

Chirurgia Metabolica: Stato dell'Arte

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Disclosures

Scientific Advisory Board: Fractyl, GI Dynamics

Consulting: Ethicon, Medtronic

Speaking Honoraria: Novo Nordisk

Research/Educational Grants: NIHR, Ethicon

nature

UIG/GETTY



Surgery can be an effective treatment for type 2 diabetes.

Time to think differently about diabetes

New guidelines for the surgical treatment of type 2 diabetes bolster hopes of finding a cure, writes **Francesco Rubino**, but long-standing preconceptions must be put aside.

Planning my career in 1999 ...



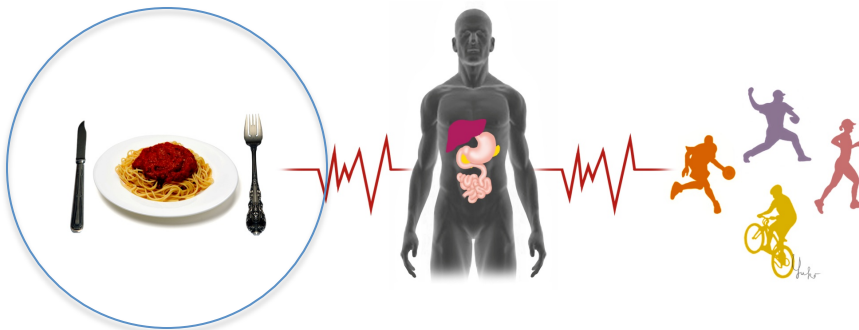
Cancer surgery?

Endocrine surgery?

Breast surgery?

NO Bariatric surgery

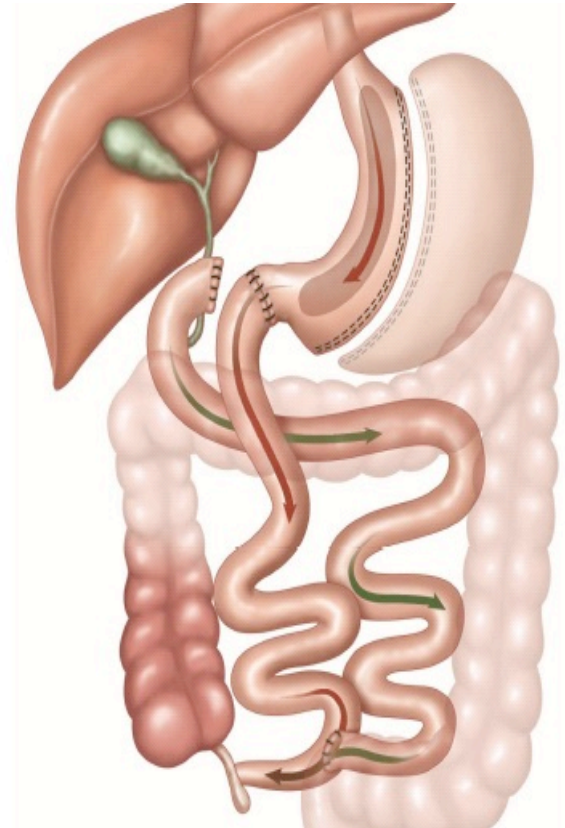
ENERGY HOMEOSTASIS



July 3, 1999

The morning, in the O.R.

World's First laparoscopic Biliopancreatic Diversion - Duodenal Switch (BPD-DS)
(Dr M. Gagner)



“criteria ex juvantibus”

“making an inference about disease causation from observations on the response of the disease to a treatment”



Could GI surgery fix a fundamental mechanism of disease?



**Can we use surgery to intentionally treat diabetes?
(“diabetes surgery”)**



Hmm...

Summer 1999

- ▶ Protocol for a Randomized Clinical Study of Diabetes Surgery Submitted to IRB (Mount Sinai Medical Center, New York)

RCT comparing Gastric Bypass Surgery vs Intensive Medical Therapy in patients with BMI 30–35

IRB did not approve

Effect of Duodenal–Jejunal Exclusion in a Non-obese Animal Model of Type 2 Diabetes

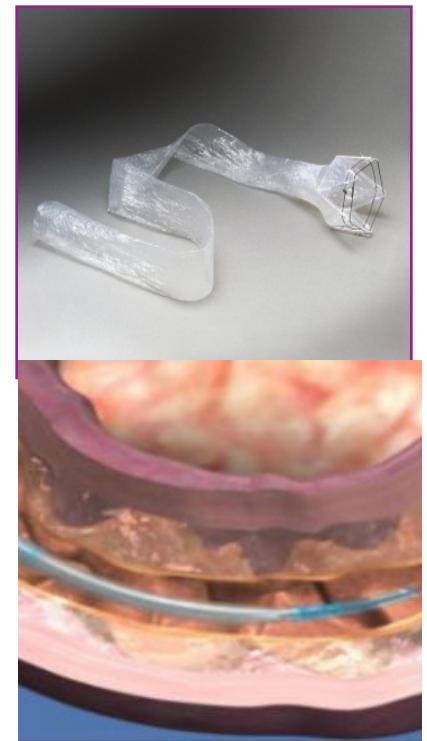
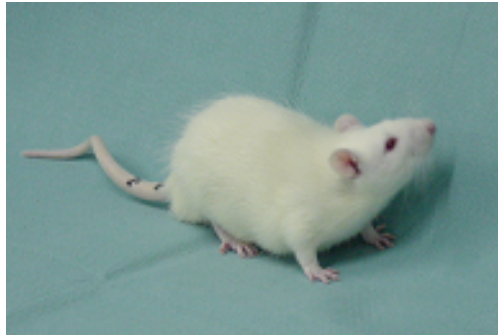
A New Perspective for an Old Disease

Francesco Rubino, MD, and Jacques Marescaux, MD, FRCS

Background: The Roux-en-Y gastric bypass and the biliopancreatic diversion effectively induce weight loss and long-term control of type 2 diabetes in morbidly obese individuals. It is unknown whether the control of diabetes is a secondary outcome from the treatment of

These findings suggest a potential role of the proximal gut in the pathogenesis of the disease and put forward the possibility of alternative therapeutic approaches for the management of type 2 diabetes.

(Ann Surg 2004;239: 1–11)



Is Type 2 Diabetes an Operable Intestinal Disease?

A provocative yet reasonable hypothesis

FRANCESCO RUBINO, MD

**TYPE 2 DIABETES: IS IT AN
INTESTINAL DISEASE?**— The
rapid resolution of diabetes after Roux-

Y. Rubino, M.D., Ph.D., www.rubino.com

The Surgeon and the Diabetologists

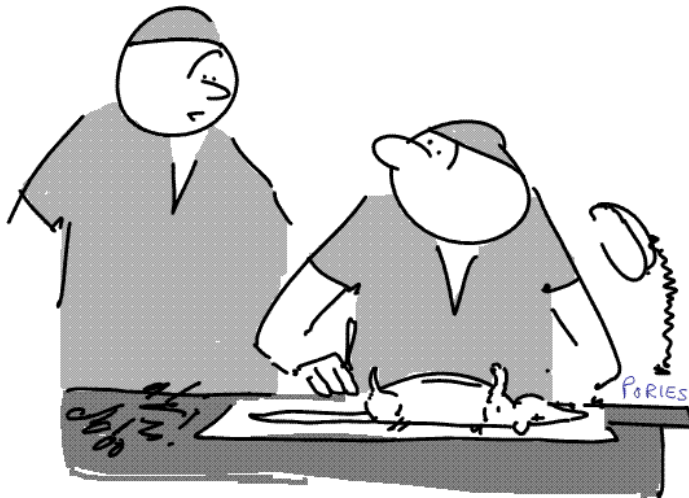


Newsweek

Is There a Surgical Cure for Diabetes?

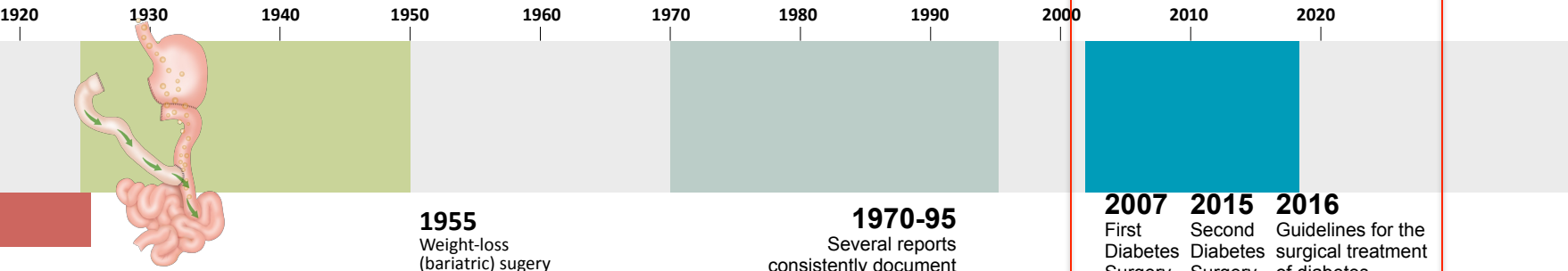
A controversial doctor says yes; his critics say bull---:

... “Rubino's idea boils down to one impolite word used to refer to the excrement of cows”



“Francesco, why don't you just give him Metformin?”

THE (long) ROAD TO METABOLIC SURGERY



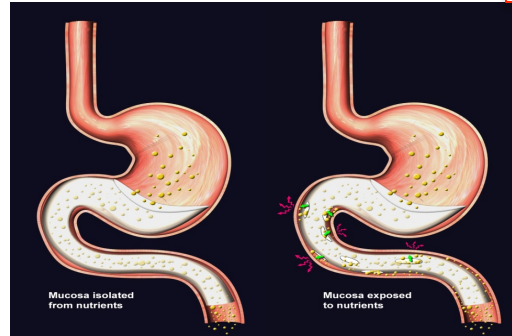
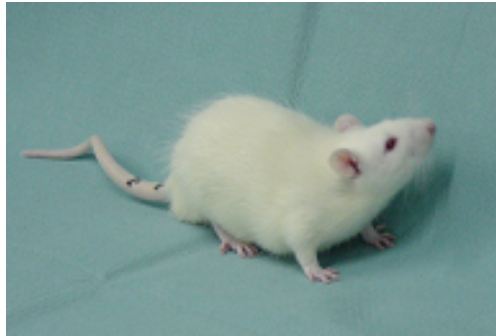
1955
Weight-loss (bariatric) surgery introduced.

1970-95
Several reports consistently document remission of diabetes after bariatric surgery

2004
Experimental evidence in rats links gastro-intestinal surgery and glucose metabolism⁶.

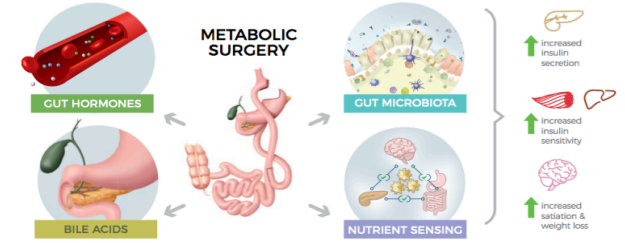
2007 First Diabetes Surgery Summit.
2015 Second Diabetes Surgery Summit.
2016 Guidelines for the surgical treatment of diabetes published in Diabetes Care¹.

F. Rubino *Nature* 533, 459–461 (2016).



How does surgery improve diabetes

Metabolic Surgery changes various mechanisms of GI physiology involved in metabolic regulation^{15, 16}

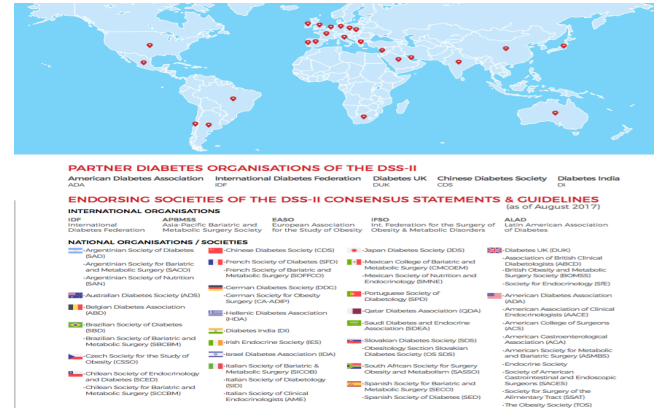


"Given its role in metabolic regulation, the GI tract constitutes a clinically and biologically meaningful target for the management of T2D." DSS-II¹²

RCTs

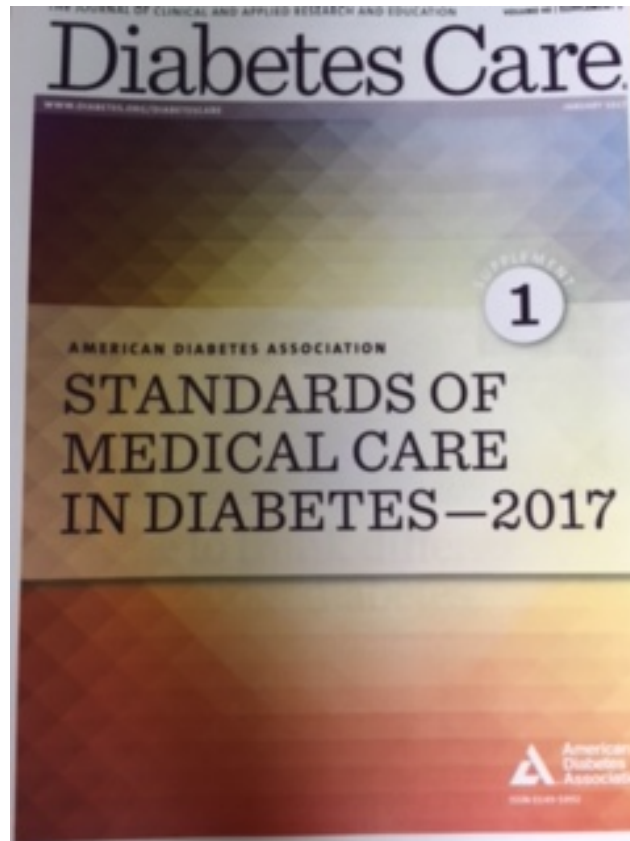
Study or Subgroup	Surgery		No Surgery		Peto Odds Ratio Peto, Fixed, 95% CI	Peto Odds Ratio Peto, Fixed, 95% CI
	Events	Total	Events	Total		
Wentworth 2014 (LAGB) (24 mo; s7.0%)	12	23	2	25	4.9%	8.11 [2.37, 27.84]
Liang 2013 (RYGB) (12 mo; s7.0% off meds)	28	31	0	70	8.4%	86.76 [33.89, 222.08]
Parikh 2014 (RYGB/LAGB/SG) (6 mo; s6.5% off meds)	13	20	0	24	4.5%	21.15 [5.85, 76.51]
Ikrumuddin 2013 (RYGB) (12 mo; s7.0%)	28	57	11	57	12.5%	3.72 [1.72, 8.04]
Ikrumuddin 2015 (RYGB) (24 mo; s7.0%)	26	60	8	59	11.8%	4.25 [1.92, 9.38]
Couroulas 2014 (RYGB/LAGB) (12 mo; s6.5% off meds)	18	41	0	17	5.1%	7.51 [2.24, 25.21]
Couroulas 2015 (RYGB/LAGB) (36 mo; s6.5% off meds)	14	37	0	14	4.0%	6.44 [1.65, 25.21]
Halperin 2014 (RYGB) (12 mo; s6.5% off meds)	11	19	3	19	4.4%	5.82 [1.59, 21.39]
Ding 2015 (LAGB) (12 mo; s6.5%)	6	18	5	22	3.9%	1.68 [0.42, 6.66]
Dixon 2008 (LAGB) (24 mo; s6.2% off meds)	22	29	4	26	6.7%	10.83 [3.79, 30.96]
Schauer 2012 (RYGB/SG) (12 mo; s6.0%)	34	99	0	41	4.0%	6.39 [2.74, 14.88]
Schauer 2014 (RYGB/SG) (36 mo; s6.0%)	27	97	0	40	8.7%	5.73 [2.28, 14.42]
Cummings 2015 (RYGB) (12 mo; s6.5% off meds)	9	15	1	17	3.4%	11.48 [2.63, 50.13]
Mingrone 2012 (RYGB/BPO) (24 mo; s6.5% off meds)	34	40	0	20	6.4%	30.08 [10.28, 88.06]
Mingrone 2015 (RYGB/BPO) (60 mo; s6.5% off meds)	19	38	0	15	4.9%	8.44 [2.46, 29.01]
Total (95% CI)	624	466	100.0%	8.45	[6.44, 11.10]	
Total events	301		34			
Heterogeneity: Chi ² = 45.43, df = 14 (P < 0.0001); I ² = 69%						
Test for overall effect: Z = 15.36 (P < 0.00001)						

