus Intensive Medical Therapy in Obese Patients with Diabetes

Philip R. Schauer, M.D., Sangeeta R. Kashyap, M.D., Kathy Wolski, M.P.H., Stacy A. Brethauer, M.D., John P. Kirwan, Ph.D., Claire E. Pothier, M.P.H., Susan Thomas, R.N., Beth Abood, R.N., Steven E. Nissen, M.D.,

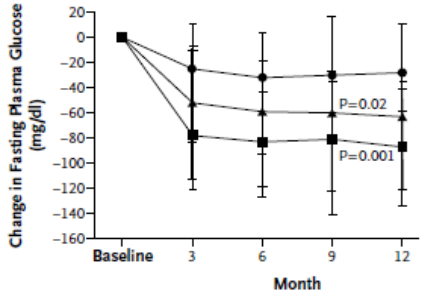
● Intensive medical therapy ■ Roux-en-Y gastric bypass ▲ Sleeve gastrectomy

A Change in Glycated Hemoglobin



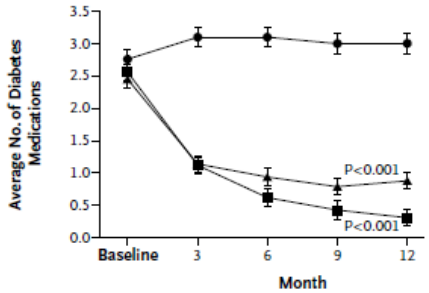
Value at Visit					
Intensive medical therapy	8.9	7.7	7.1	7.4	7.5
Roux-en-Y gastric bypass	9.3	6.8	6.3	6.4	6.4
Sleeve gastrectomy	9.5	7.1	6.7	6.7	6.6

B Change in Fasting Plasma Glucose



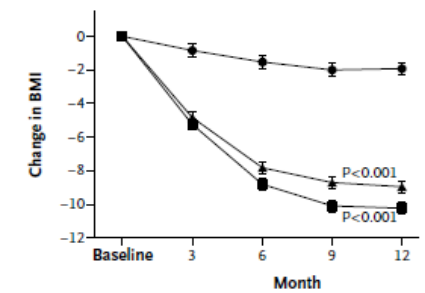
Value at Visit					
Intensive medical therapy	155	122	113	120	120
Roux-en-Y gastric bypass	193	109	96	96	99
Sleeve gastrectomy	164	118	104	102	97

C Average No. of Diabetes Medications



Value at Visit					
Intensive medical therapy	2.8	3.1	3.1	3.0	3.0
Roux-en-Y gastric bypass	2.6	1.1	0.6	0.4	0.3
Sleeve gastrectomy	2.4	1.1	0.9	0.8	0.9

D Change in BMI



Value at Visit					
Intensive medical therapy	36.3	35.4	34.8	34.5	34.4
Roux-en-Y gastric bypass	37.0	31.8	28.2	26.9	26.8
Sleeve gastrectomy	36.1	31.3	28.3	27.3	27.2

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Bariatric Surgery versus Conventional Medical Therapy for Type 2 Diabetes

Geltrude Mingrone, M.D., Simona Panunzi, Ph.D., Andrea De Gaetano, M.D., Ph.D., Caterina Guidone, M.D., Amerigo Iaconelli, M.D., Laura Leccesi, M.D., Giuseppe Nanni, M.D., Alfons Pomp, M.D., Marco Castagneto, M.D., Giovanni Ghirlanda, M.D., and Francesco Rubino, M.D.

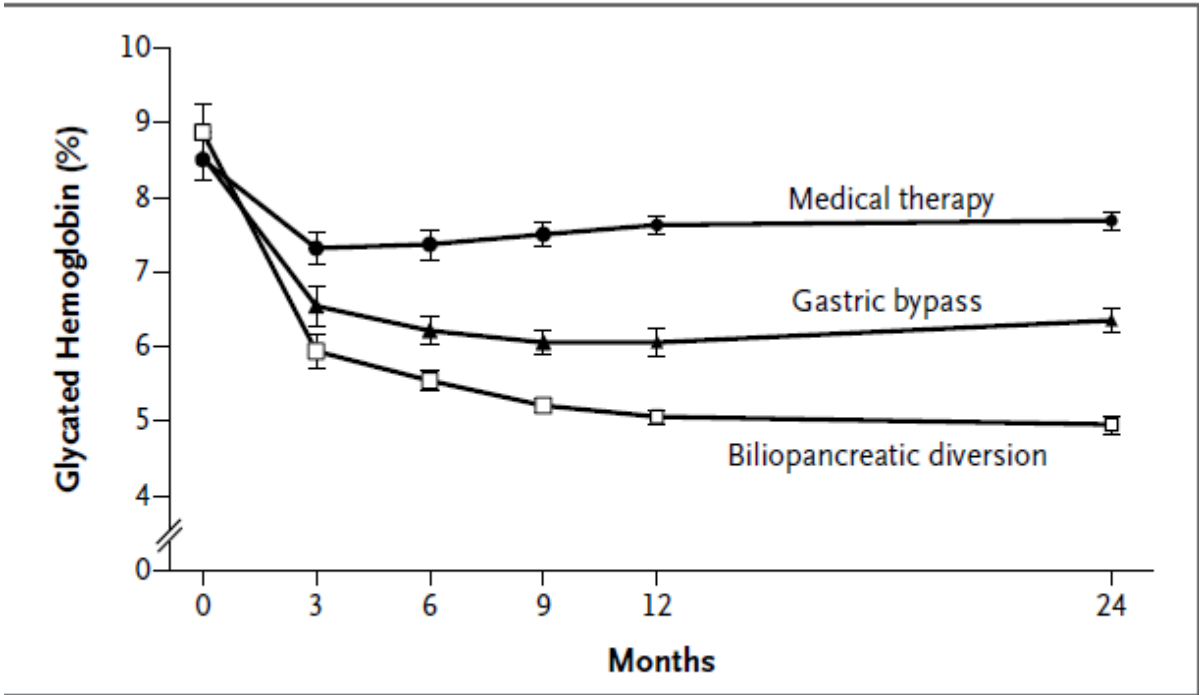
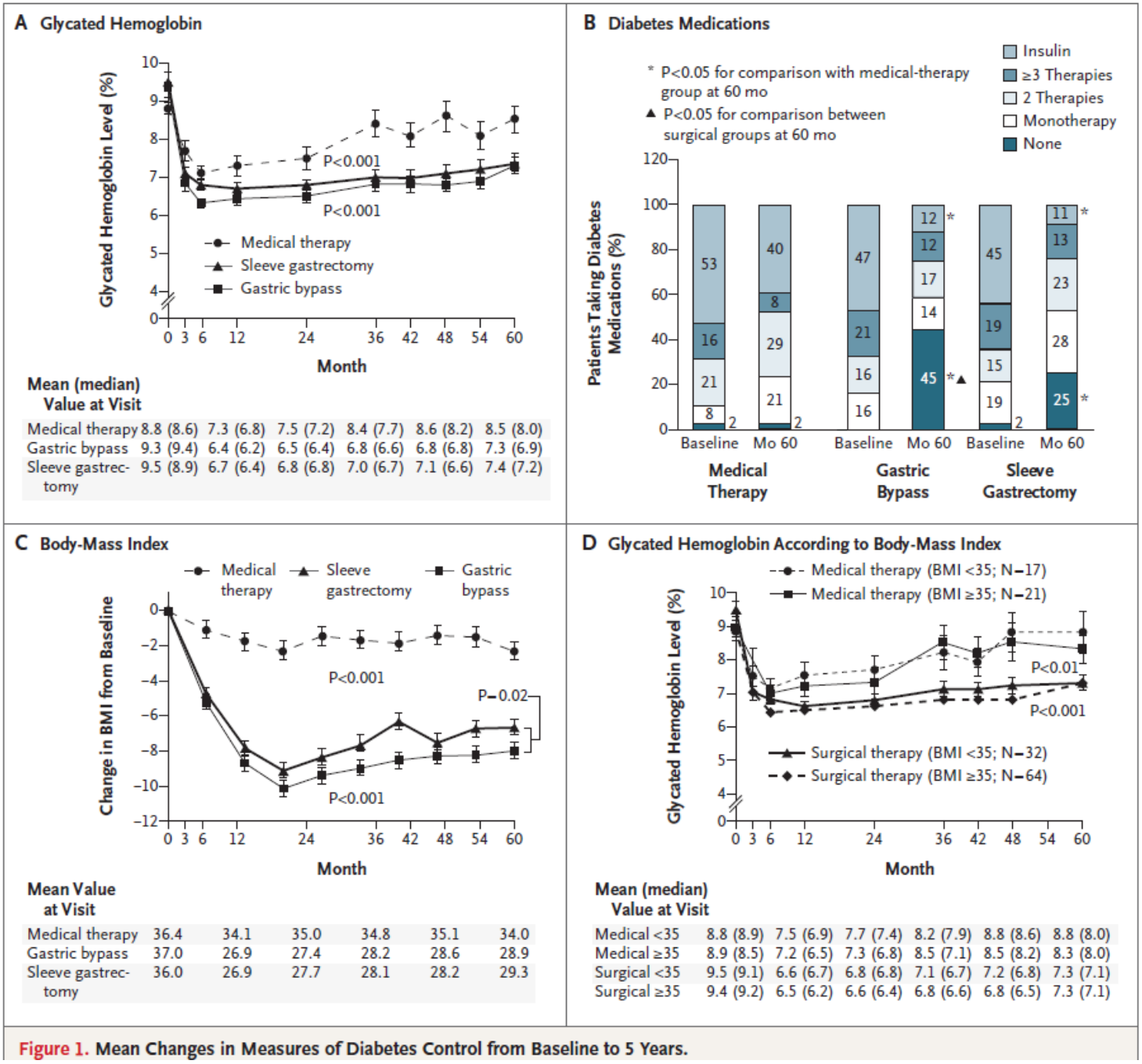


Figure 2. Glycated Hemoglobin Levels during 2 Years of Follow-up.