GLOBAL DSS GUIDELINES



January 2017:

The American Diabetes Association (ADA) introduces surgery in the *Standards of Medical Care* for Diabetes





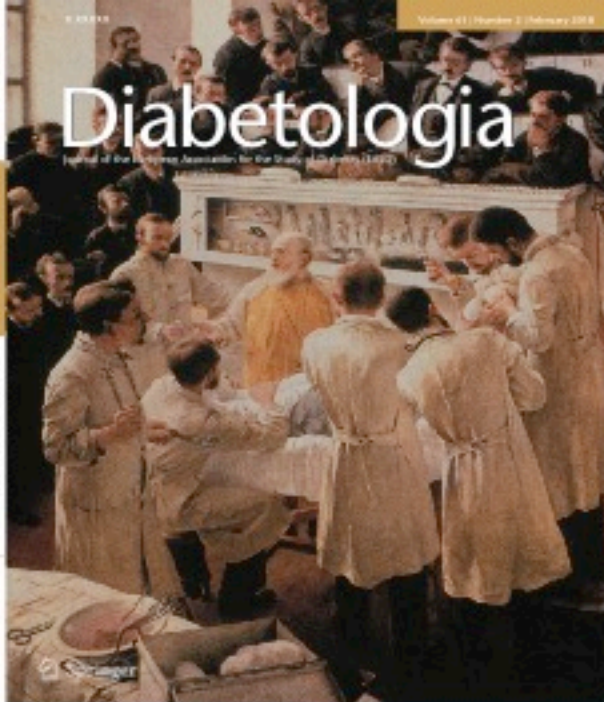
Metabolic Surgery for Type 2 Diabetes: Changing the Landscape of Diabetes Care
W. H. Kessler, Jr., M. D., et al.

Notes of the Gut in Diabetes Management
J. J. Holm, M. D., et al.

Glucose Variability in a 26-Week Randomized Comparison of Insulin Treatment With Rapid Acting Insulin Versus GIP-2 Agonist in Participants With Type 2 Diabetes at High Cardiovascular Risk
The STAMP Trial Investigators

Association Between Use of Light-Curing Energy and Cardiovascular Disease and Death in Individuals With Type 2 Diabetes
S. S. Kim, M. D., et al.

SPECIAL ARTICLE COLLECTION:
Metabolic Surgery and the Changing Landscape for Diabetes Care



Diabetologia

Journal of the European Association for the Study of Diabetes (EASD)



nature



Comparative growth rates among young meerkats in a natural environment
COMPARE THE MEERKATS

HEALTH SCIENCE

CUTTING-EDGE MEDICINE

Why surgery is the next big thing in type 2 diabetes
PAGE 459



HOW CITIES CAN SAVE US ALL A vision for a zero-waste, driver-less, energy-positive urban future

SCIENTIFIC AMERICAN



PLUS

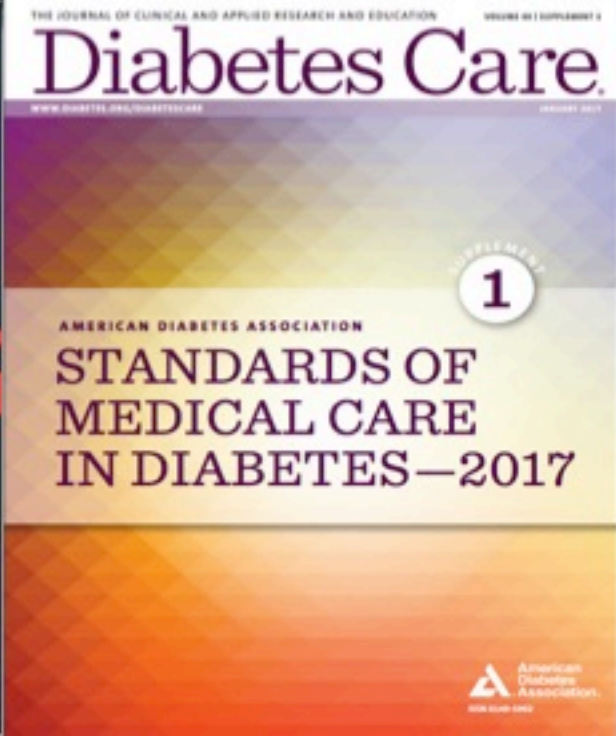
IS DARK MATTER MADE OF BLACK HOLES?
A cosmic mystery

SURGERY STOPS DIABETES...
... and leads to a new theory of the disease



OPERATION: DIABETES

Surgery that shortens intestines gets rid of the illness, and new evidence shows the gut—not simply insulin—may be responsible
By Francesco Rubino



Diabetes Care

THE JOURNAL OF CLINICAL AND APPLIED RESEARCH AND EDUCATION

1

AMERICAN DIABETES ASSOCIATION
STANDARDS OF MEDICAL CARE IN DIABETES—2017



Can a cure for diabetes be found through surgery? | The ...

The Economist



The Economist

THE TIMES

Scalpel, Please

Gastric surgery can achieve extraordinary results for diabetes sufferers

Health secretary would lightly spend £600 million on 100,000 operations if he did not think they were essential. That is why the diabetes research community has assembled every possible argument in favour of gastric surgery as a treatment for the condition. The arguments are compelling and Jeremy Hunt and NHS regulators should pay attention to them.

Gastric surgery is traditionally seen as a last resort for the morbidly obese. The latest science suggests that it may in fact be the closest thing yet to a cure for diabetes, which afflicts 4 million people in Britain and consumes 12 per cent of global healthcare spending.

Diabetes is the pandemic of the modern age. There is a direct correlation between rising GDP and the incidence of obesity-linked type 2 diabetes. There are also serious barriers to the adoption of gastric surgery as a way of containing it, including the high cost per patient and the widely held view that the first line of defence should be a return to healthier lifestyles by people seen to have brought the illness on themselves. Economics as a science suggest otherwise. Gastric bands

and bypasses on a mass scale may be the best investment on offer to a cash-strapped NHS.

Research released yesterday based on 11 clinical trials finds that surgery can attack the causes of diabetes, not just its symptoms — and can do so more effectively than drugs, diet or exercise. In one study by Newcastle University the blood-sugar levels of 18 patients returned to normal after gastric bypass surgery. In another published last year half the subjects were, effectively, free of diabetes five years after a similar procedure. Meanwhile, fewer than half of sufferers who rely on conventional treatments significantly lower their risk of complications, which include stroke, kidney failure, blindness and heart disease.

How surgery can achieve such dramatic results is not yet clear. Some experiments suggest that it boosts natural insulin production by altering the secretion of hormones in the gut. Others point to fat loss in the pancreas itself, allowing formerly obese patients to resume virtually normal blood-sugar management. However, the potential for surgery to reverse the effects of diabetes rather than merely treat them is clear. The conclusion

that surgery should be considered a mainstream response is unavoidable.

In Britain the first step towards this would be for the National Institute for Health and Care Excellence (Nice) to approve surgery not just for extreme obesity but specifically for advanced type 2 diabetes. About a million patients would be eligible. Of these 100,000 would be highly likely to benefit. At present, their treatment costs the NHS about £3,000 per patient a year. At an average cost per operation of £6,000 the health service could expect to earn that back in subsequent savings within two years.

Some worry that the easy availability of surgery would signal to diabetes sufferers that better diets and less sedentary lifestyles were no longer paramount. This advice has not stopped the global incidence of diabetes quadrupling since 1980. Moreover, surveys show that the rapid results achieved through surgery often encourage patients where willpower alone has let them down. In straitened times, with an ageing population and spiralling diabetes-related costs, Nice and the NHS need to think outside the box and embrace the band.

“The conclusion that Surgery should be considered a mainstream response is unavoidable”

nature

UIG/GETTY



Surgery can be an effective treatment for type 2 diabetes.

Time to think differently about diabetes

New guidelines for the surgical treatment of type 2 diabetes bolster hopes of finding a cure, writes **Francesco Rubino**, but long-standing preconceptions must be put aside.

DIABETES REMISSION

ADA DEFINITION of REMISSION OF DIABETES

HbA1c < 6.5% (partial remission)

HbA1c < 6.0% (complete remission)

NO ONGOING PHARMACOLOGIC TREATMENT
FOR AT LEAST 1-YEAR



Incidence of Remission in Adults With Type 2 Diabetes: The Diabetes & Aging Study

*Andrew J. Karter,¹ Shantanu Nundy,^{2,3}
Melissa M. Parker,¹ Howard H. Moffet,¹
and Elbert S. Huang^{4,5,6}*

DOI: 10.2337/dc14-0874

Diabetes Care Publish Ahead of Print, published online September 17, 2014

122,781 patients **UNDER
MEDICAL MANAGEMENT ONLY**

Remission of T2DM with lifestyle modification/medical therapy

Partial	2.8%
Complete	0.24%
Prolonged	0.04%

ORIGINAL ARTICLE

Weight and Metabolic Outcomes 12 Years after Gastric Bypass

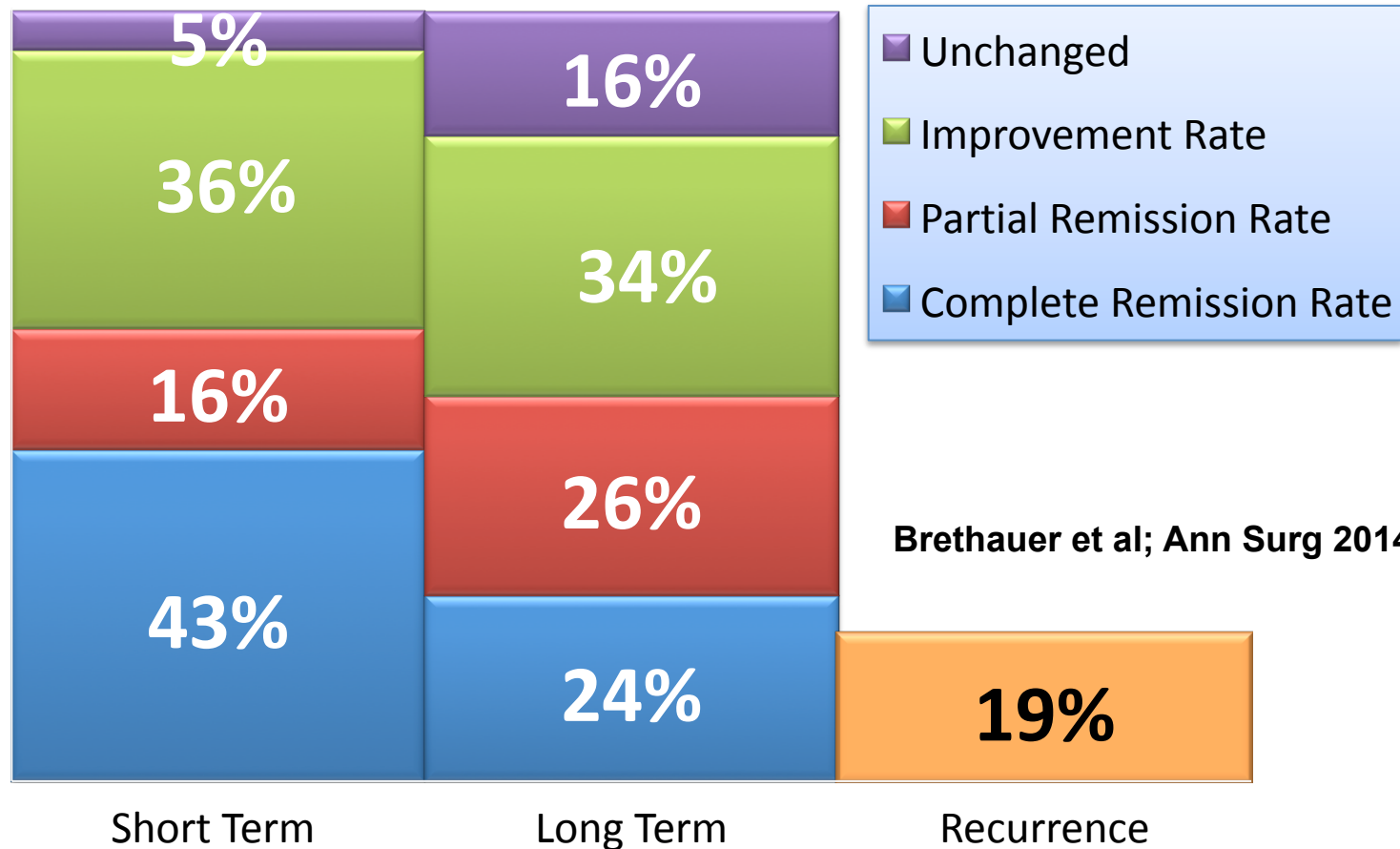
Ted D. Adams, Ph.D., M.P.H., Lance E. Davidson, Ph.D., Sheldon E. Litwin, M.D., Jaewhan Kim, Ph.D., Ronette L. Kolotkin, Ph.D., M. Nazeem Nanjee, Ph.D., Jonathan M. Gutierrez, B.S., Sara J. Frogley, M.B.A., Anna R. Ibele, M.D., Eliot A. Brinton, M.D., Paul N. Hopkins, M.D., M.S.P.H., Rodrick McKinlay, M.D., Steven C. Simper, M.D., and Steven C. Hunt, Ph.D.