Mean (median) Value at Visit

Medical therapy	8.8 (8.6)	7.3 (6.8)	7.5 (7.2)	8.4 (7.7)	8.6 (8.2)	8.5 (8.0)
Gastric bypass	9.3 (9.4)	6.4 (6.2)	6.5 (6.4)	6.8 (6.6)	6.8 (6.8)	7.3 (6.9)
Sleeve gastrectomy	9.5 (8.9)	6.7 (6.4)	6.8 (6.8)	7.0 (6.7)	7.1 (6.6)	7.4 (7.2)

Mean Value at Visit

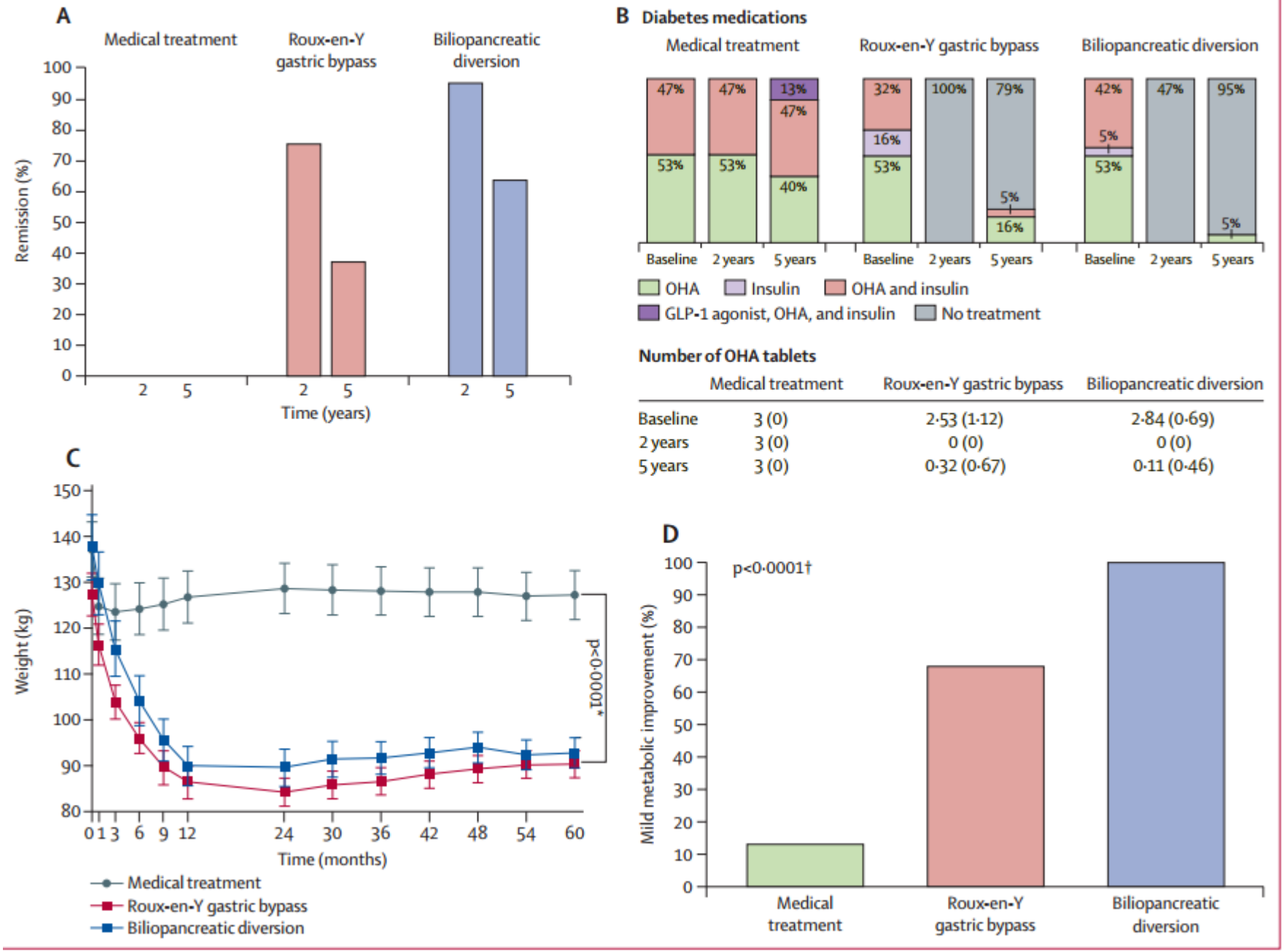
Medical therapy	36.4	34.1	35.0	34.8	35.1	34.0
Gastric bypass	37.0	26.9	27.4	28.2	28.6	28.9
Sleeve gastrectomy	36.0	26.9	27.7	28.1	28.2	29.3

Mean (median) Value at Visit

Medical <35	8.8 (8.9)	7.5 (6.9)	7.7 (7.4)	8.2 (7.9)	8.8 (8.6)	8.8 (8.0)
Medical ≥35	8.9 (8.5)	7.2 (6.5)	7.3 (6.8)	8.5 (7.1)	8.5 (8.2)	8.3 (8.0)
Surgical <35	9.5 (9.1)	6.6 (6.7)	6.8 (6.8)	7.1 (6.7)	7.2 (6.8)	7.3 (7.1)
Surgical ≥35	9.4 (9.2)	6.5 (6.2)	6.6 (6.4)	6.8 (6.6)	6.8 (6.5)	7.3 (7.1)

Figure 1. Mean Changes in Measures of Diabetes Control from Baseline to 5 Years.

P.R.Schauer, 2017



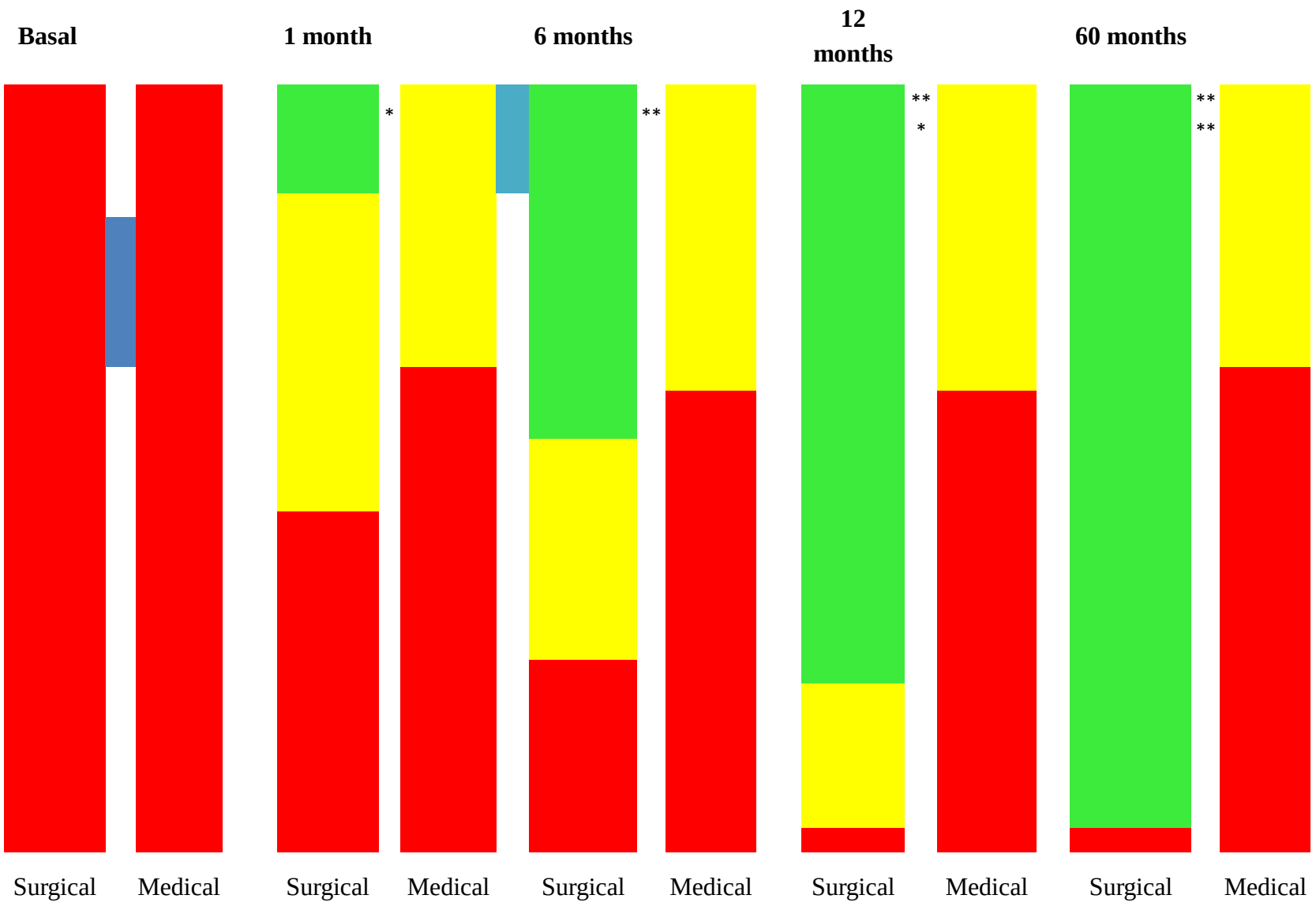
G. Mingrone, 2015

DMT2 :RISULTATI DELLA CHIRURGIA BARIATRICA-METABOLICA

Intervento	Numero pazienti: 83	Remissione completa: 75	Persistenza: 8
SG-DE-II	41	40	1 (2.5%)
SG	20	18	2 (10%)
VBG	8	7	1 (12.5%)
RY-GBP	14	10	4 (28%)

Casistica Chirurgia Generale II AO Luigi Sacco 2000-2012
SG-DE-II : Sleeve gastrectomy-esclusione duodenale- interposizione ileale
SG : Sleeve gastrectomy
VBG : Gastroplastica verticale sec. McLean
RY-GBP: By-pass gastrico Y Roux

Patient's distribution in ADA classification



* p < 0,02

** p<0,0001

*** p<0,0001

** ** p<0,0001

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8^ edizione
Top Ten
IN GASTROENTEROLOGIA

La chirurgia metabolica è superiore alla terapia medica e alle modifiche dello stile di vita nel determinare la remissione del diabete mellito di tipo II nel paziente obeso.

Metabolic Surgery in the Treatment Algorithm for Type 2 Diabetes: a Joint Statement by International Diabetes Organizations

Francesco Rubino[1] · David M. Nathan[2] · Robert H. Eckel[3] · Philip R. Schauer[4] · K. George M. M. Alberti[5] · Paul Z. Zimmet[6] · Stefano Del Prato[7] · Linong Ji[8] · Shaukat M. Sadikot[9] · William H. Herman[10] · Stephanie A. Amiel[1] · Lee M. Kaplan[2] · Gaspar Taroncher-Oldenburg[11] · David E. Cummings[12] · on behalf of the Delegates of the 2nd Diabetes Surgery Summit

Obes. Surg. 2017

Table 1 International societies that have ratified and/or endorsed the DSS-II consensus statements and guidelines

Partner diabetes organizations that helped develop and have ratified the DSS-II consensus statements and guidelines:	Country
American Diabetes Association (ADA)	USA
International Diabetes Federation (IDF)	International
Diabetes UK (DUK)	UK
Chinese Diabetes Society (CDS)	China
Diabetes India (DI)	India
Other organizations that formally endorse the DSS-II consensus statements and guidelines (to date):	
American Association of Clinical Endocrinologists (AACE)	USA
American College of Surgeons (ACS)	USA
American Gastroenterological Association (AGA)	USA
American Society for Metabolic and Bariatric Surgery (ASMBS)	USA
Argentinian Society of Diabetes (SAD)	Argentina
Argentinian Society for Bariatric and Metabolic Surgery (SACO)	Argentina
Asia-Pacific Bariatric and Metabolic Surgery Society (APBMSS)	International
Association of British Clinical Diabetologists (ABCD)	UK
Australian Diabetes Society (ADS)	Australia
Belgian Diabetes Association (ABD)	Belgium
Brazilian Society of Diabetes (SBD)	Brazil
Brazilian Society of Bariatric and Metabolic Surgery (SBCBM)	Brazil
British Obesity and Metabolic Surgery Society (BOMSS)	UK
Czech Society for the Study of Obesity (CSSO)	Czech Republic
Chilean Society of Endocrinology and Diabetes (SCED)	Chile
Chilean Society for Bariatric and Metabolic Surgery (SCCBM)	Chile
Endocrine Society	USA
European Association for the Study of Obesity (EASO)	International
French Society of Diabetes (SFD)	France
French Society of Bariatric and Metabolic Surgery (SOFFCO)	France
German Diabetes Society (DDG)	Germany
German Society for Obesity Surgery (CA-ADIP)	Germany
Hellenic Diabetes Association (HDA)	Greece
International Federation for the Surgery of Obesity & Metabolic Disorders (IFSO)	International
Israel Diabetes Association (IDA)	Israel
Italian Society of Bariatric & Metabolic Surgery (SICOB)	Italy
Italian Society of Diabetology (SID)	Italy
Japan Diabetes Society (JDS)	Japan
Latin American Association of Diabetes (ALAD)	International
Mexican College of Bariatric and Metabolic Surgery (CMCOEM)	Mexico
Mexican Society of Nutrition and Endocrinology (SMNE)	Mexico
Qatar Diabetes Association (QDA)	Qatar
Saudi Diabetes and Endocrine Association (SDEA)	Saudi Arabia
Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)	USA
Society for Endocrinology (SfE)	UK
Society for Surgery of the Alimentary Tract (SSAT)	USA
South African Society for Surgery Obesity and Metabolism (SASSO)	South Africa
Spanish Society for Bariatric and Metabolic Surgery (SECO)	Spain
Spanish Society of Diabetes (SED)	Spain
The Obesity Society (TOS)	USA

- La chirurgia metabolica è stata inclusa nell'algoritmo di trattamento del DMT2 e riconosciuta come strumento terapeutico da oltre 40 società scientifiche a livello mondiale

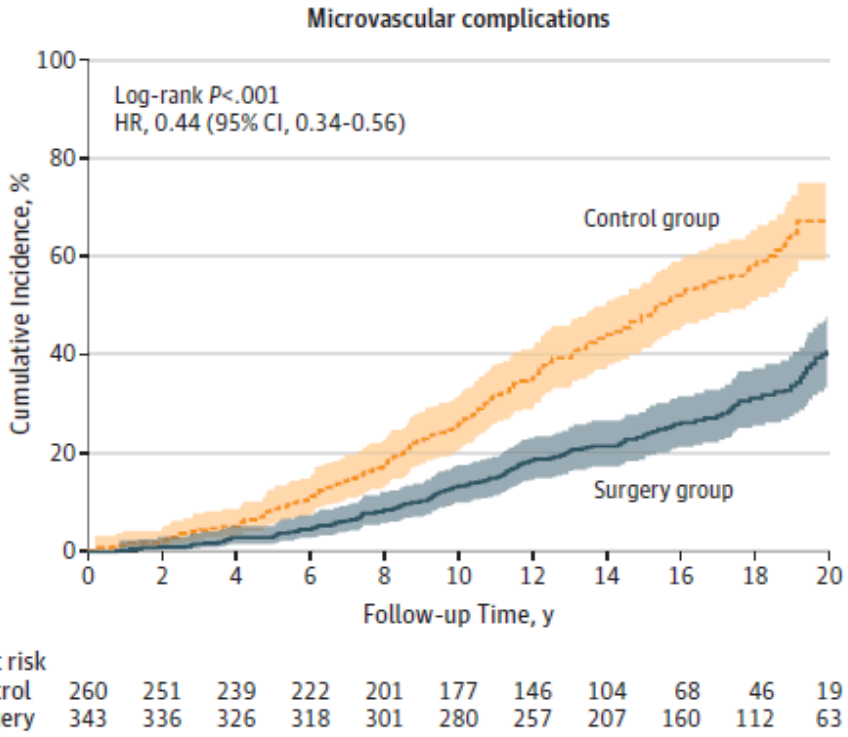
8

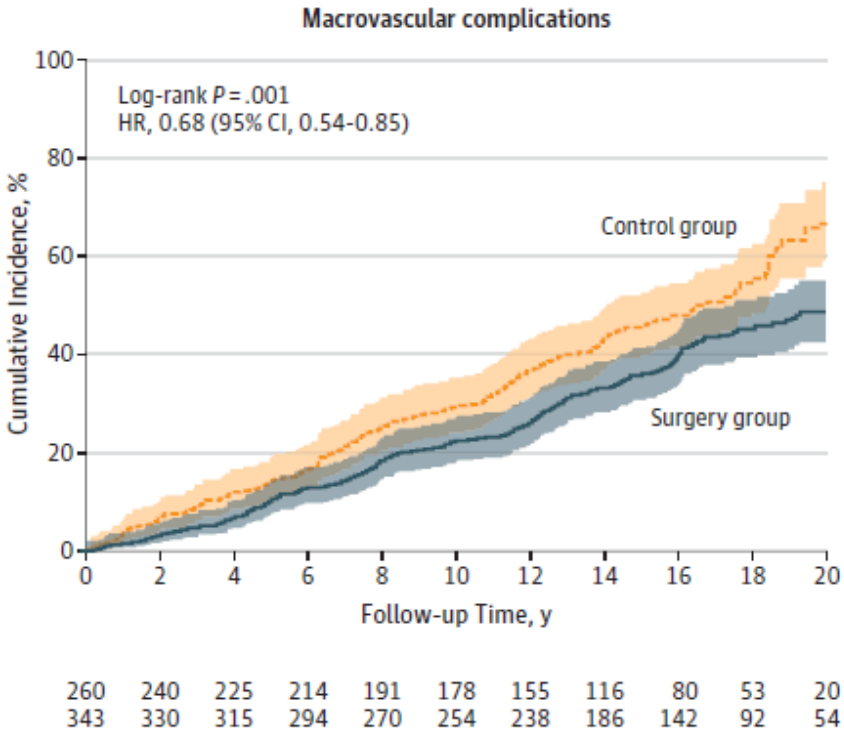
8^ edizione
Top Ten
IN GASTROENTEROLOGIA

- La chirurgia metabolica è necessariamente bariatrica
- L'esclusione del duodeno e l'effetto incretinico sono due utili meccanismi fisiopatologici per ottenere la remissione del DMT2
- Il trattamento chirurgico deve essere personalizzato
- Il trattamento chirurgico deve essere precoce

Complicanze vascolari dopo chirurgia metabolica per DMT2

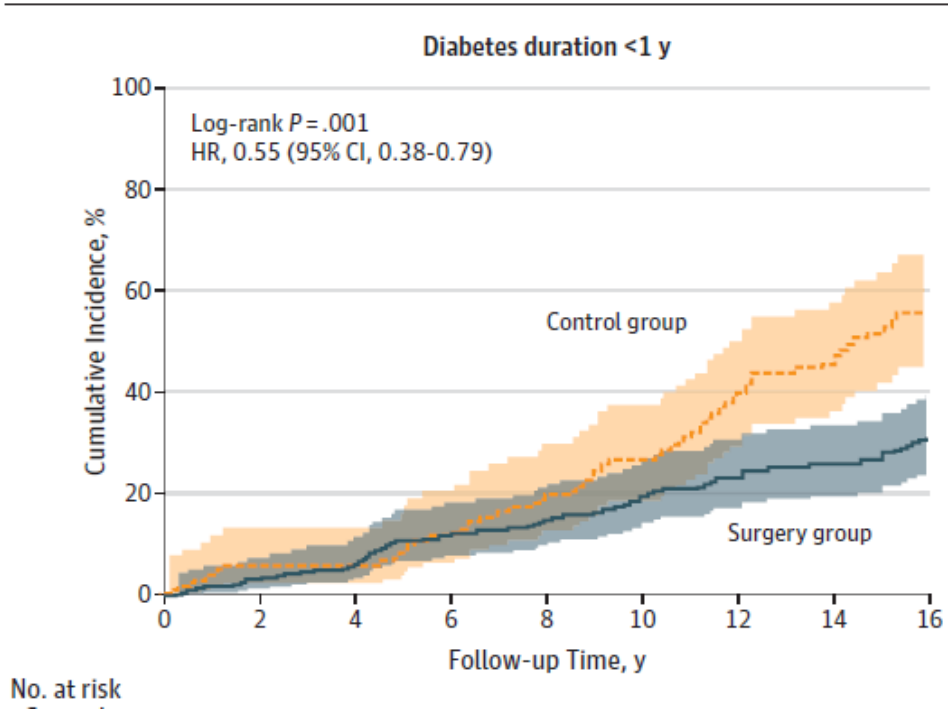
Figure 3. Cumulative Incidence of Microvascular and Macrovascular Diabetes Complications in the Surgery and Control Groups