Sept 21, 2017

REMISSION OF TYPE 2 DIABETES AFTER RYGB

75% at 2 years
62% at 6 years,
51% at 12 years

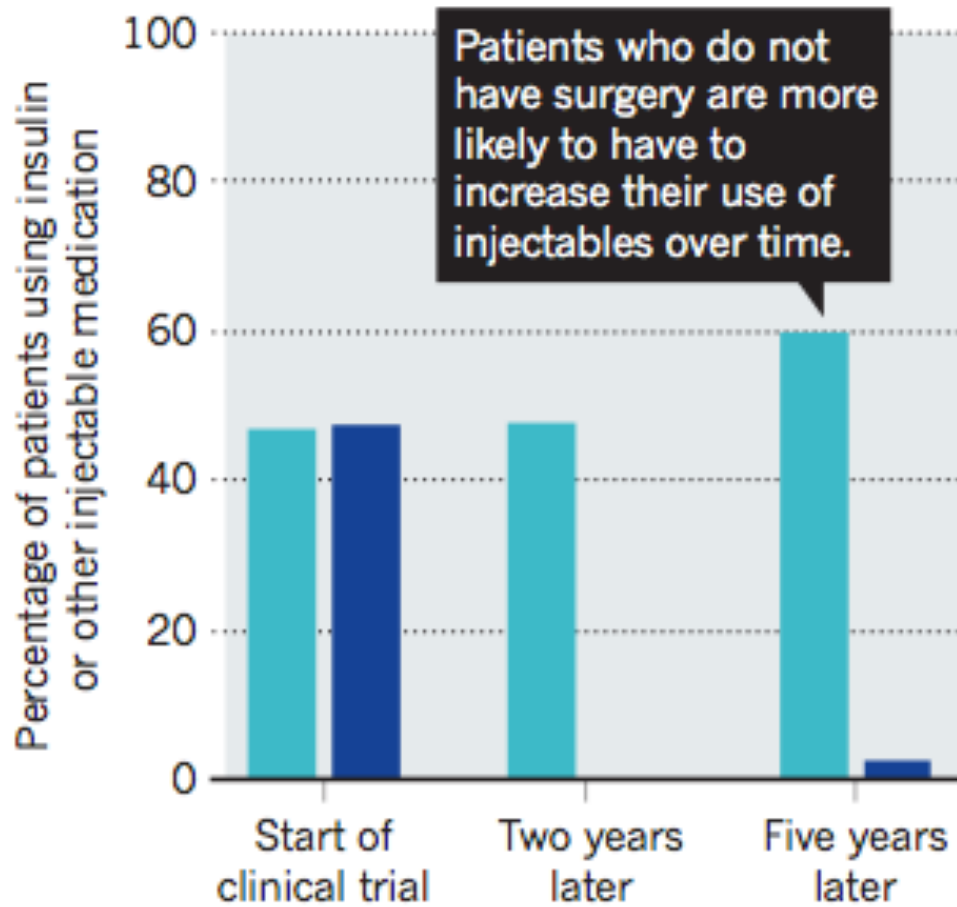
Remission and Recurrence @5-yr (n=217)



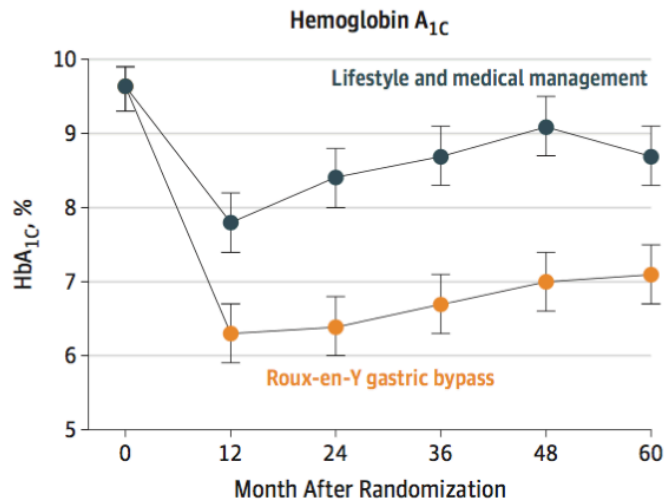
Of 19% of patients developed recurrence of diabetes, 75% still had A1c <7%

BENEFITS BEYOND REMISSION

■ Not undergoing surgery ■ Undergoing surgery

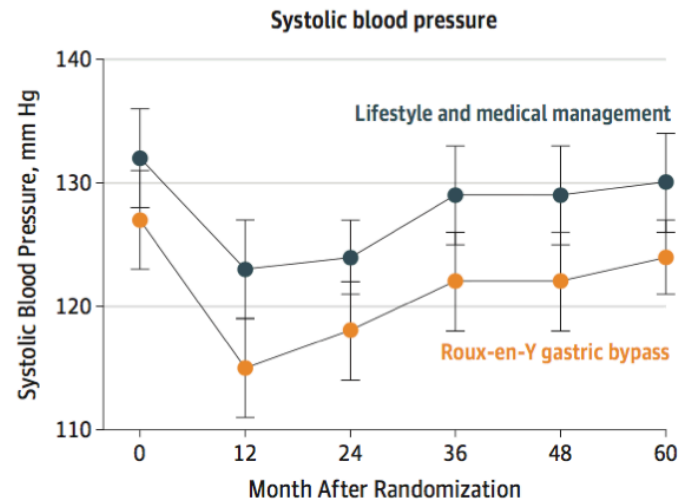


Data from 5-year outcomes in RCT; Mingrone et al, Lancet 2015



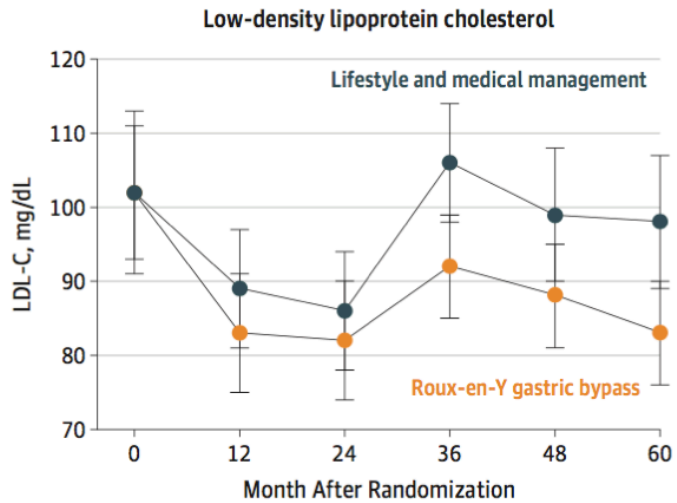
No. of patients

	0	12	24	36	48	60
Lifestyle and medical management	56	56	54	44	42	43
Roux-en-Y gastric bypass	57	57	56	55	54	55



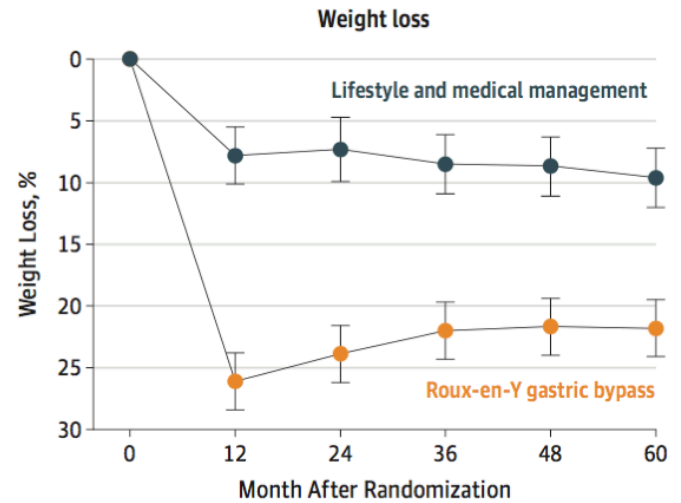
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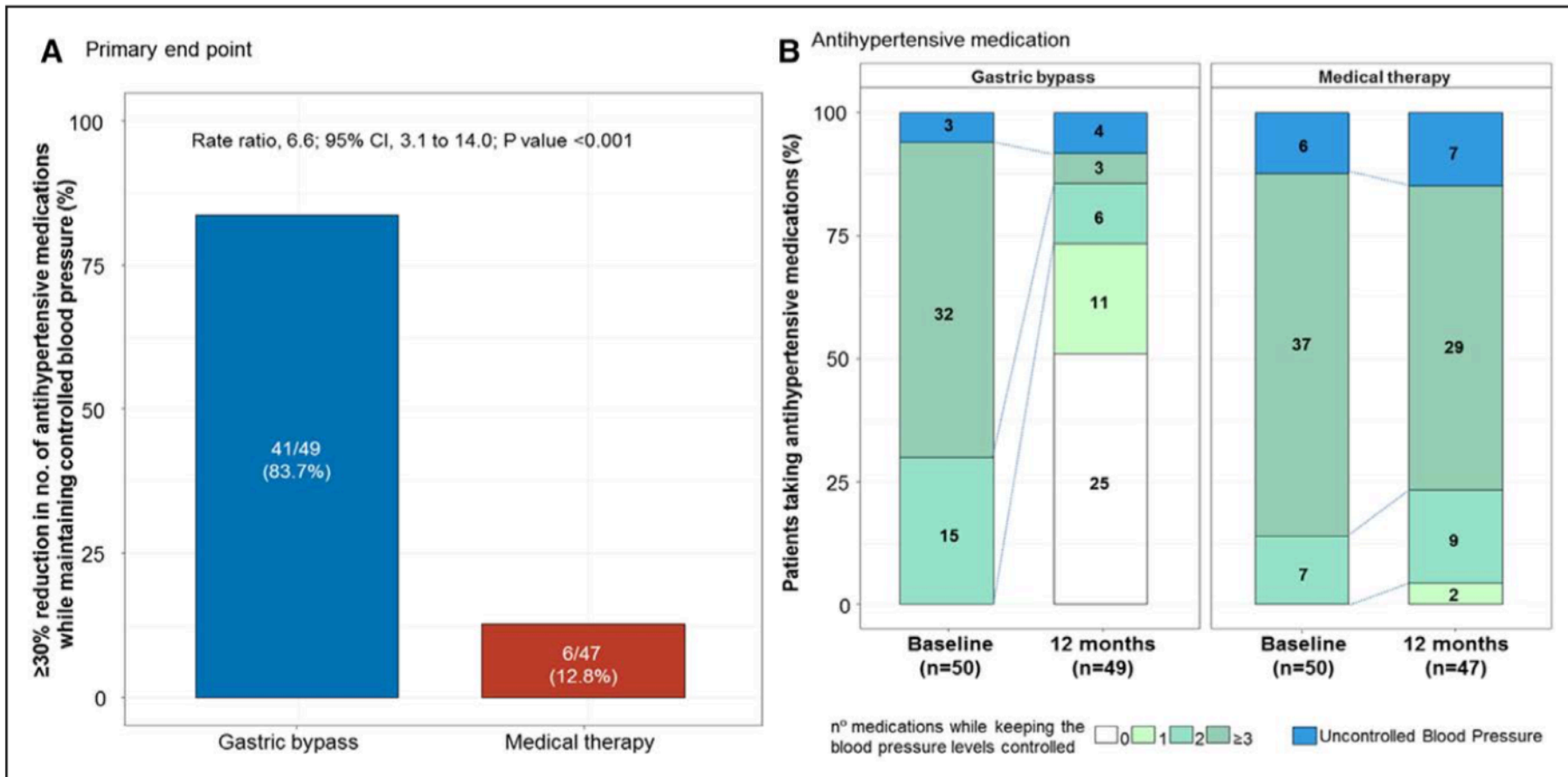


No. of patients

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Roux-en-Y gastric bypass	57	57	56	55	54	55

GATEWAY Trial: RYGB vs Lifestyle and Medical Rx for Hypertension

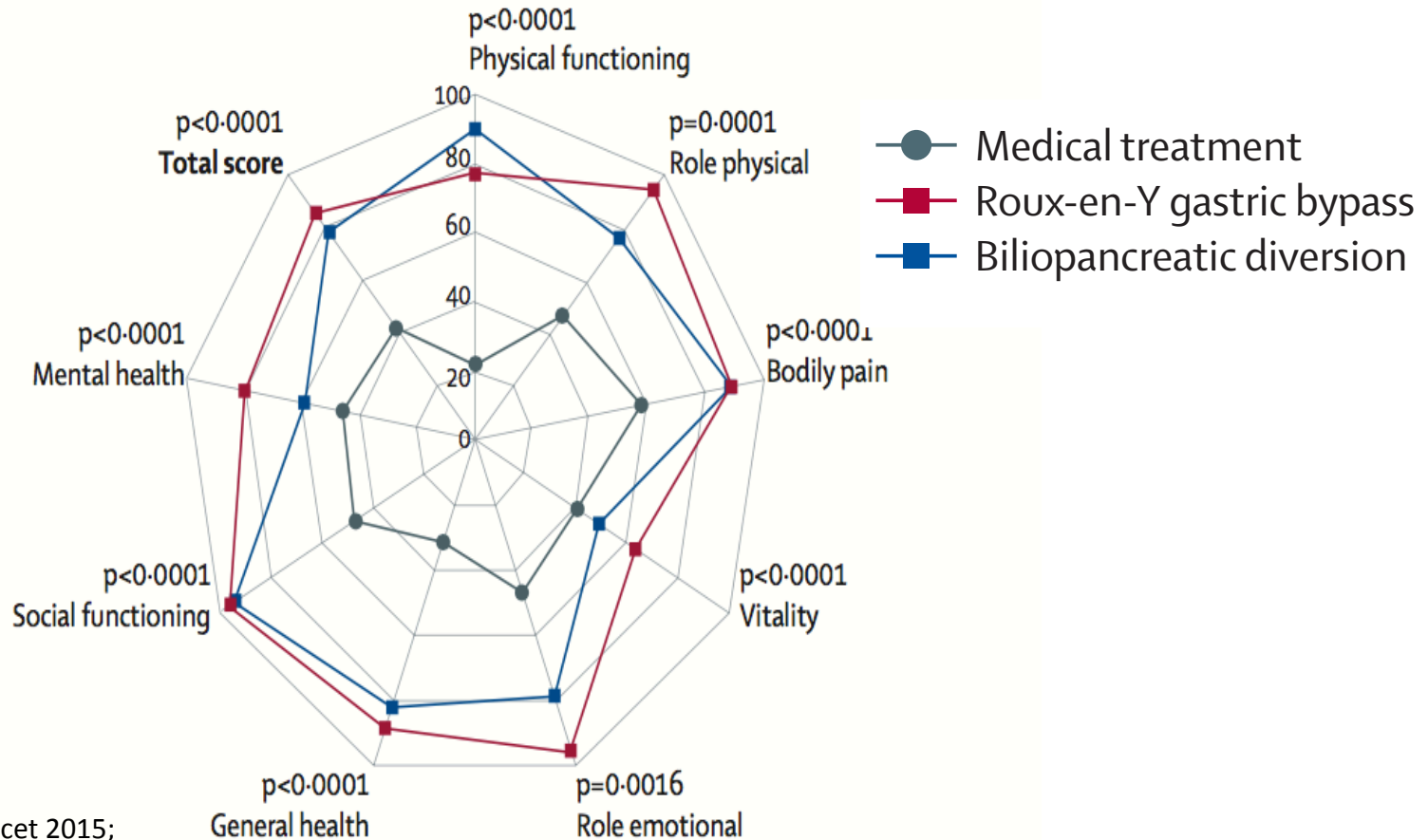
Schiavon et al



5-Yr Outcomes of Surgical vs Medical Treatment of T2DM: An Open-label, Randomized Clinical Trial

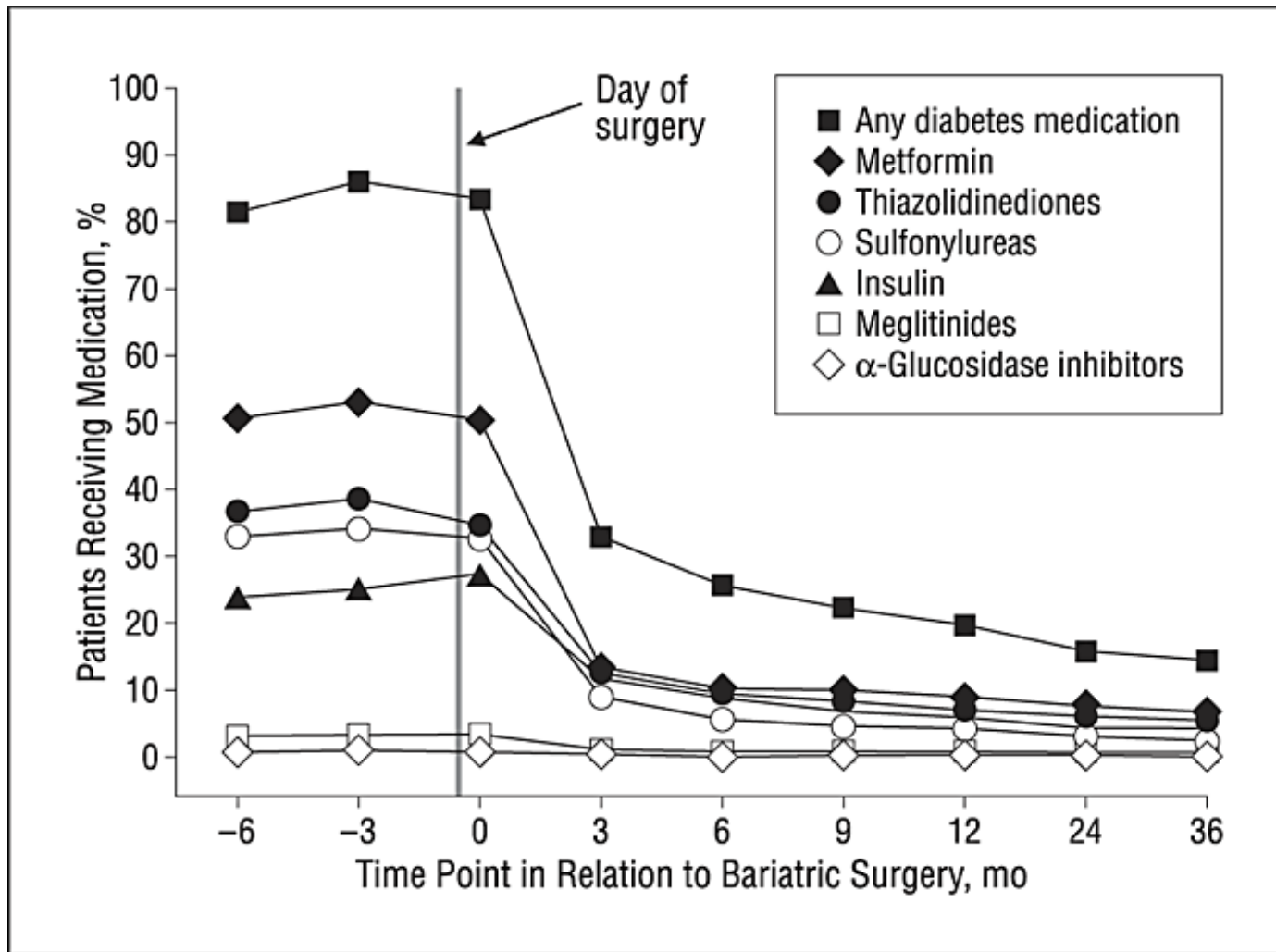
Surgery associated with Improved QoL

D Quality of life‡



REDUCTION OF MEDICATION USAGE

Use of diabetes medication before and after bariatric surgery



Makary, M. A. et al. Arch Surg 2010;145:726-731.