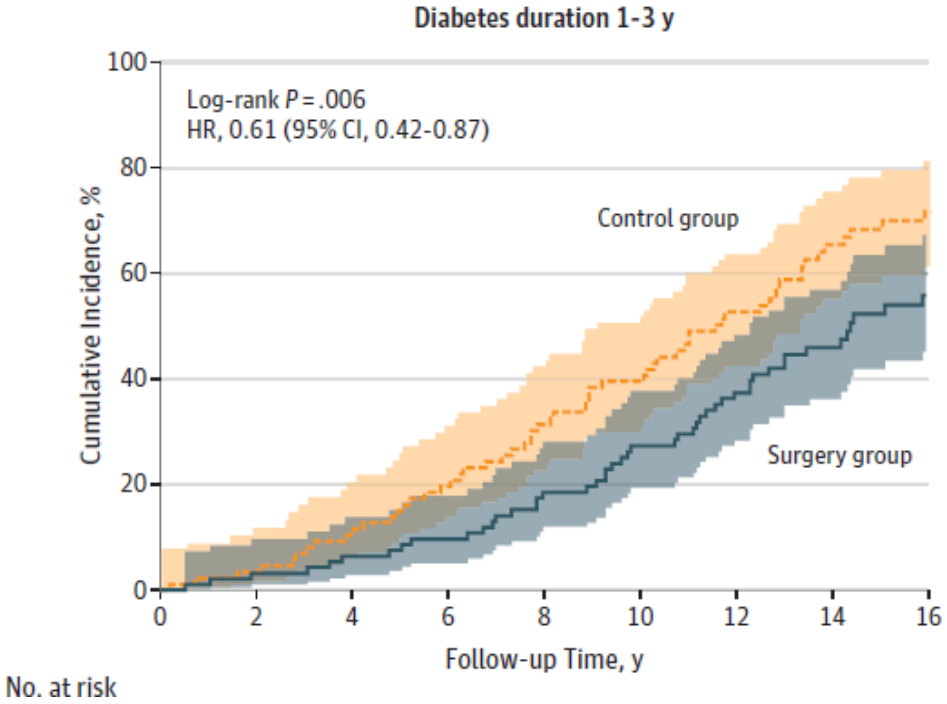




L.Sjostrom, 2014

Complicanze vascolari dopo chirurgia metabolica per DMT2





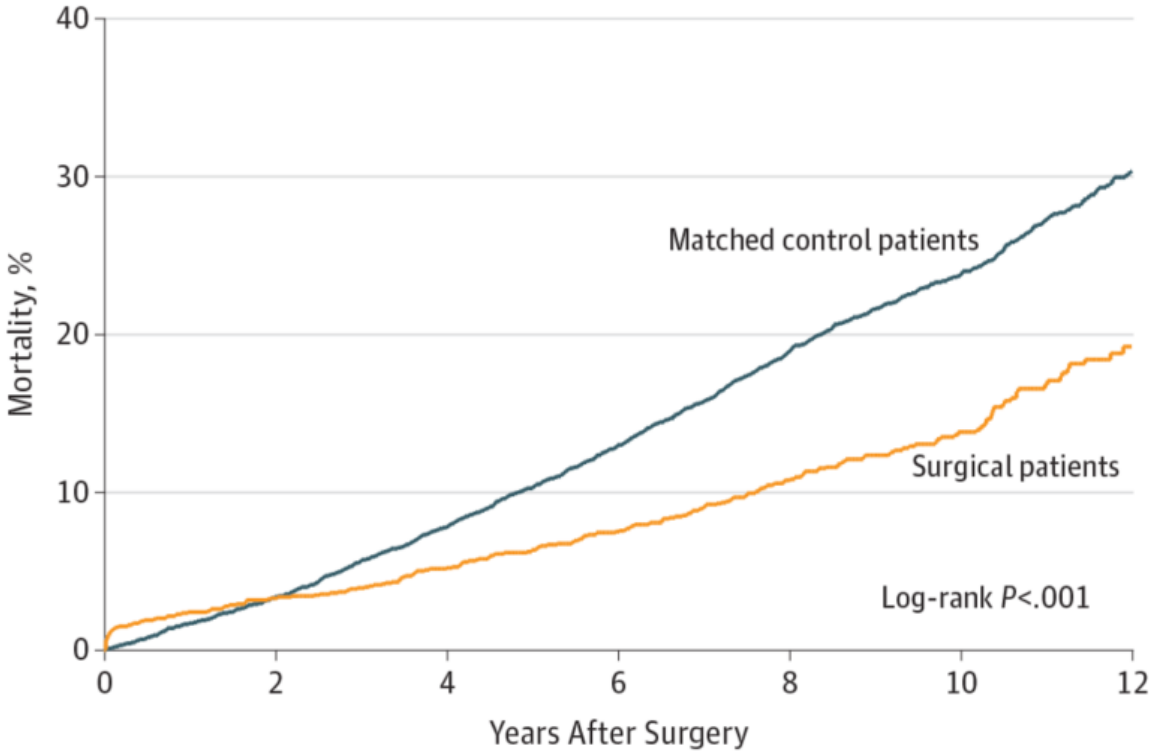
L.Sjostrom, 2014

9

8^ edizione
Top Ten
IN GASTROENTEROLOGIA

- La chirurgia metabolica riduce il rischio delle complicanze micro e macro-vascolari del paziente diabetico

Mortalità di DMT2 dopo chirurgia metabolica



No. at risk							
Matched control patients	7462	7114	5306	3878	2641	1407	472
Surgical patients	2500	2416	1868	1412	1004	552	185

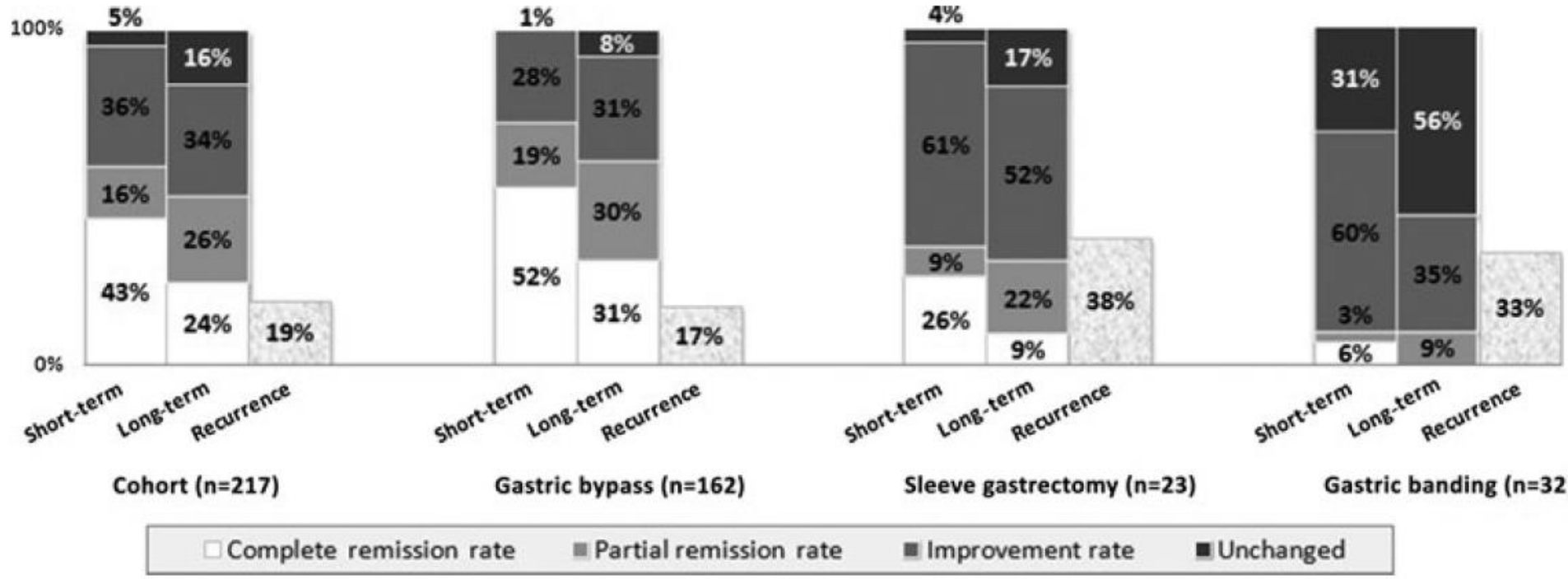
D.Arterburn, 2015

10

8^ edizione
Top Ten
IN GASTROENTEROLOGIA

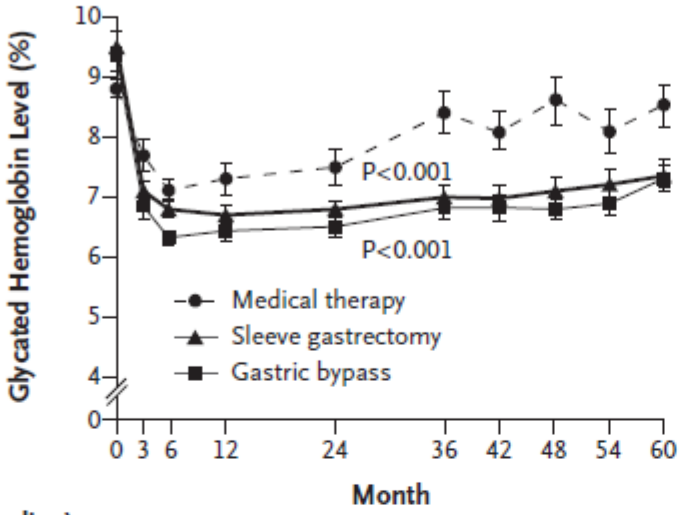
- La chirurgia metabolica migliora la sopravvivenza dei pazienti obesi affetti da DMT2

RISULTATI A LUNGO TERMINE DELLA CHIRURGIA DI DMT2



S. Brethauer, 2013

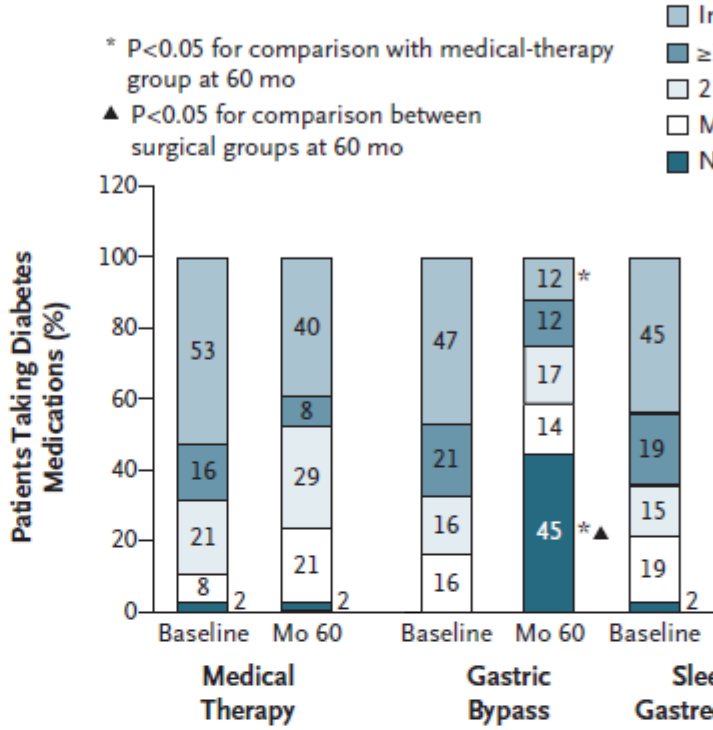
A Glycated Hemoglobin



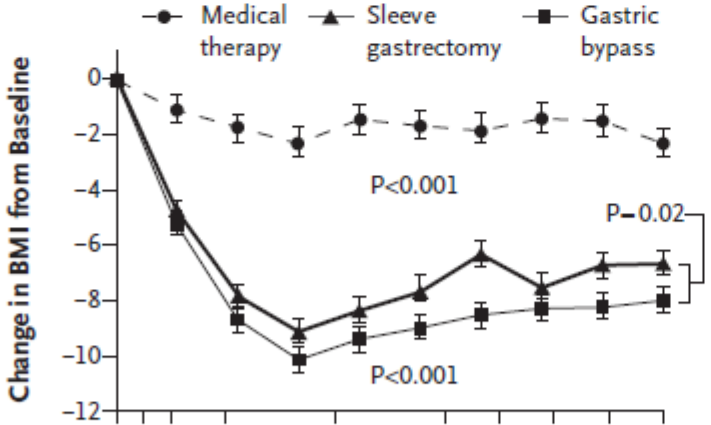
Mean (median) Value at Visit

Medical therapy	8.8 (8.6)	7.3 (6.8)	7.5 (7.2)	8.4 (7.7)	8.6 (8.2)	8.5 (8.0)
Gastric bypass	9.3 (9.4)	6.4 (6.2)	6.5 (6.4)	6.8 (6.6)	6.8 (6.8)	7.3 (6.9)
Sleeve gastrectomy	9.5 (8.9)	6.7 (6.4)	6.8 (6.8)	7.0 (6.7)	7.1 (6.6)	7.4 (7.2)