Clinical and Patient-Centered Outcomes in Obese Type 2 Diabetes Patients 3 Years After Randomization to Roux-en-Y Gastric Bypass Surgery Versus Intensive Lifestyle Management: The SLIMM-T2D Study

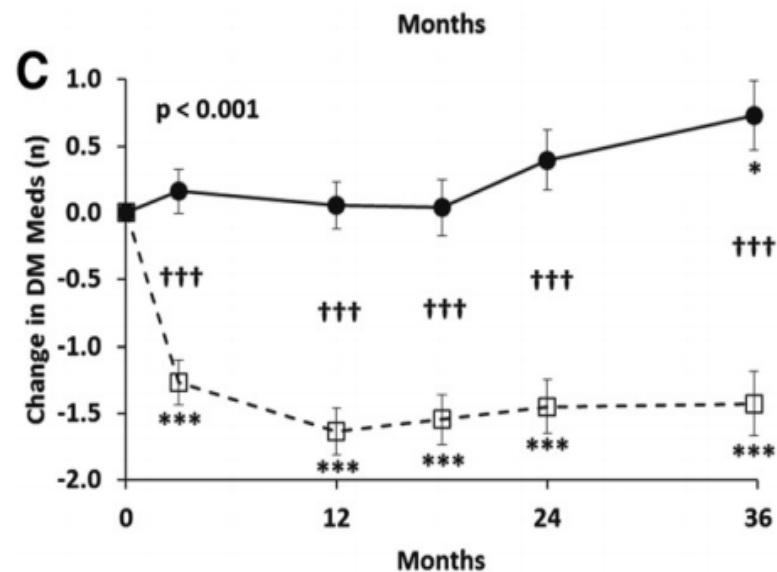
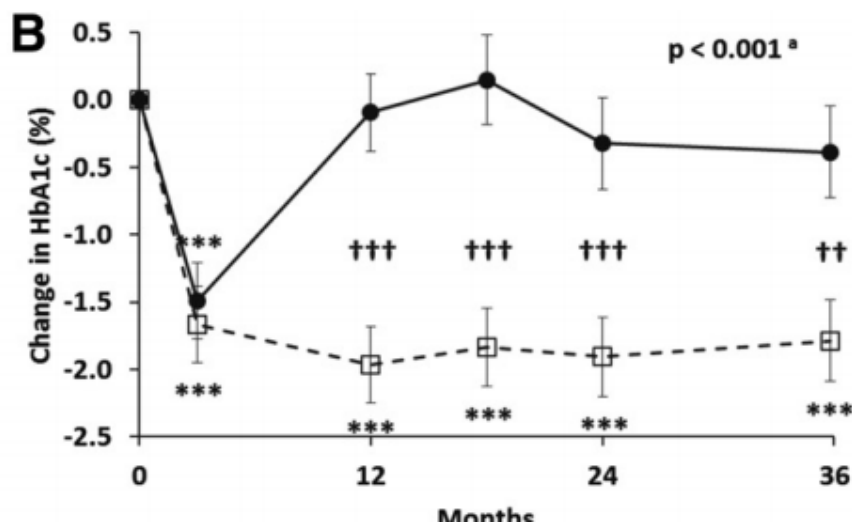


Donald C. Simonson, Florencia Halperin, Kathleen Foster, Ashley Vernon and Allison B. Goldfine

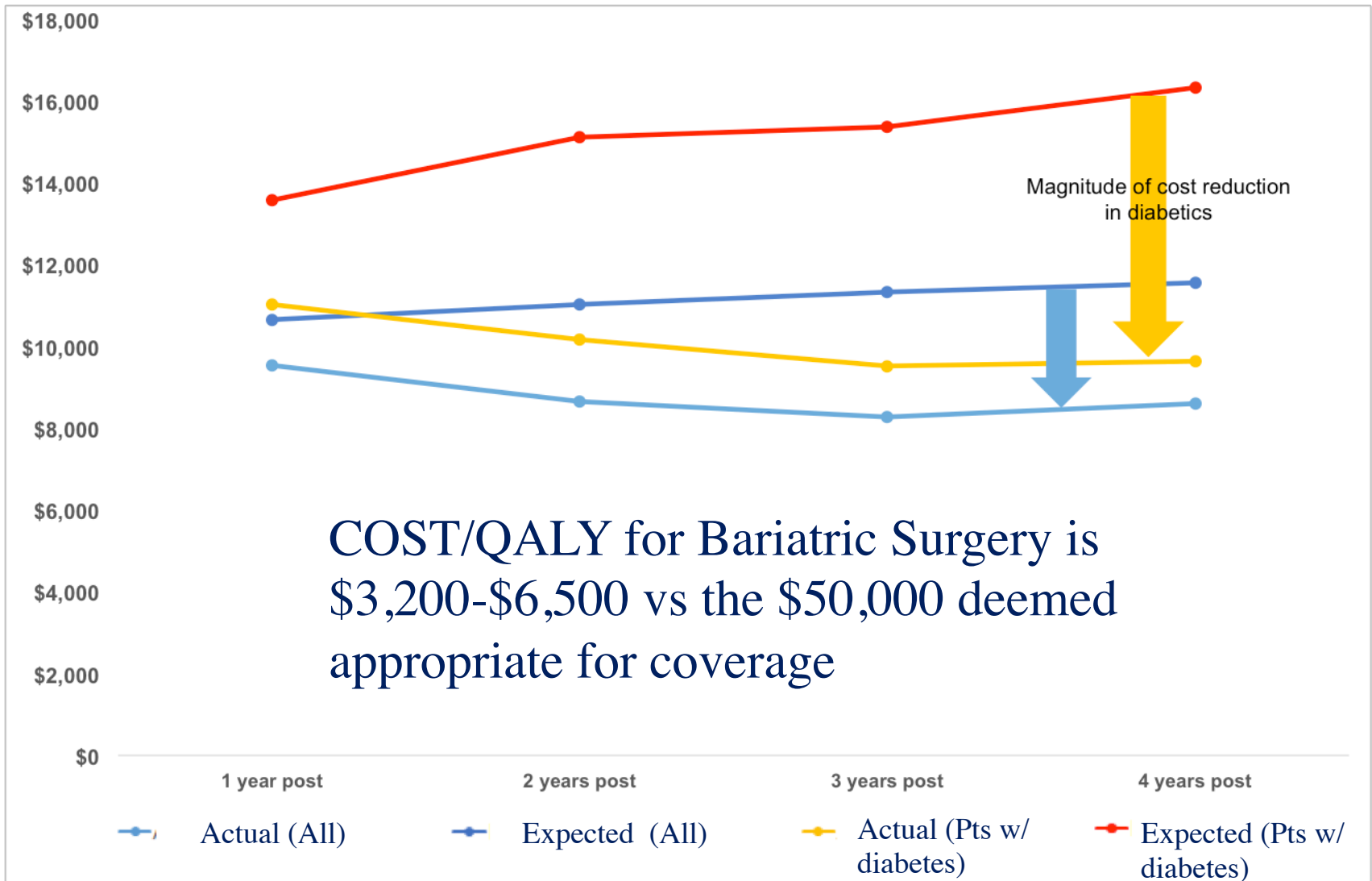
Diabetes Care 2018 Feb; dc170487. <https://doi.org/10.2337/dc17-0487>

- Change in DM Meds

Change in HbA1c



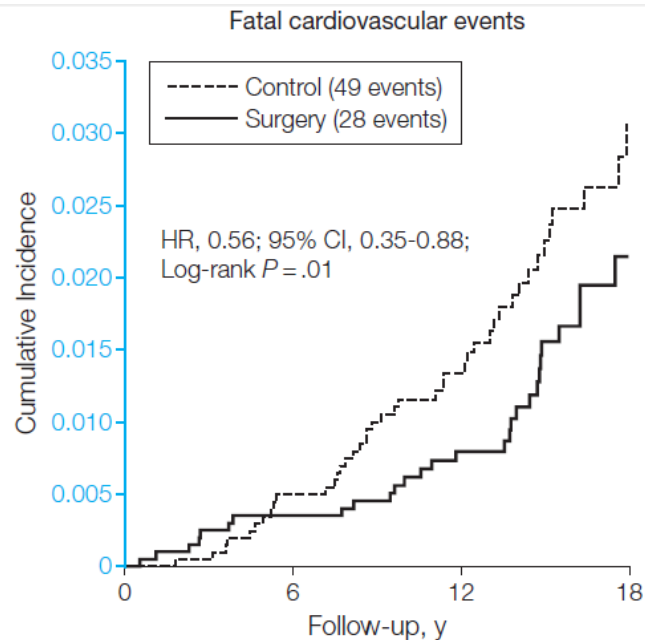
EXPECTED vs. ACTUAL COST POST BARIATRIC SURGERY



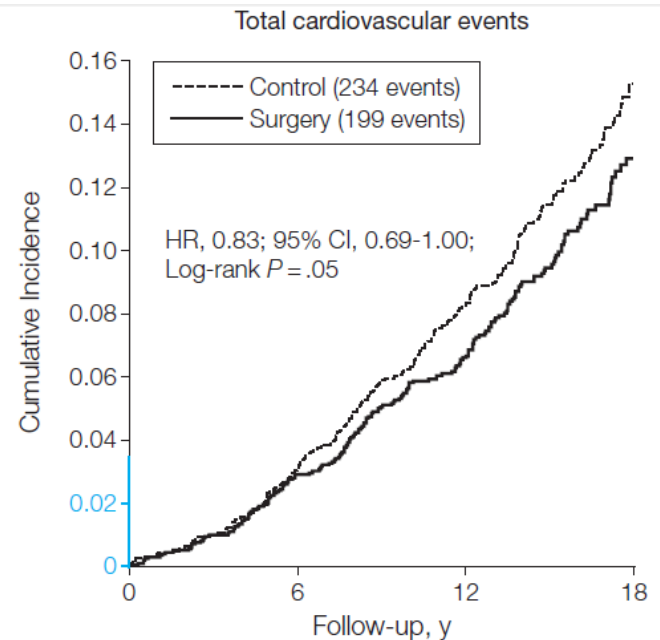
Estimates based on Milliman's longitudinal analysis of the 2009 RYGB laparoscopic surgery patient population identified in the Truven MarketScan commercial claims database for 2005-2013 2013 costs trended 5% per year to 2015 and thereafter trended by 3%.

PREVENTION OF COMPLICATIONS

Bariatric surgery reduces MI and stroke



No. at risk	0	6	12	18
Control	2037	1993	1423	405
Surgery	2010	1970	1557	412



No. at risk	0	6	12	18
Control	2037	1945	1326	361
Surgery	2010	1921	1468	375

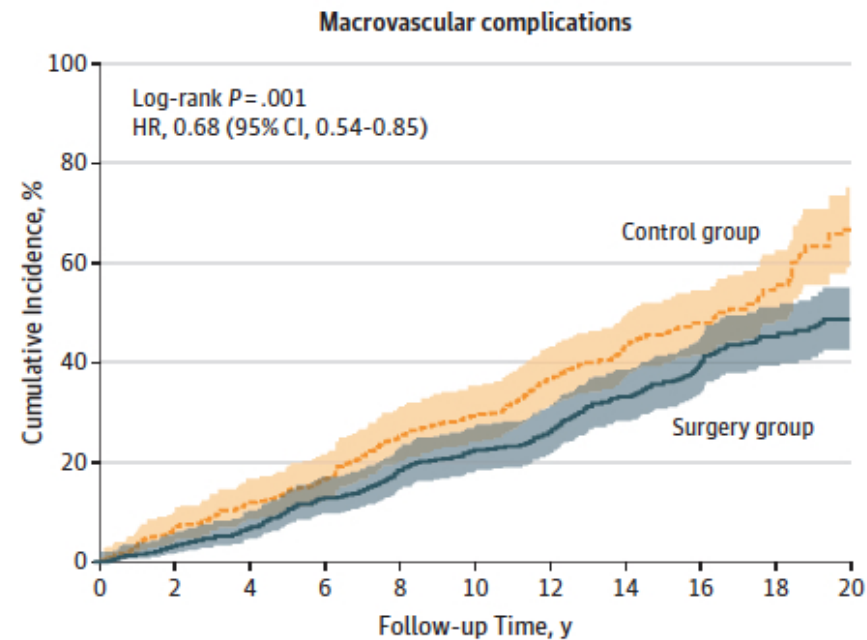
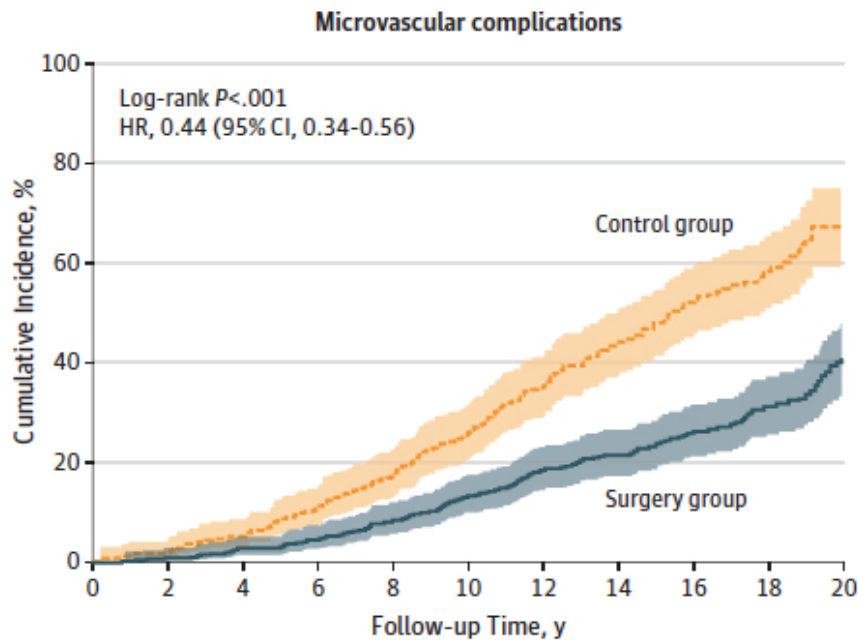
Bariatric surgery associated with reduced number of cardiovascular deaths and cardiovascular events in obese adults, compared with usual care