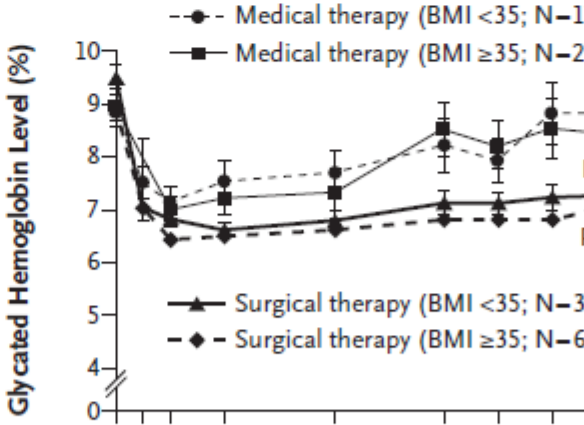
B Diabetes Medications

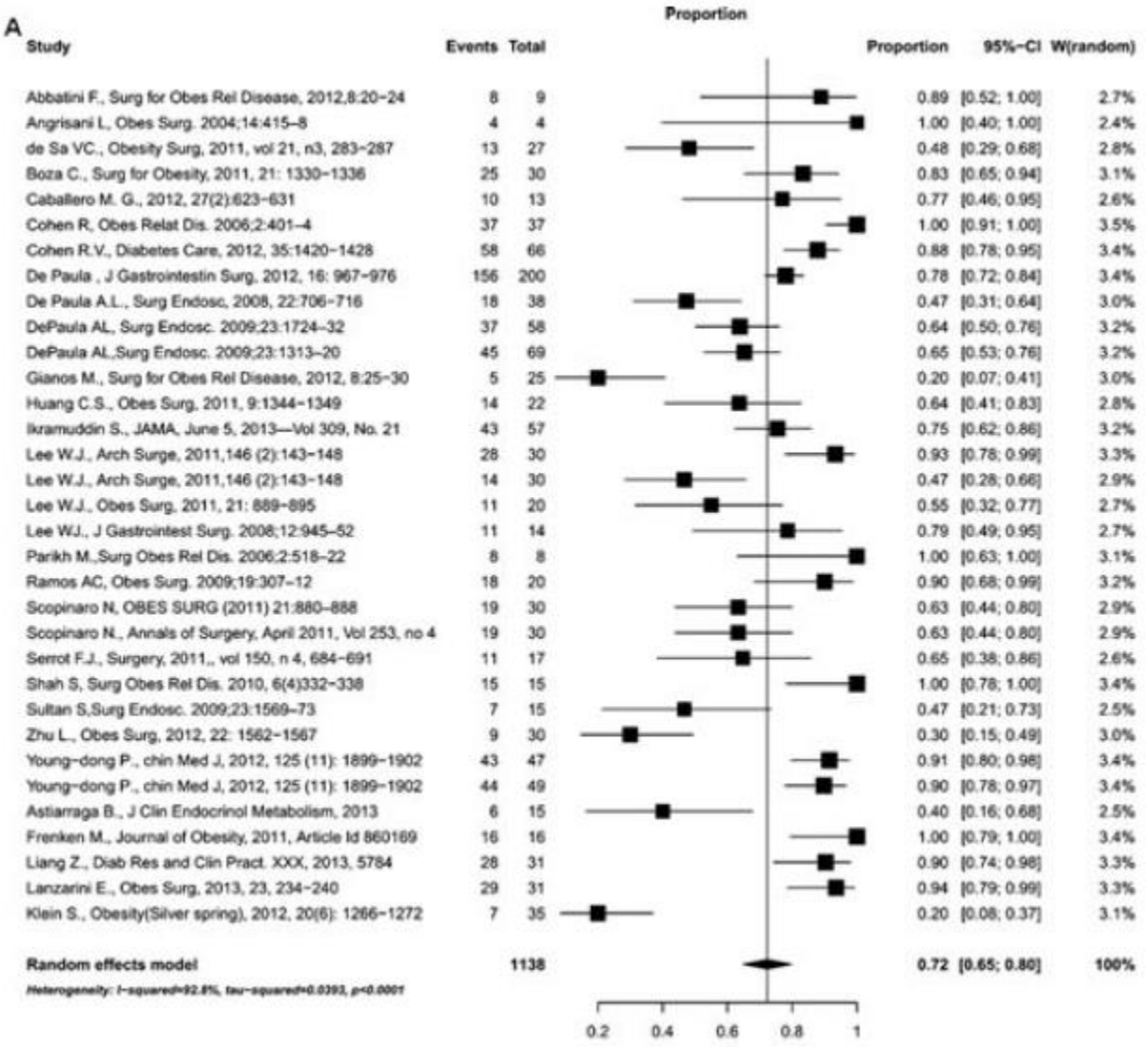


C Body-Mass Index



D Glycated Hemoglobin According to Body-Mass Index




A
Proportion
Study
Events
Total
Proportion
95%−CI
W(random)
Abbatini F., Surg for Obes Rel Disease, 2012,8:20−24 8 9 0.89 [0.52; 1.00] 2.7%
Angrisani L, Obes Surg. 2004;14:415−8 4 4 1.00 [0.40; 1.00] 2.4%
de Sa VC., Obesity Surg, 2011, vol 21, n3, 283−287 13 27 0.48 [0.29; 0.68] 2.8%
Boza C., Surg for Obesity, 2011, 21: 1330−1336 25 30 0.83 [0.65; 0.94] 3.1%
Caballero M. G., 2012, 27(2):623−631 10 13 0.77 [0.46; 0.95] 2.6%
Cohen R, Obes Relat Dis. 2006;2:401−4 37 37 1.00 [0.91; 1.00] 3.5%
Cohen R.V., Diabetes Care, 2012, 35:1420−1428 58 66 0.88 [0.78; 0.95] 3.4%
De Paula , J Gastrointestin Surg, 2012, 16: 967−976 156 200 0.78 [0.72; 0.84] 3.4%
De Paula A.L., Surg Endosc, 2008, 22:706−716 18 38 0.47 [0.31; 0.64] 3.0%
DePaula AL, Surg Endosc. 2009;23:1724−32 37 58 0.64 [0.50; 0.76] 3.2%
DePaula AL,Surg Endosc. 2009;23:1313−20 45 69 0.65 [0.53; 0.76] 3.2%
Gianos M., Surg for Obes Rel Disease, 2012, 8:25−30 5 25 0.20 [0.07; 0.41] 3.0%
Huang C.S., Obes Surg, 2011, 9:1344−1349 14 22 0.64 [0.41; 0.83] 2.8%
Ikramuddin S., JAMA, June 5, 2013—Vol 309, No. 21 43 57 0.75 [0.62; 0.86] 3.2%
Lee W.J., Arch Surge, 2011,146 (2):143−148 28 30 0.93 [0.78; 0.99] 3.3%
Lee W.J., Arch Surge, 2011,146 (2):143−148 14 30 0.47 [0.28; 0.66] 2.9%
Lee W.J., Obes Surg, 2011, 21: 889−895 11 20 0.55 [0.32; 0.77] 2.7%
Lee W.J., J Gastrointest Surg. 2008;12:945−52 11 14 0.79 [0.49; 0.95] 2.7%
Parikh M.,Surg Obes Rel Dis. 2006;2:518−22 8 8 1.00 [0.63; 1.00] 3.1%
Ramos AC, Obes Surg. 2009;19:307−12 18 20 0.90 [0.68; 0.99] 3.2%
Scopinaro N, OBES SURG (2011) 21:880−888 19 30 0.63 [0.44; 0.80] 2.9%
Scopinaro N., Annals of Surgery, April 2011, Vol 253, no 4 19 30 0.63 [0.44; 0.80] 2.9%
Serrot F.J., Surgery, 2011,, vol 150, n 4, 684−691 11 17 0.65 [0.38; 0.86] 2.6%
Shah S, Surg Obes Rel Dis. 2010, 6(4)332−338 15 15 1.00 [0.78; 1.00] 3.4%
Sultan S,Surg Endosc. 2009;23:1569−73 7 15 0.47 [0.21; 0.73] 2.5%
Zhu L., Obes Surg, 2012, 22: 1562−1567 9 30 0.30 [0.15; 0.49] 3.0%
Young−dong P., chin Med J, 2012, 125 (11): 1899−1902 43 47 0.91 [0.80; 0.98] 3.4%
Young−dong P., chin Med J, 2012, 125 (11): 1899−1902 44 49 0.90 [0.78; 0.97] 3.4%
Astiarraga B., J Clin Endocrinol Metabolism, 2013 6 15 0.40 [0.16; 0.68] 2.5%
Frenken M., Journal of Obesity, 2011, Article Id 860169 16 16 1.00 [0.79; 1.00] 3.4%
Liang Z., Diab Res and Clin Pract. XXX, 2013, 5784 28 31 0.90 [0.74; 0.98] 3.3%
Lanzarini E., Obes Surg, 2013, 23, 234−240 29 31 0.94 [0.79; 0.99] 3.3%
Klein S., Obesity(Silver spring), 2012, 20(6): 1266−1272 7 35 0.20 [0.08; 0.37] 3.1%
Random effects model 1138 0.72 [0.65; 0.80] 100%
Heterogeneity: I−squared=92.8%, tau−squared=0.0393, p<0.0001
0.2
0.4
0.6
0.8
1

T2DM AND ILEAL INTERPOSITION (+ S.G.)

AUTHOR	YEAR	N. CASES	FOLLOW-UP (months)	BMI <35	T2DM RESOLUTION	R-Improvement
A. De Paula	2008	39	16	+	47,4 %	86,9 %
R. Goel	2011	5	6	+	100 %	----
A. Tinoco	2011	30	18	+	80 %	100 %
S. Kota	2011	43	20	-	47 %	100 %
A. De Paula	2012	202	39,1	+	78,3 %	89,9 %

related complications

BMI = body mass index, DBP = diastolic blood pressure, FPG = fasting plasma glucose, HbA1c = hemoglob
lipoprotein, HMW = high-molecular weight, HOMA-IR = homeostasis model assessment of insulin resistance, hs-CR
protein.

	RYGB		Medical			Odds Ratio	Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	M-H, Random, 95% C
Courcoulas 2015	8	18	0	14	19.4%	23.48 [1.22, 453.35]	
Ikramuddin 2015	40	60	0	59	21.2%	235.10 [13.82, 3998.51]	
Liang 2013	28	31	0	34	18.9%	561.86 [27.85, 11335.33]	
Mingrone 2015	7	19	0	15	19.5%	18.60 [0.97, 358.26]	
Schauer 2014	17	48	0	40	21.0%	45.00 [2.60, 777.50]	

DISCUSSION

This systematic review and meta-analysis demonstrates that RYGB surgery is more efficient than medical treatment alone for T2DM in obese patients. According to the results of pooled analysis, RYGB surgery is superior in terms of short- to medium-term (12–60 months) T2DM remission. After RYGB surgery, HbA1c, triglycerides, and low-density lipoprotein cholesterol decreased more, and high-density lipoprotein cholesterol increased more. Furthermore, RYGB surgery led to greater weight loss and abdominal fat mass reduction, and

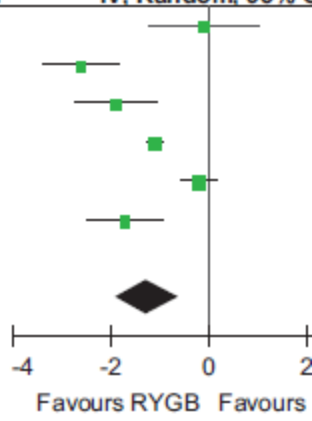
the medical group. As a cons
should be considered an efficient tre
in obese patients, but continued n
control is warranted because of pote
cemia in some patients.

The effect of RYGB surgery on
to be strictly different compared t
treatment alone, as 56.81% (100/17
RYGB surgery and none of the 162
treatment alone attained diabetes rem
centre Bypass or Sleeve Study (SM

	RYGB			Medical				Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% C
Courcoulas 2015	7.1	2.2	18	7.2	0.8	14	12.7%	-0.10 [-1.20, 1.00]	
Halperin 2014	6.2	1.4	19	8.8	1	19	15.9%	-2.60 [-3.37, -1.83]	
Ikramuddin 2015	6.5	1.6	60	8.4	2.9	59	15.2%	-1.90 [-2.74, -1.06]	
Liang 2013	6	0.3	31	7.1	0.3	34	20.8%	-1.10 [-1.25, -0.95]	
Mingrone 2015	6.7	0.5	19	6.9	0.6	15	19.5%	-0.20 [-0.58, 0.18]	
Schauer 2014	6.7	1.3	48	8.4	2.2	40	15.9%	-1.70 [-2.47, -0.93]	
Total (95% CI)			**195**			**181**	**100.0%**	**-1.25 [-1.88, -0.63]**	

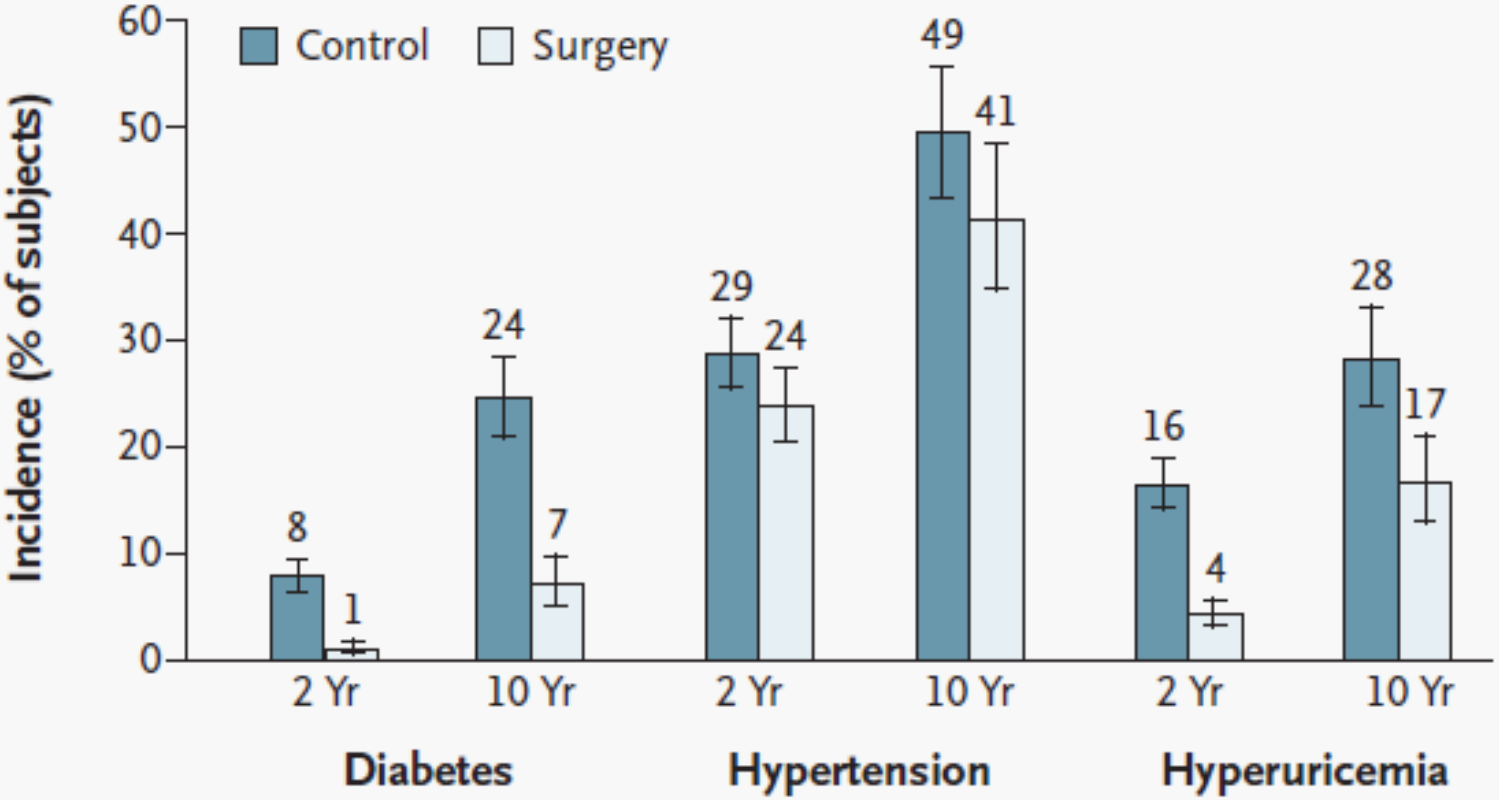
Heterogeneity: Tau² = 0.48; Chi² = 44.78, df = 5 (P < 0.00001); I² = 89%