Association of Bariatric Surgery With Long-term Remission of Type 2 Diabetes and With Microvascular and Macrovascular Complications

JAMA, June 2014

Lars Sjöström, MD, PhD; Markku Peltonen, PhD; Peter Jacobson, MD, PhD; Sofie Ahlin, MD, PhD; Johanna Andersson-Assarsson, PhD; Åsa Anveden, MD; Claude Bouchard, PhD; Björn Carlsson, MD, PhD; Kristjan Karason, MD, PhD; Hans Lönroth, MD, PhD; Ingmar Näslund, MD, PhD; Elisabeth Sjöström, MD; Magdalena Taube, PhD; Hans Wedel, PhD; Per-Arne Svensson, PhD; Kajsa Sjöholm, PhD; Lena M. S. Carlsson, MD, PhD

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

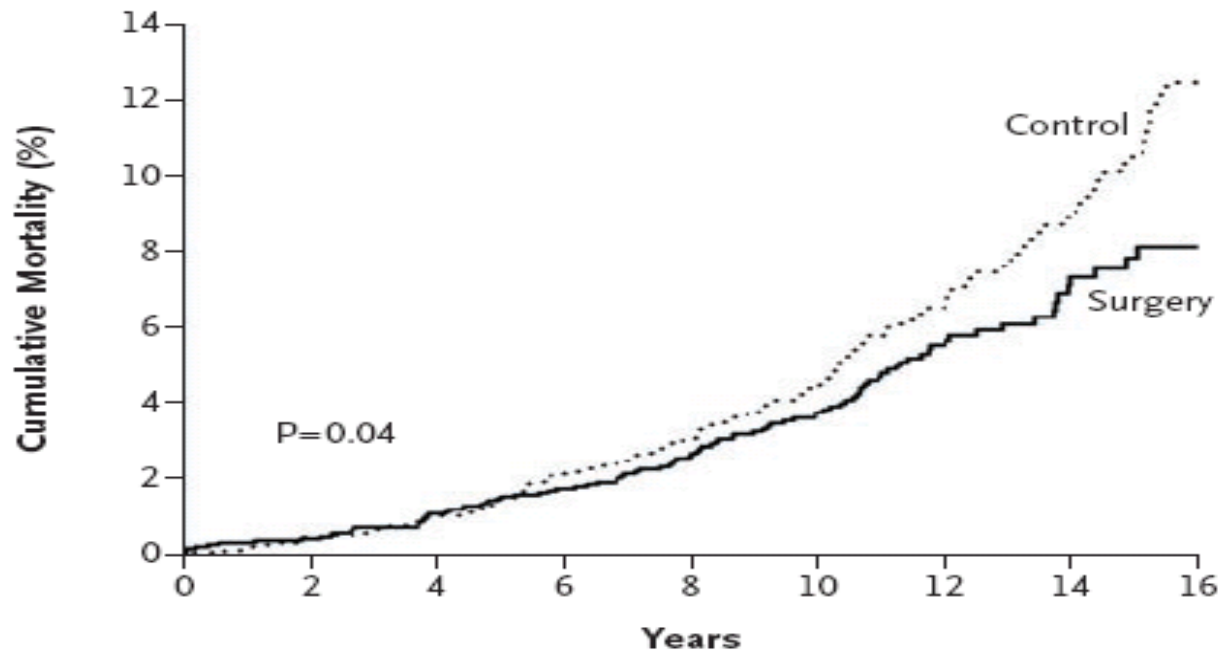


No. at risk

Control	260	251	239	222	201	177	146	104	68	46	19
Surgery	343	336	326	318	301	280	257	207	160	112	63

	260	240	225	214	191	178	155	116	80	53	20
	343	330	315	294	270	254	238	186	142	92	54

Surgery Improves Long-Term Survival



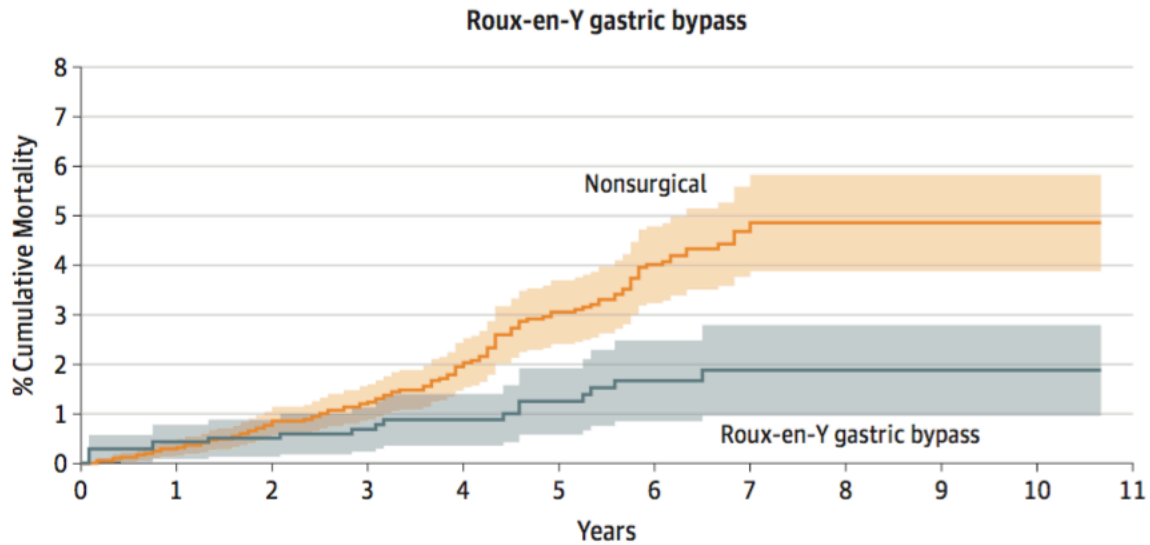
No. at Risk

Surgery	2010	2001	1987	1821	1590	1260	760	422	169
Control	2037	2027	2016	1842	1455	1174	749	422	156

Figure 2. Unadjusted Cumulative Mortality.

The hazard ratio for subjects who underwent bariatric surgery, as compared with control subjects, was 0.76 (95% confidence interval, 0.59 to 0.99; $P=0.04$), with 129 deaths in the control group and 101 in the surgery group.

Adjusted Hazard Ratios for mortality among non surgical patients vs gastric bypass: 2.65 (95% CI, 1.55-4.52)



No. of patients	0	1	2	3	4	5	6	7	8	9	10	11
Nonsurgical	4164	4073	3450	2930	2383	2022	1681	536	136	48	10	
Roux-en-Y gastric bypass	1388	1332	1202	1044	867	753	636	209	53	20	5	

Bariatric Surgery Associated With Reduced Long-Term, All-Cause Mortality Compared With Non-Operated Controls

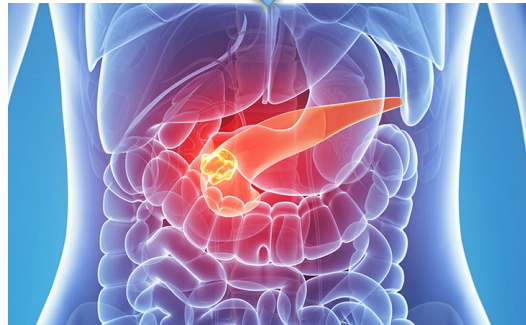
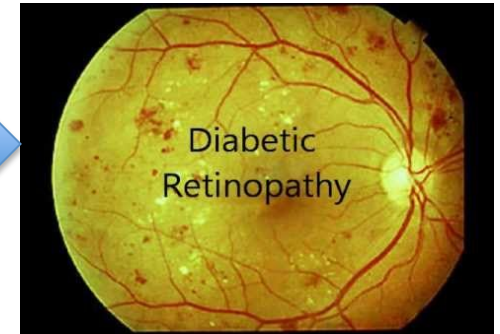
Study	Procedure	F/U	Mortality Reduction
MacDonald, 1997	RYGB	9 yr	88%
Flum, 2004	RYGB	4.4 yr	33%
Christou, 2004	RYGB	5 yr	89%
Sowemimo, 2007	RYGB	4.4 yr	63%
Dixon, 2007	LAGB	12 yr	72%
Adams, 2007	RYGB	8.4 yr	40%
Sjostrom, 2007	VBG/other	14 yr	31%
Perry, 2008	RYGB/LAGB	2 yr	48%

Inadequacy of BMI as an Indicator for Bariatric Surgery

Edward H. Livingston, MD

 SINCE THE TIME OF INTESTINAL BYPASS SURGERY AND

ceived diets that had normal or elevated protein levels. Low protein diets also were associated with a net loss of lean body mass, whereas the other diets resulted in gains in lean body

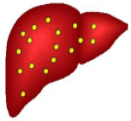


The Spectrum of NAFLD

Fatty Liver

NASH

Cirrhosis



Fat accumulates in the liver

Fat plus inflammation and scarring

Scar tissue replaces liver cells

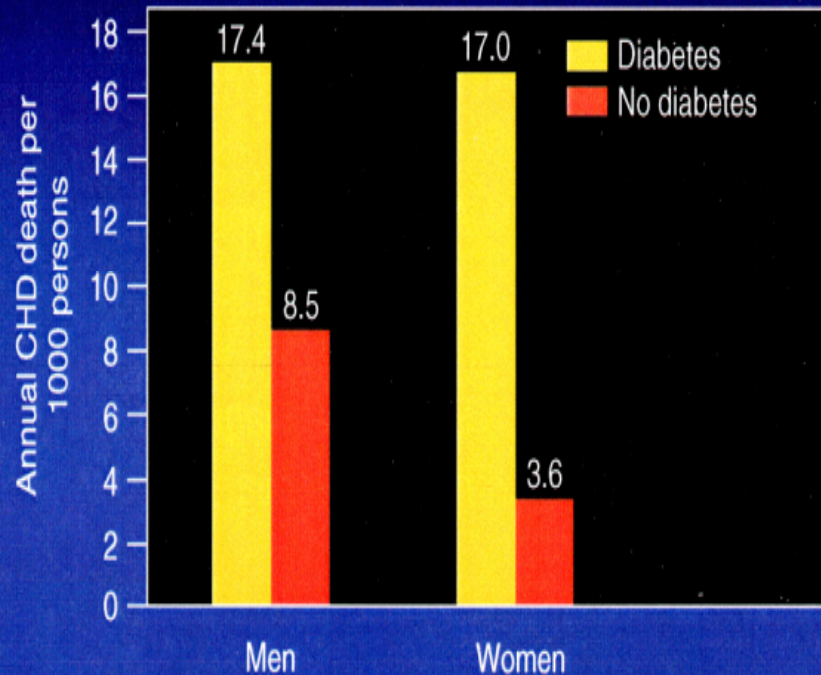
42 yo Female Pt with T2DM, Hypertension, Dyslipidaemia, CVD; BMI 31 kg/m²

October 2009

History of Diabetes: 8 yr
Meds: Insulin, Exenatide, Ramipril, Statins

HbA1c: 9.1% (8.2-12)
History of ischemic heart disease

Framingham Study: DM and CHD Mortality — 20-Year Follow-Up

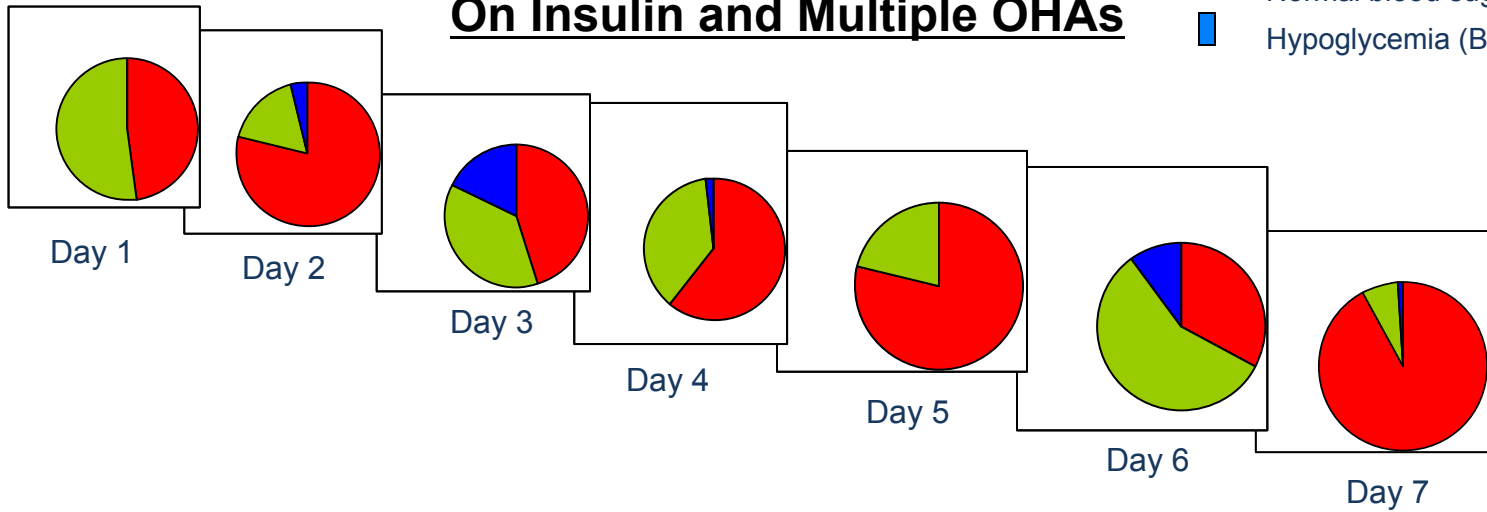


DM = diabetes mellitus
Kannel WB, McGee DL. JAMA 1979;241:2035-2036.

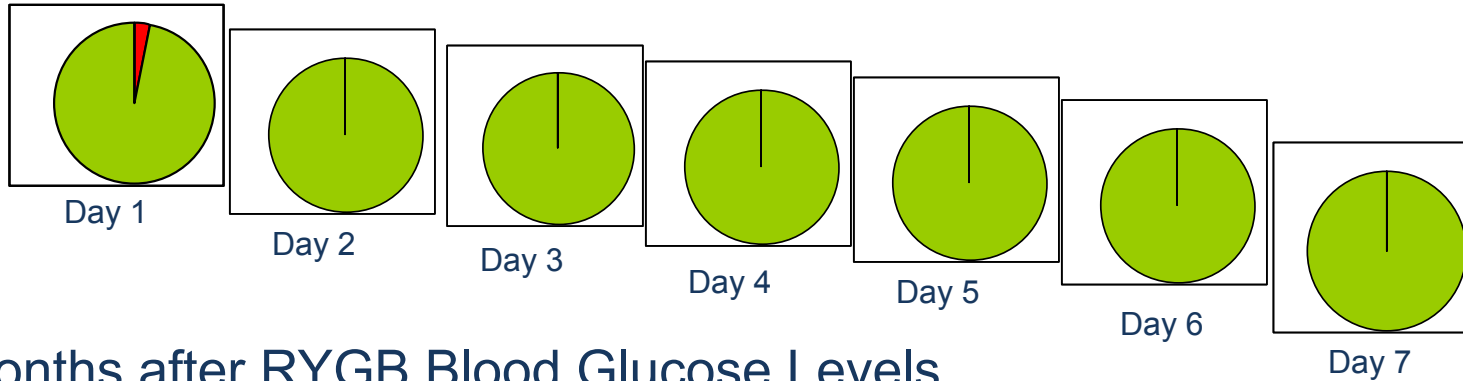
Preoperative

Female, 42 yo, BMI 31
On Insulin and Multiple OHAs

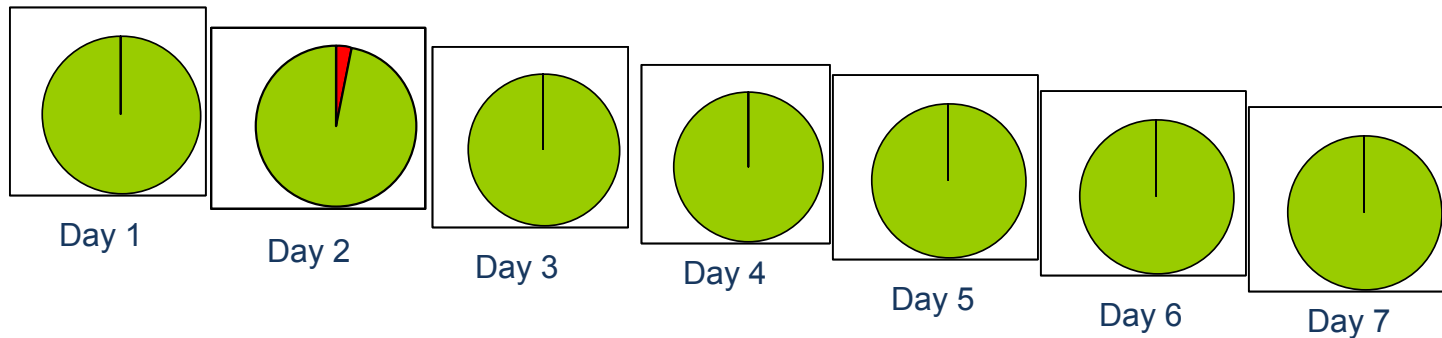
- Hyperglycemia (BG>180mg/dl)
- Normal blood sugar (BG btwn 70-180)
- Hypoglycemia (BG<70mg/dl)



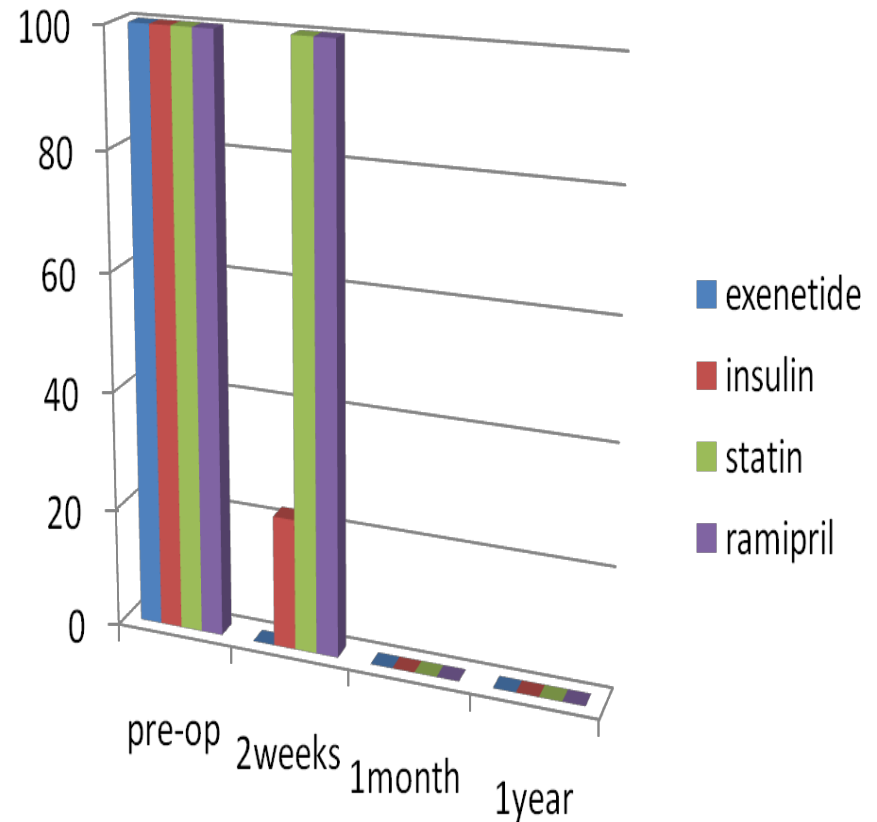
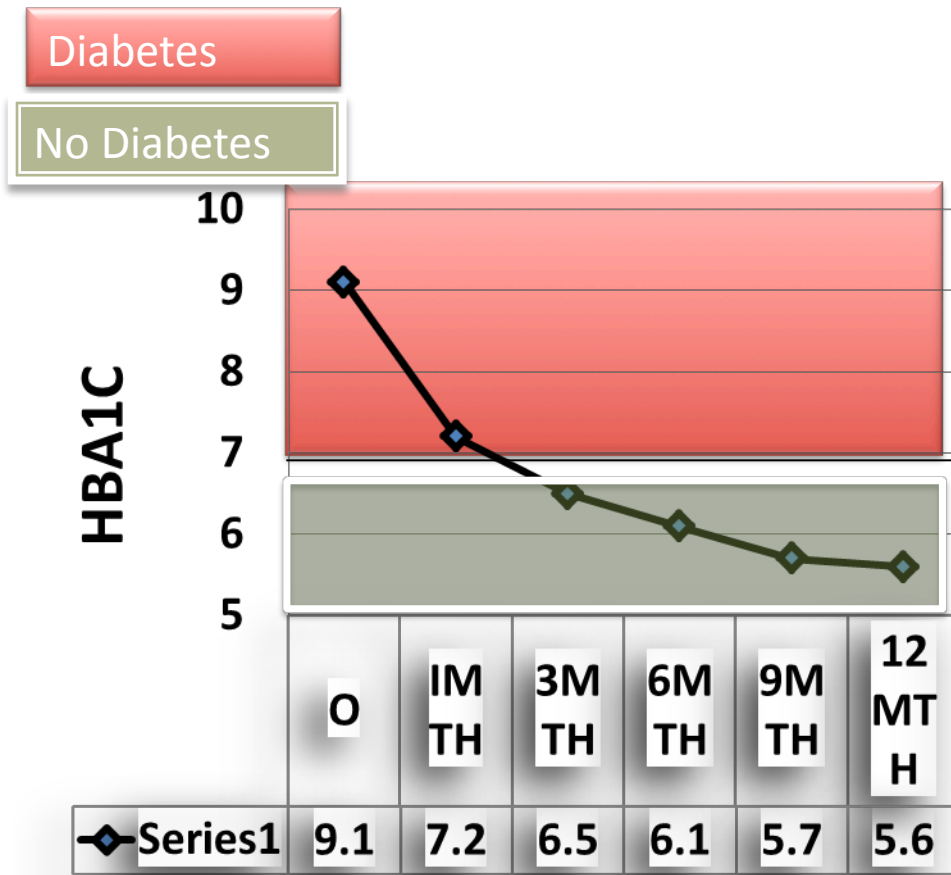
2 Weeks after RYGB Blood Glucose Levels



3 Months after RYGB Blood Glucose Levels



42 yo Female Pt with T2DM, Hypertension, Dyslipidaemia, CVD



42 yo Female Pt with T2DM, Hypertension, Dyslipidaemia, CVD

Diabetes

No Diabetes

RYGB Oct 2009

HbA1c

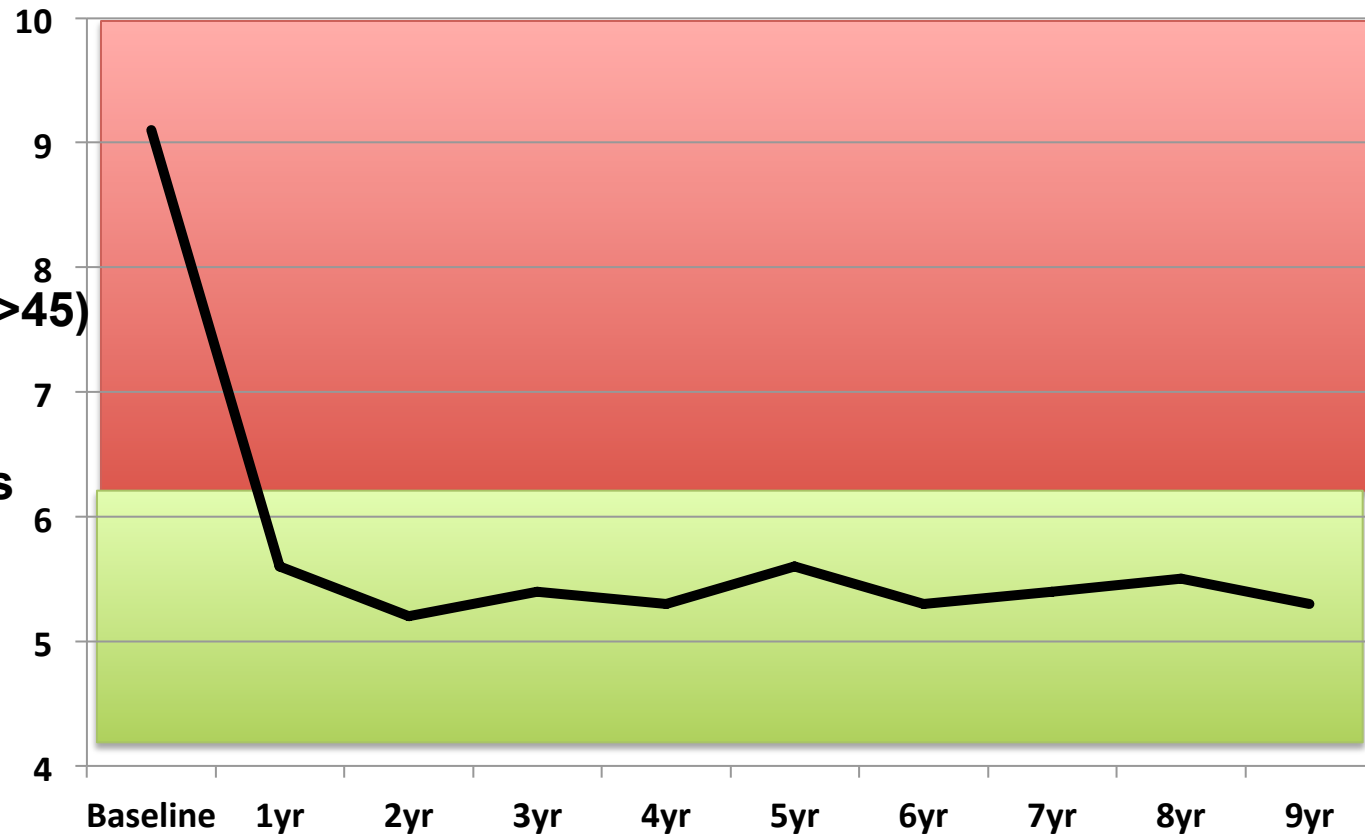
Sept 2018

BP: 120/68 mmHg

HDL: 59 mg/dl (nv: >45)