Test for overall effect: Z = 3.94 (P < 0.0001)



A

	RYGB			Medical				Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% C
Courcoulas 2015	7	4.3	18	6.3	1.6	14	22.4%	0.70 [-1.46, 2.86]	
Halperin 2014	4.9	2.8	19	9	3	19	24.1%	-4.10 [-5.95, -2.25]	
Ikramuddin 2015	6.2	2.9	60	8.9	6.2	59	24.6%	-2.70 [-4.44, -0.96]	



No. of subjects						
Control	1402	539	770	279	1017	382
Surgery	1489	517	623	215	1044	342
Odds ratio	0.14	0.25	0.78	0.75	0.22	0.49
95% CI	0.08–0.24	0.17–0.38	0.60–1.01	0.52–1.08	0.15–0.31	0.34–0.71
P value	<0.001	<0.001	0.06	0.13	<0.001	<0.001

SOS. 2004

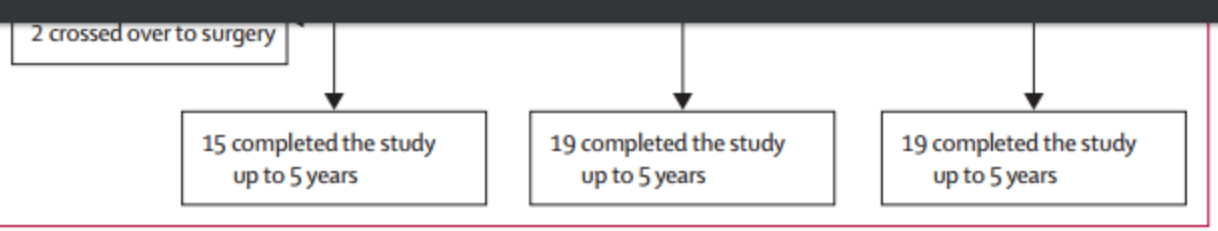


Figure 1: **Trial profile**
MI=myocardial infarction.

	Medical treatment group (n=15)	Roux-en-Y gastric bypass group (n=19)	Biliopancreatic diversion group (n=19)	p value*
ADA partial remission at 2 years	0	15 (75%)	19 (95%)	<0·0001
ADA partial remission at 5 years	0	7 (37%)	12 (63%)	0·0007
ADA complete remission at 5 years	0	0	0	..
HbA_{1c} ≤6% (≤42·1 mmol/mol) and FPG ≤5·6 mmol/L without glucose-lowering drugs	0	1 (5%)	7 (37%)	0·0039
HbA_{1c} ≤6·5% (≤47·5 mmol/mol) without glucose-lowering drugs	0	8 (42%)	13 (68%)	0·0003
HbA_{1c} ≤6·5% (≤47·5 mmol/mol) with or without glucose-lowering drugs	4 (27%)	8 (42%)	13 (68%)	0·0457
Relapse	..	8/15 (53%)	7/19 (37%)	..
ADA treatment goals†	0	2 (11%)	6 (32%)	0·0332

Data are n (%) or n/N (%), unless otherwise indicated. The table shows the number of diabetes remissions according to the criterion used in this study (FPG ≤5·6 mmol/L and HbA_{1c} ≤6·5% [≤47·5 mmol/mol] for at least 1 year without treatment) and the number of partial (FPG 5·6–6·9 mmol/L and HbA_{1c} <6·5% for at least 1 year without treatment) and complete (FPG 5·6 mmol/L and HbA_{1c} <6·0% for at least 1 year without treatment) remissions according to both the ADA expert group definition[17] and one of its variants. Because no patients had remissions in the medical treatment

carotid or peripheral arterial
clinically indicated.

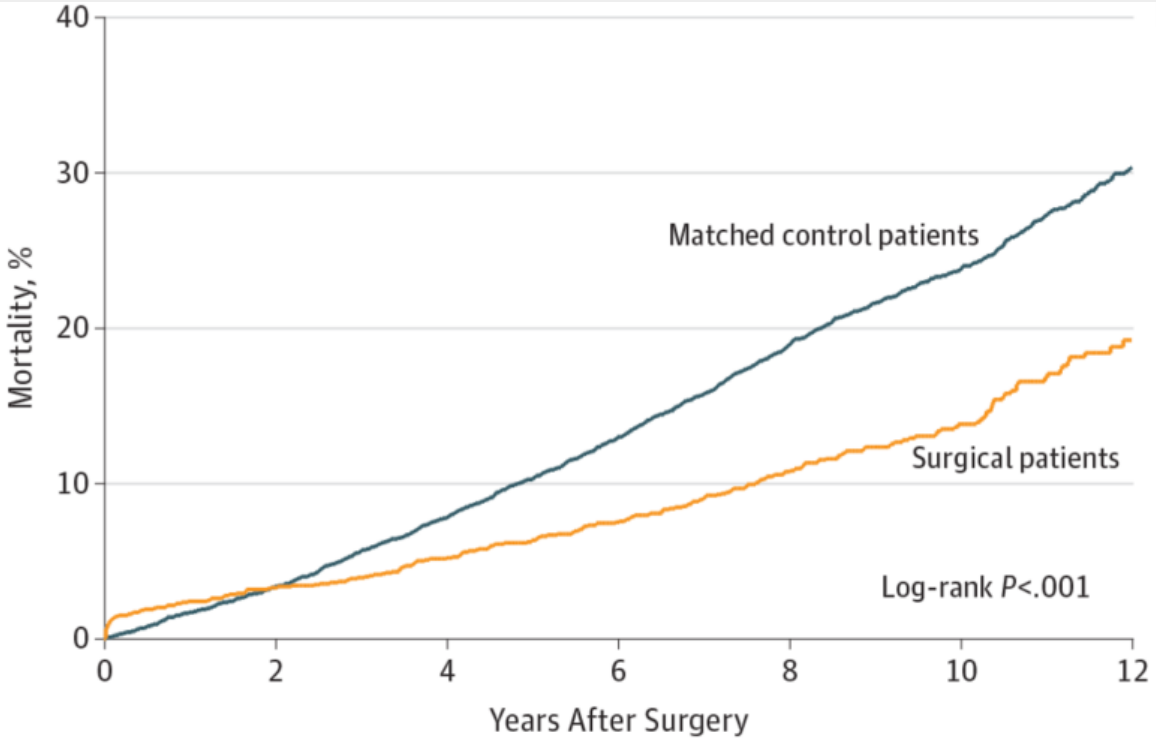
Diet and lifestyle modificatio
lowering drugs, insulin, and
(GLP-1) analogues were optimis
with the aim of reaching ade
(HbA_{1c} <7·0% [<53·0 mmol/m
per standard diabetes guidelin
measured with the glucose-ox
Glucose Analyzer, Fullerton,
insulin by microparticle enzym
Laboratories, Abbot Park, IL, U
1 µU/mL and an intra-assay c
6·6%. We measured serum H
high-performance liquid chrom
3·5–6·5%), and total cholester
triglycerides with standard
cholesterol was calculated with
The concentration of HDL ch
low if it was less than 1·0 mm
1·3 mmol/L in women. Insulin
with the Homeostasis Model
Resistance (HOMA-IR).[16]

Outcomes

The primary endpoint was the
at 2 years, defined as a fasting

From: **Association Between Bariatric Surgery and Long-term Survival**

JAMA. 2015;313(1):62-70. doi:10.1001/jama.2014.16968



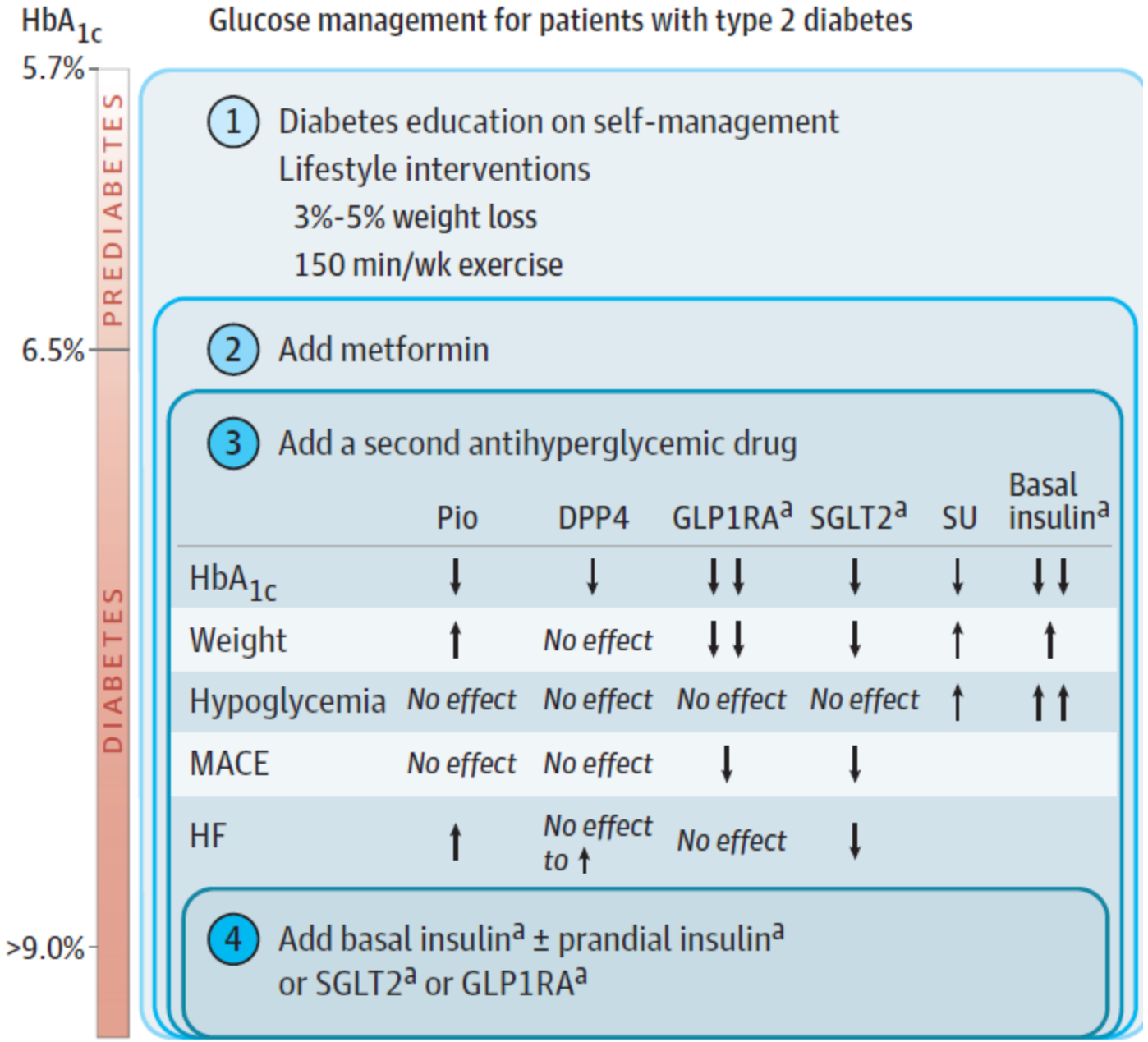
No. at risk

Matched control patients	7462	7114	5306	3878	2641	1407	472
Surgical patients	2500	2416	1868	1412	1004	552	185