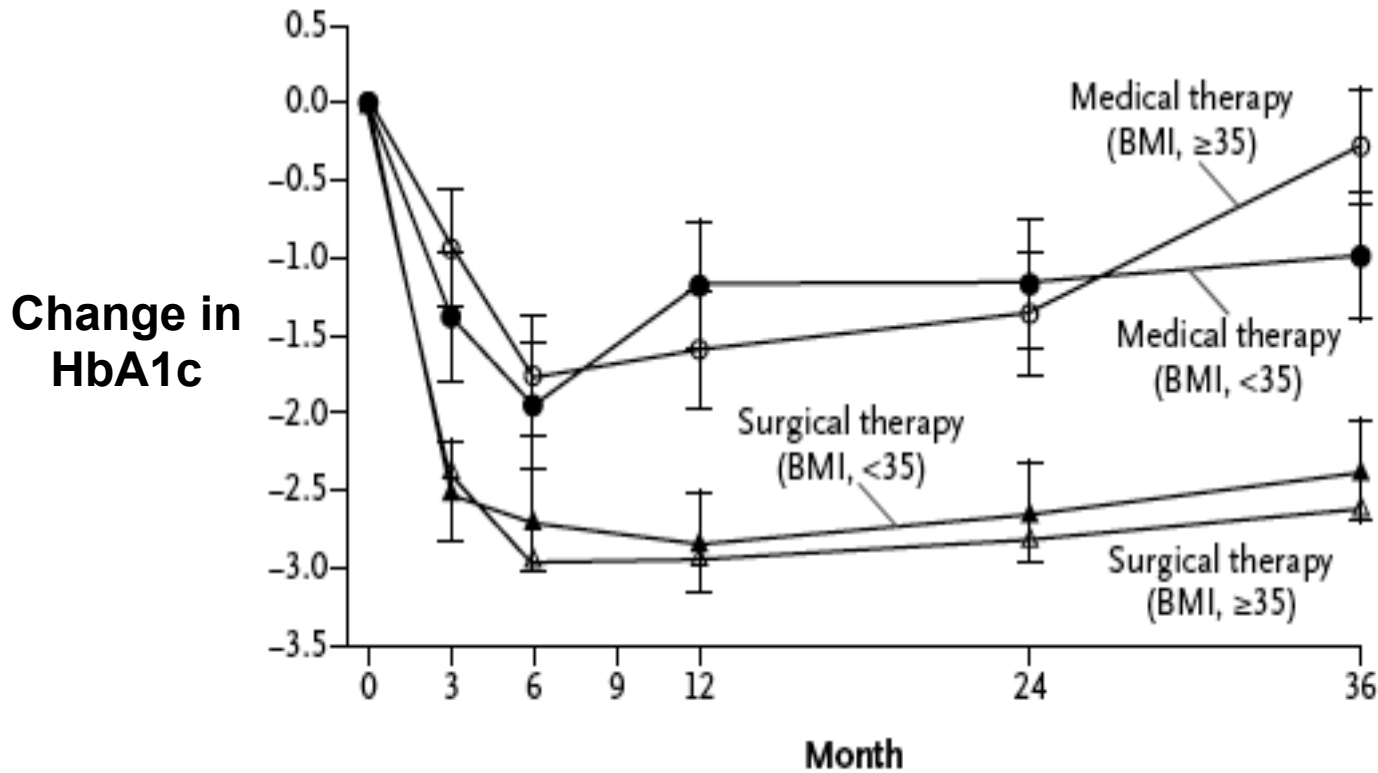
LDL: 102 mg/dl

Meds: Multivitamins



Diabetes Control in pts with BMI < 35 kg/m²

STAMPEDE Trial



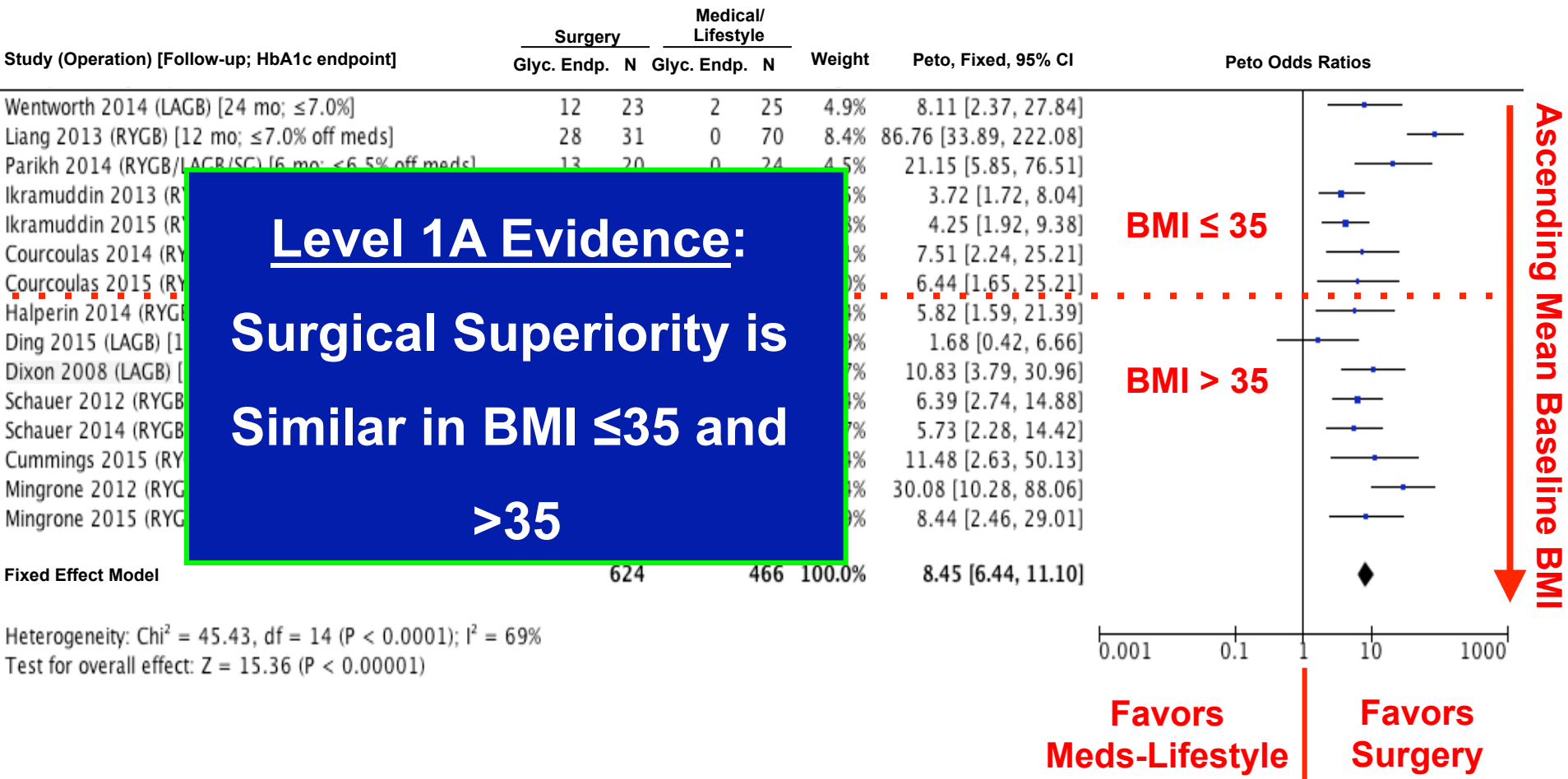
Medical
BMI ≥35 vs <35

Surgical
BMI ≥35 vs <35

Value at Visit

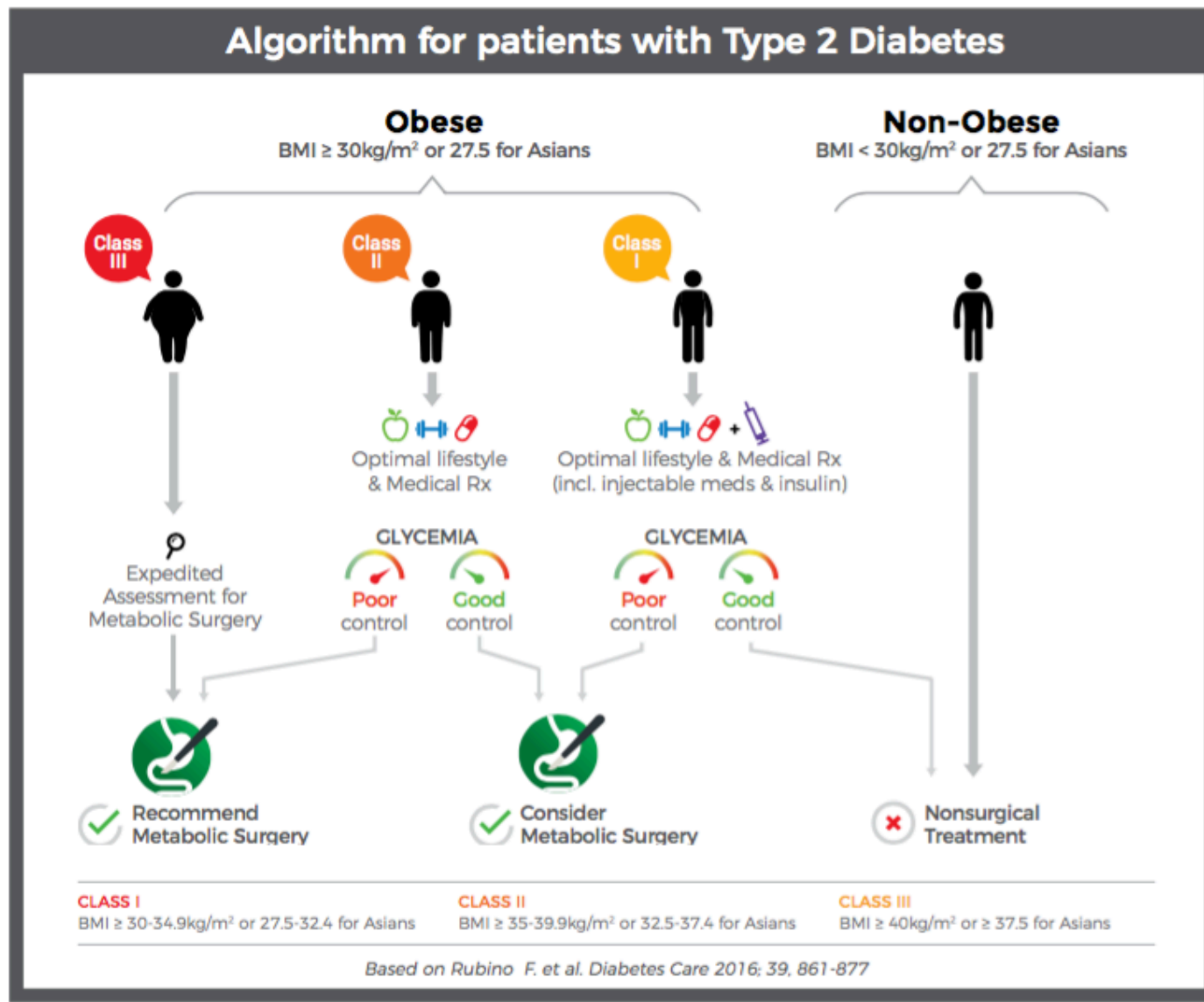
Medical <35 BMI	9.1 (8.9)	7.2 (6.8)	7.9 (6.9)	8.0 (7.4)	8.1 (7.8)
Medical ≥35 BMI	8.8 (8.5)	7.1 (6.8)	7.2 (6.7)	7.4 (6.9)	8.5 (7.3)
Surgical <35 BMI	9.4 (9.1)	6.7 (6.9)	6.6 (6.6)	6.8 (6.8)	7.1 (6.7)
Surgical ≥35 BMI	9.3 (9.2)	6.4 (6.2)	6.4 (6.1)	6.6 (6.4)	6.7 (6.4)

Odds of Diabetes Remission or Glycemic Control in All 11 RCTs of Surgery vs. Meds/Lifestyle Care for T2DM



Indications for Surgical Treatment

"There is now sufficient clinical and mechanistic evidence to support inclusion of metabolic surgery among antidiabetes interventions for people with T2D and obesity." DSS-II⁽²⁾



SAFETY

Bariatric Surgery Mortality Rate: 0.3% (55,567 patients)

	Aortic Aneurysm	CABG	Craniotomy	Esophageal Resection	Hip Replacement	Pediatric Heart Surgery
Hospitals Performing Operation	2485	1036	1600	1717	3445	458
Mortality Index (%)	3.9	3.5	10.7	9.1	0.3	5.4
Median Volume per Hospital	30	491	12	5	24	4

Source: Dimick JB, Welch HG, Birkmeyer JD. Surgical mortality as an indicator of hospital quality. JAMA 2004,292, 847-851

Clinical and Patient-Centered Outcomes in Obese Type 2 Diabetes Patients 3 Years After Randomization to Roux-en-Y Gastric Bypass Surgery Versus Intensive Lifestyle Management: The SLIMM-T2D Study

Donald C. Simonson, Florencia Halperin, Kathleen Foster, Ashley Vernon

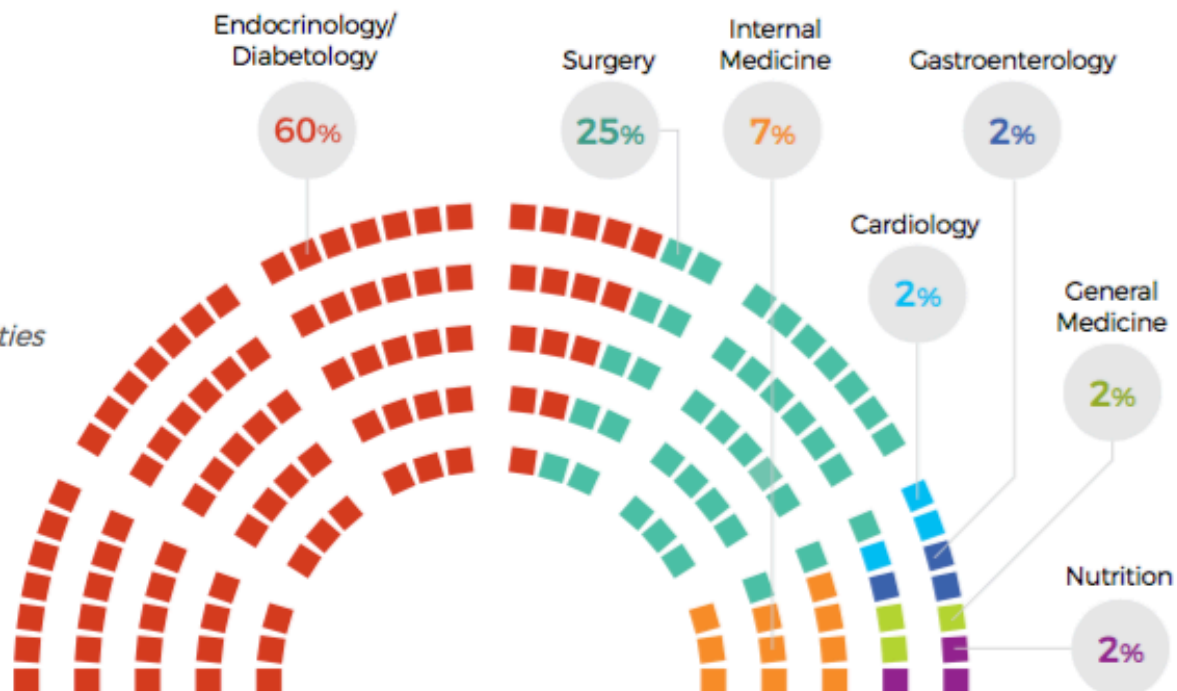


Diabetes Care 2018 Feb; dc170487. <https://doi.org/10.2337/dc17-0487>

	RYGB	IMWM
Adverse Events	n=20 events in 11 participants ^a	n=7 events in 5 participants ^b
Cardiac		
CV Death - resuscitated		1 ^c
MI		
Stroke		
Revascularization	1	
Hospitalization for Heart Failure		1
Supraventricular arrhythmia		2
Presyncope		2
Vascular	1 ^d	
Gastrointestinal Surgery		
Marginal Ulcer	2	
Lysis of Adhesions	3	
Cholestasis/Cholecystitis	3	
Paniclectomy	2	
Orthopedic	2	1
Renal	3 ^e	
Cancer	1 ^f	
Psychiatric	2	

DSS-II expert committee

- 48 members
- 7 medical specialities
- 14 countries





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

Diabetes Care 2016;39:861-877 | DOI: 10.2337/dc16-0236



METABOLIC SURGERY

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 Shaikat M. Sadikot,⁹ William H. Herman,¹⁰ Stephanie A. Amiel,¹¹ Lee M. Kaplan,² Gaspar Taroncher-Oldenburg,¹¹ and David E. Cummings,¹² on behalf of the Delegates of the 2nd Diabetes Surgery Summit*

BACKGROUND

Despite growing evidence that bariatric/metabolic surgery powerfully improves type 2 diabetes (T2D), existing diabetes treatment algorithms do not include surgical options.

AIM

The 2nd Diabetes Surgery Summit (DSS-II), an international consensus conference, was convened in collaboration with leading diabetes organizations to develop global guidelines to inform clinicians and policymakers about benefits and limitations of metabolic surgery for T2D.

METHODS

A multidisciplinary group of 48 international clinicians/scholars (75% nonsurgeons), including representatives of leading diabetes organizations, participated in DSS-II. After evidence appraisal (MEDLINE [1 January 2005–30 September 2015]), three rounds of Delphi-like questionnaires were used to measure consensus for 32 data-based conclusions. These drafts were presented at the combined DSS-II and 3rd World Congress on Interventional Therapies for Type 2 Diabetes (London, U.K., 28–30 September 2015), where they were open to public comment by other professionals and amended face-to-face by the Expert Committee.

RESULTS

Given its role in metabolic regulation, the gastrointestinal tract constitutes a meaningful target to manage T2D. Numerous randomized clinical trials, albeit mostly short/midterm, demonstrate that metabolic surgery achieves excellent glycemic control and reduces cardiovascular risk factors. On the basis of such evidence, metabolic surgery should be recommended to treat T2D in patients with class III obesity (BMI ≥40 kg/m²) and in those with class II obesity (BMI 35.0–39.9 kg/m²) when hyperglycemia is inadequately controlled by lifestyle and optimal medical therapy. Surgery should also be considered for patients with T2D and BMI 30.0–34.9 kg/m² if hyperglycemia is inadequately controlled despite optimal treatment with either oral or injectable medications. These BMI thresholds should be reduced by 2.5 kg/m² for Asian patients.

CONCLUSIONS

Although additional studies are needed to further demonstrate long-term benefits, there is sufficient clinical and mechanistic evidence to support inclusion of metabolic surgery among antidiabetes interventions for people with T2D and obesity. To date, the DSS-II guidelines have been formally endorsed by 45 worldwide medical and scientific societies. Health care regulators should introduce appropriate reimbursement policies.

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This article contains Supplementary Data online at <http://care.diabetesjournals.org/lookup/suppl/doi:10.2337/dc16-0236/-/DC1>.

F.R. and D.E.C. chaired the writing committee for this report.

*The 2nd Diabetes Surgery Summit voting delegates are listed in Table 2.

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See accompanying articles, pp. 857, 878, 884, 893, 902, 912, 924, 934, 941, 945, and 954.