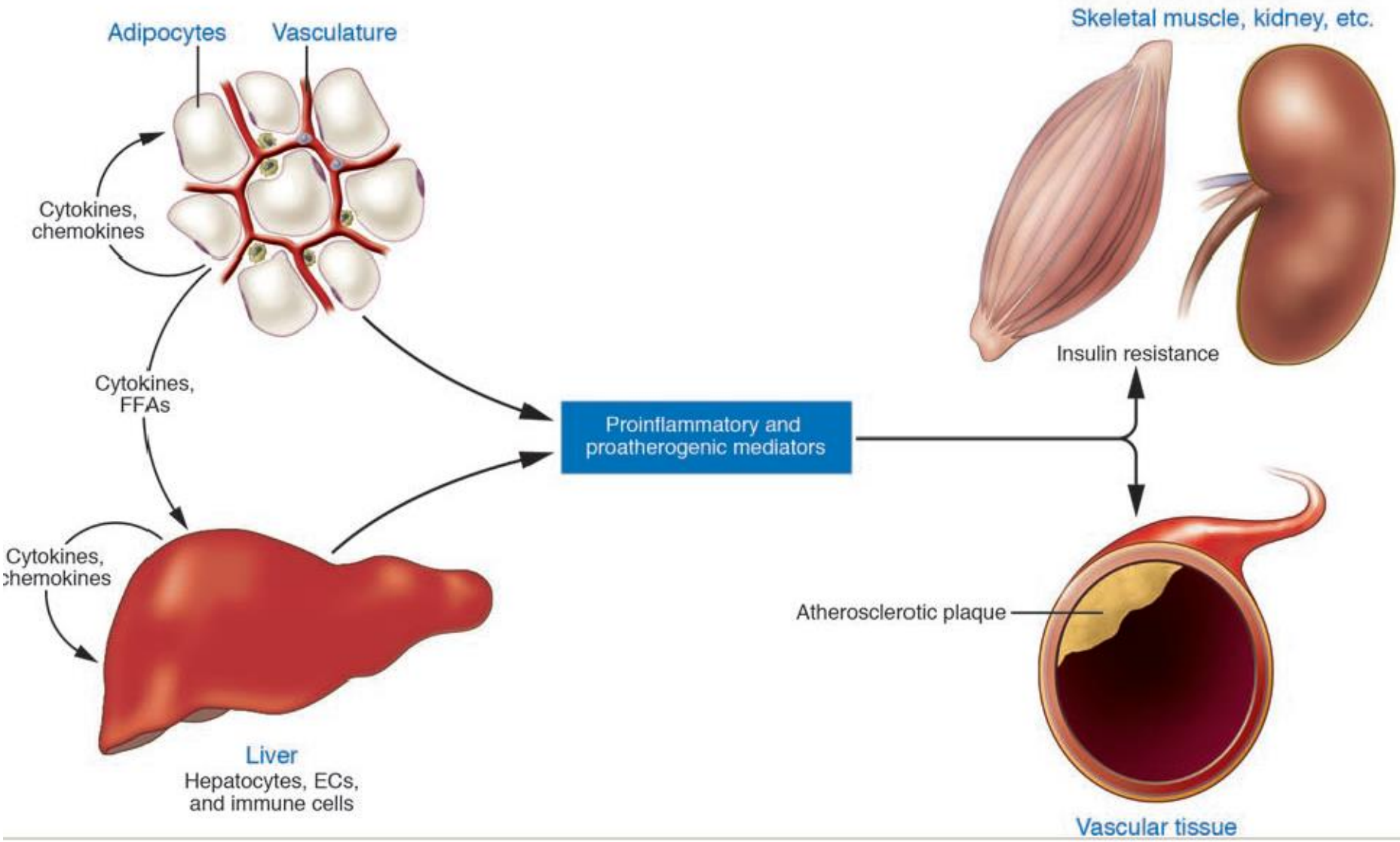
Figure Leg

Kaplan-Meier Estimated Mortality Curves for Surgical Patients and Matched Control PatientsEntire cohort includes 2500 surgical patients and 7462 matched control patients; follow-up was censored at December 31, 2013. Estimated mortality rates were 2.4% at 1 year, 6.4% at 5 years, and 13.8% at 10 years for surgical patients; for matched control patients, 1.7% at 1 year, 10.4% at 5 years, and 23.9% at 10 years.

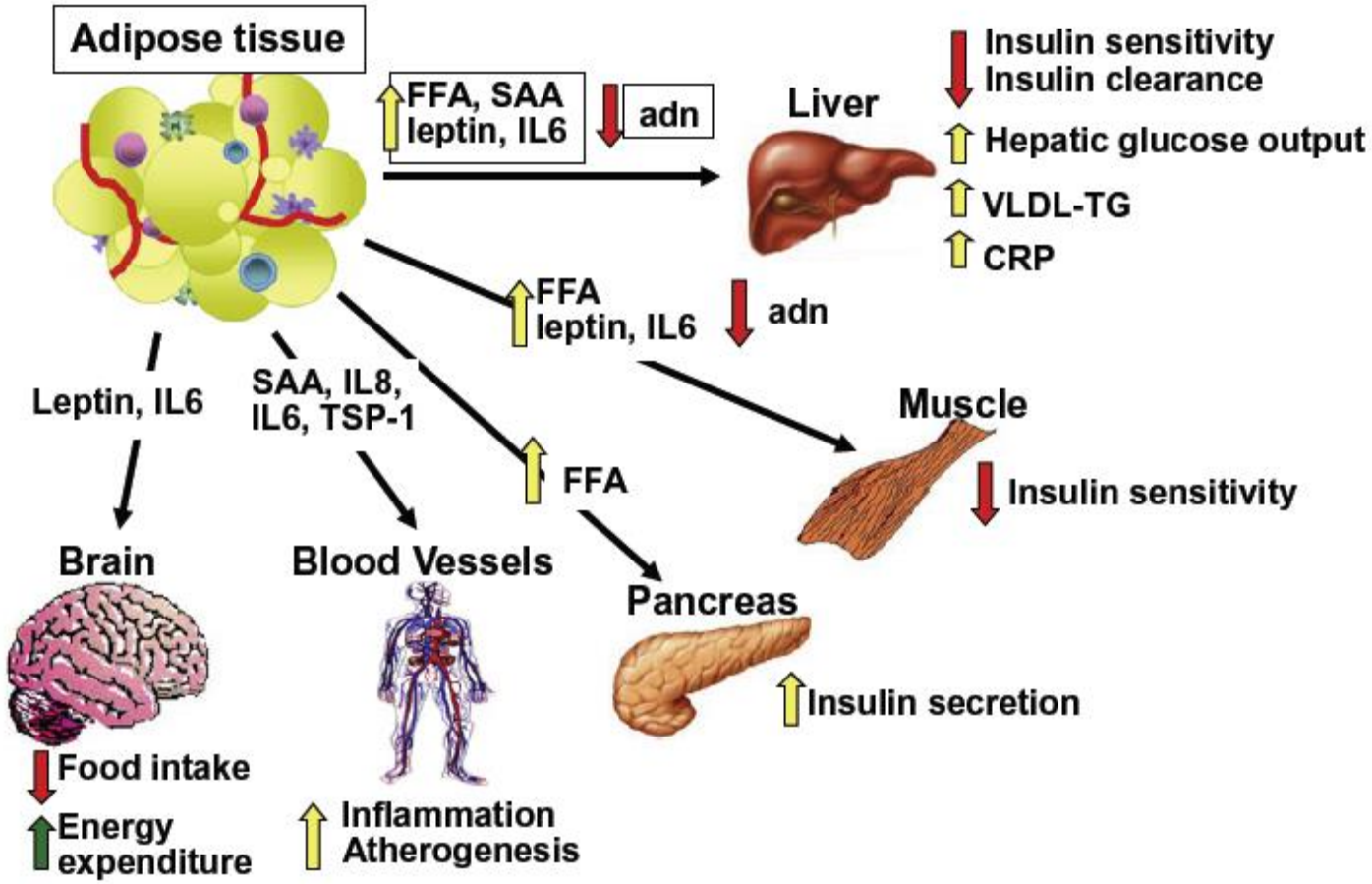
Figure. Glucose Management for Patients With Type 2 Diabetes



OBESITA' E INSULINO-RESISTENZA



S.E. Shoelson, JCI, 2006


Adipose tissue
FFA, SAA
leptin, IL6
adn
Liver
Insulin sensitivity
Insulin clearance
Hepatic glucose output
VLDL-TG
CRP
FFA
leptin, IL6
adn
Leptin, IL6
SAA, IL8,
IL6, TSP-1
FFA
Muscle
Insulin sensitivity
Brain
Blood Vessels
Pancreas
Insulin secretion
Food intake
Energy
expenditure
Inflammation
Atherogenesis