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Rubino F, Nathan DM, Eckel RH et al. Diabetes Care 2016; 39:861-877

> 50 ENDORSING SOCIETIES



PARTNER DIABETES ORGANISATIONS OF THE DSS-II

American Diabetes Association (ADA) International Diabetes Federation (IDF) Diabetes UK (DUK) Chinese Diabetes Society (CDS) Diabetes India (DI)

ENDORISING SOCIETIES OF THE DSS-II CONSENSUS STATEMENTS & GUIDELINES (as of August 2017)

INTERNATIONAL ORGANISATIONS

IDF International Diabetes Federation APBMSS Asia-Pacific Bariatric and Metabolic Surgery Society EASO European Association for the Study of Obesity IFSO Int. Federation for the Surgery of Obesity & Metabolic Disorders ALAD Latin American Association of Diabetes

NATIONAL ORGANISATIONS / SOCIETIES

-  -Argentinian Society of Diabetes (SAD)
-  -Argentinian Society for Bariatric and Metabolic Surgery (SACO)
-  -Argentinian Society of Nutrition (SAN)
-  -Australian Diabetes Society (ADS)
-  -Belgian Diabetes Association (ABD)
-  -Brazilian Society of Diabetes (SBD)
-  -Brazilian Society of Bariatric and Metabolic Surgery (SBCBM)
-  -Czech Society for the Study of Obesity (CSSO)
-  -Chilean Society of Endocrinology and Diabetes (SCED)
-  -Chilean Society for Bariatric and Metabolic Surgery (SCCBM)
-  -Chinese Diabetes Society (CDS)
-  -French Society of Diabetes (SFD)
-  -French Society of Bariatric and Metabolic Surgery (SOFFCO)
-  -German Diabetes Society (DDC)
-  -German Society for Obesity Surgery (CA-ADIP)
-  -Hellenic Diabetes Association (HDA)
-  -Diabetes India (DI)
-  -Irish Endocrine Society (IES)
-  -Israel Diabetes Association (IDA)
-  -Italian Society of Bariatric & Metabolic Surgery (SICOB)
-  -Italian Society of Diabetology (SID)
-  -Italian Society of Clinical Endocrinologists (AME)
-  -Japan Diabetes Society (JDS)
-  -Mexican College of Bariatric and Metabolic Surgery (CMCOEM)
-  -Mexican Society of Nutrition and Endocrinology (SMNE)
-  -Portuguese Society of Diabetology (SPD)
-  -Qatar Diabetes Association (QDA)
-  -Saudi Diabetes and Endocrine Association (SDEA)
-  -Slovakian Diabetes Society (SDS)
-  -Obesity Section Slovakian Diabetes Society (OS SDS)
-  -South African Society for Surgery Obesity and Metabolism (SASSO)
-  -Spanish Society for Bariatric and Metabolic Surgery (SECO)
-  -Spanish Society of Diabetes (SED)
-  -Diabetes UK (DUK)
-  -Association of British Clinical Diabetologists (ABCD)
-  -British Obesity and Metabolic Surgery Society (BOMSS)
-  -Society for Endocrinology (SfE)
-  -American Diabetes Association (ADA)
-  -American Association of Clinical Endocrinologists (AACE)
-  -American College of Surgeons (ACS)
-  -American Gastroenterological Association (AGA)
-  -American Society for Metabolic and Bariatric Surgery (ASMBS)
-  -Endocrine Society
-  -Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)
-  -Society for Surgery of the Alimentary Tract (SSAT)
-  -The Obesity Society (TOS)

METABOLIC SURGERY: CLINICAL DEFINITION

DSS-II

What is Metabolic Surgery?

"Metabolic surgery is defined as the use of gastrointestinal operations with the intent to treat T2D and obesity." DSS-II⁽²⁾

TIME TO THINK DIFFERENTLY ABOUT SURGERY

UIG/GETTY

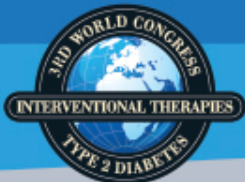


FROM “BARIATRIC” TO “METABOLIC” SURGERY

METABOLIC SURGERY: BIOLOGICAL RATIONALE

Given its role in the regulation of glucose levels in homeostasis and in disease, the GI tract constitutes a clinically and biologically meaningful target for anti-diabetes interventions.

Diabetes Surgery Summit (DSS-II)



THE 3RD WORLD CONGRESS ON
INTERVENTIONAL THERAPIES
FOR TYPE 2 DIABETES

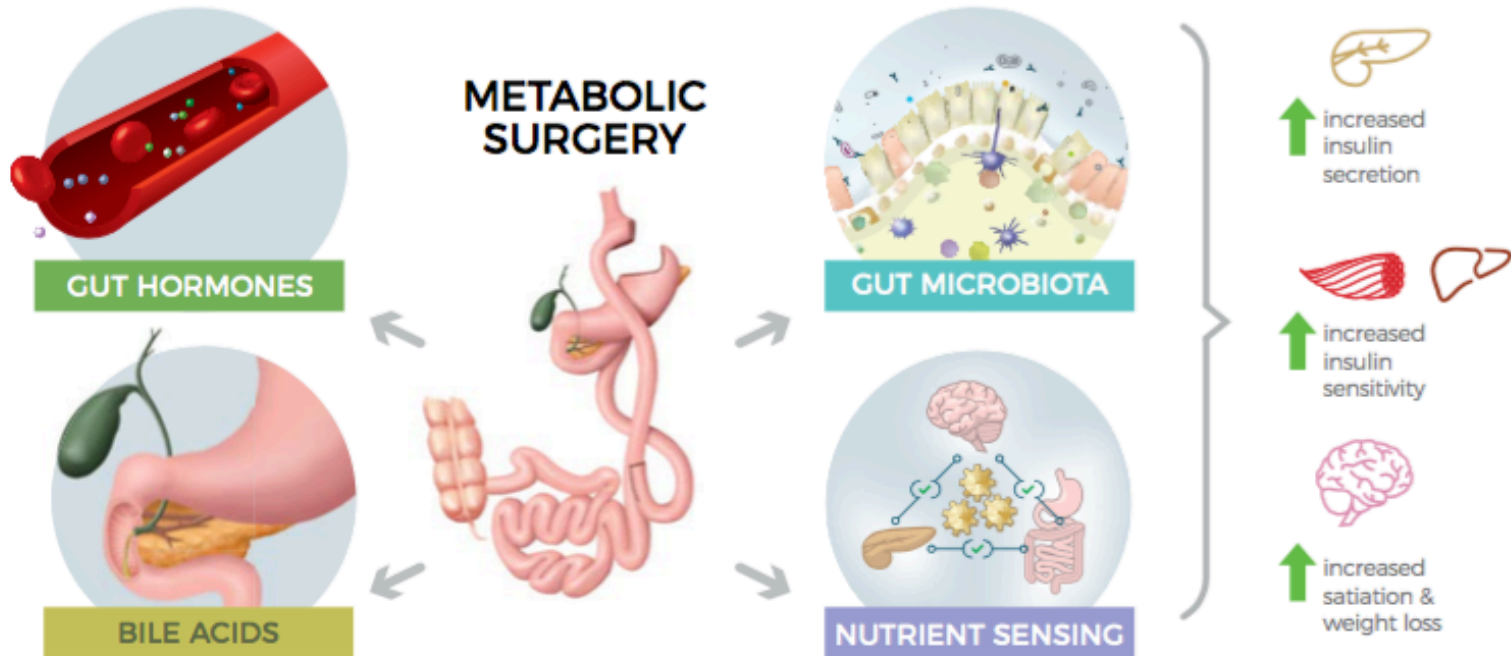


2ND DIABETES
SURGERY SUMMIT
DSS-II



How does surgery improve diabetes

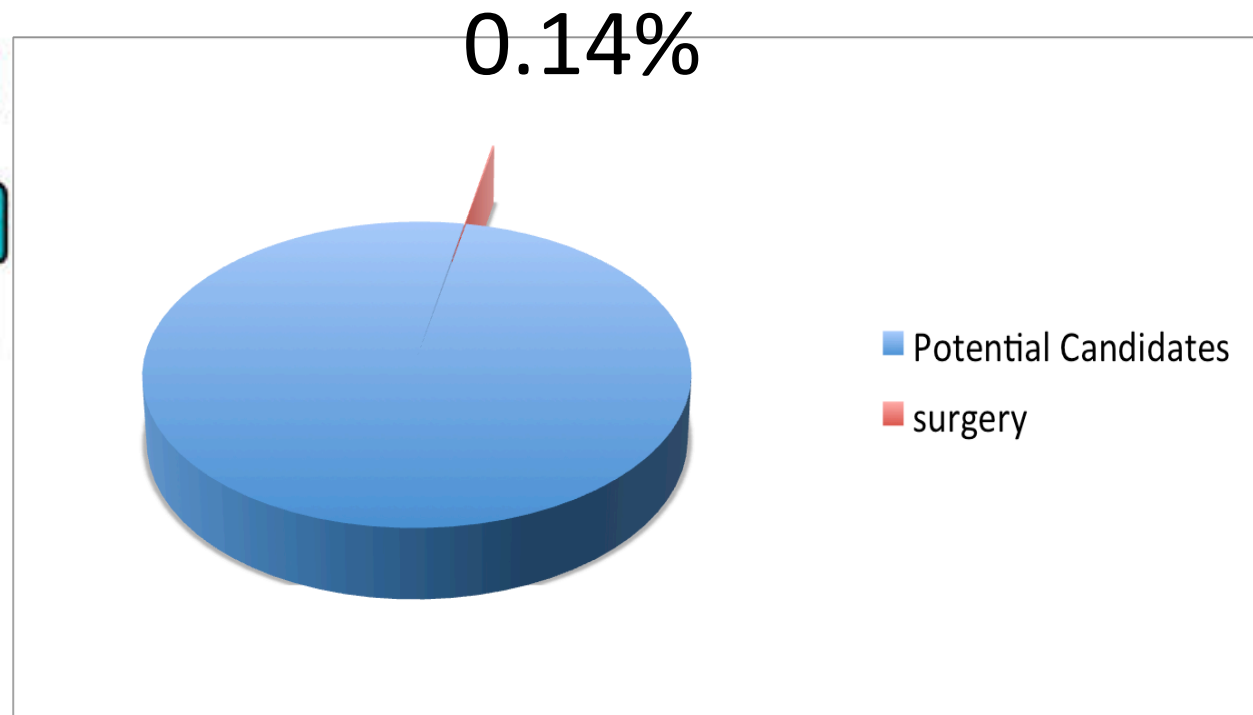
Metabolic Surgery changes various mechanisms of GI physiology involved in metabolic regulation^(3,4)



"Given its role in metabolic regulation, the GI tract constitutes a clinically and biologically meaningful target for the management of T2D." DSS-II⁽²⁾

BARRIERS TO IMPLEMENTATION

% of pts with T2DM in UK who meet International criteria for surgery and have access to Surgical treatment



(Historical) Clinical Rationale for Bariatric Surgery



Weight
Loss
Surgery





Misperceptions about Bariatric (Weight-Loss) Surgery



Misperceptions about Risks



Bariatric Surgery



Elective General Surgery

Cholecystectomy, Hernia Surgery,
Reflux Surgery, Colorectal (benign)



Misperceptions about Costs



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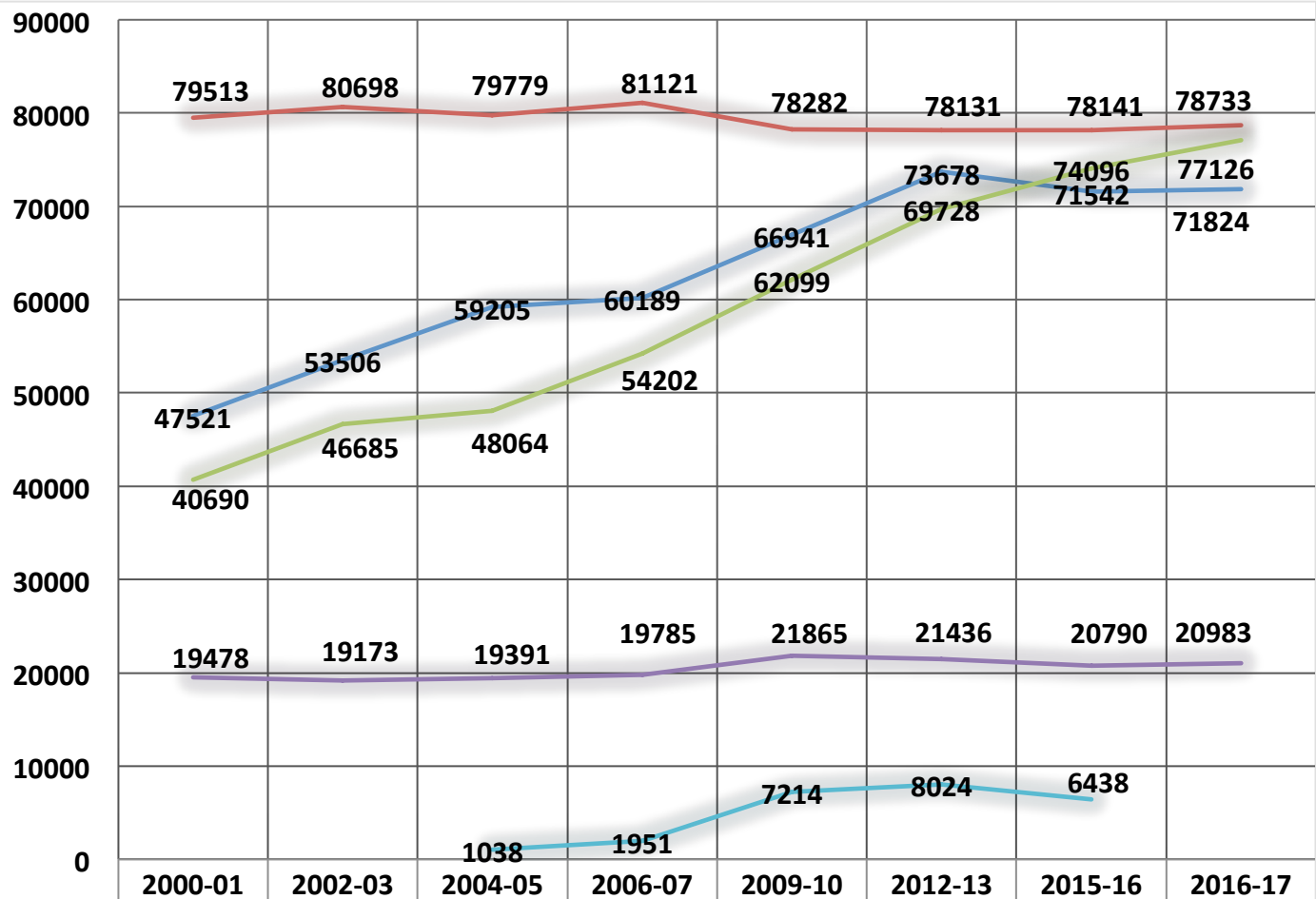
WEIRD

SU

Home > News > UK > NHS squanders millions on fat surgery

NHS squanders millions on fat surgery

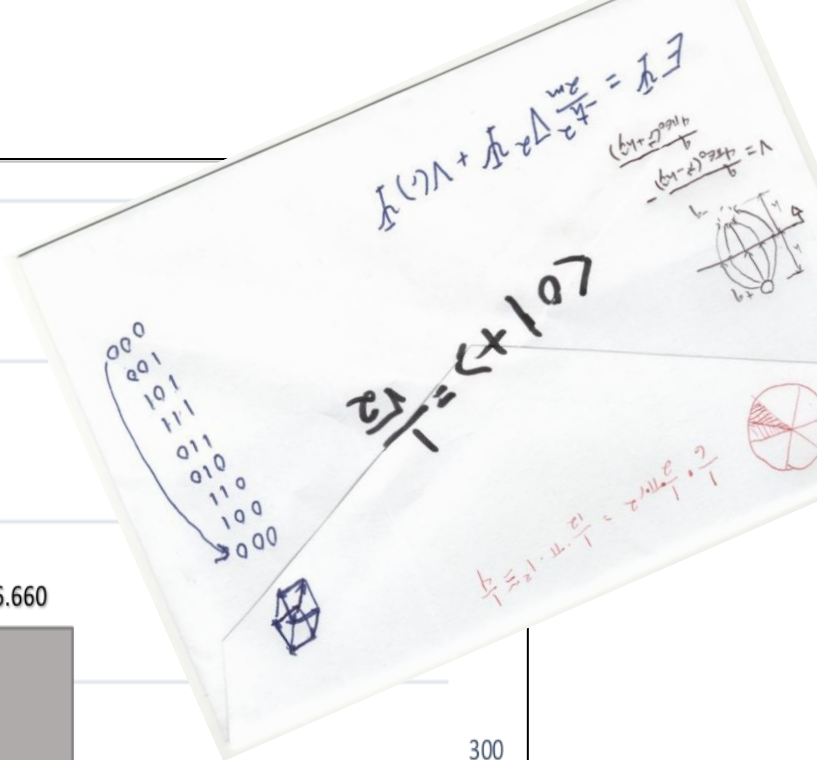
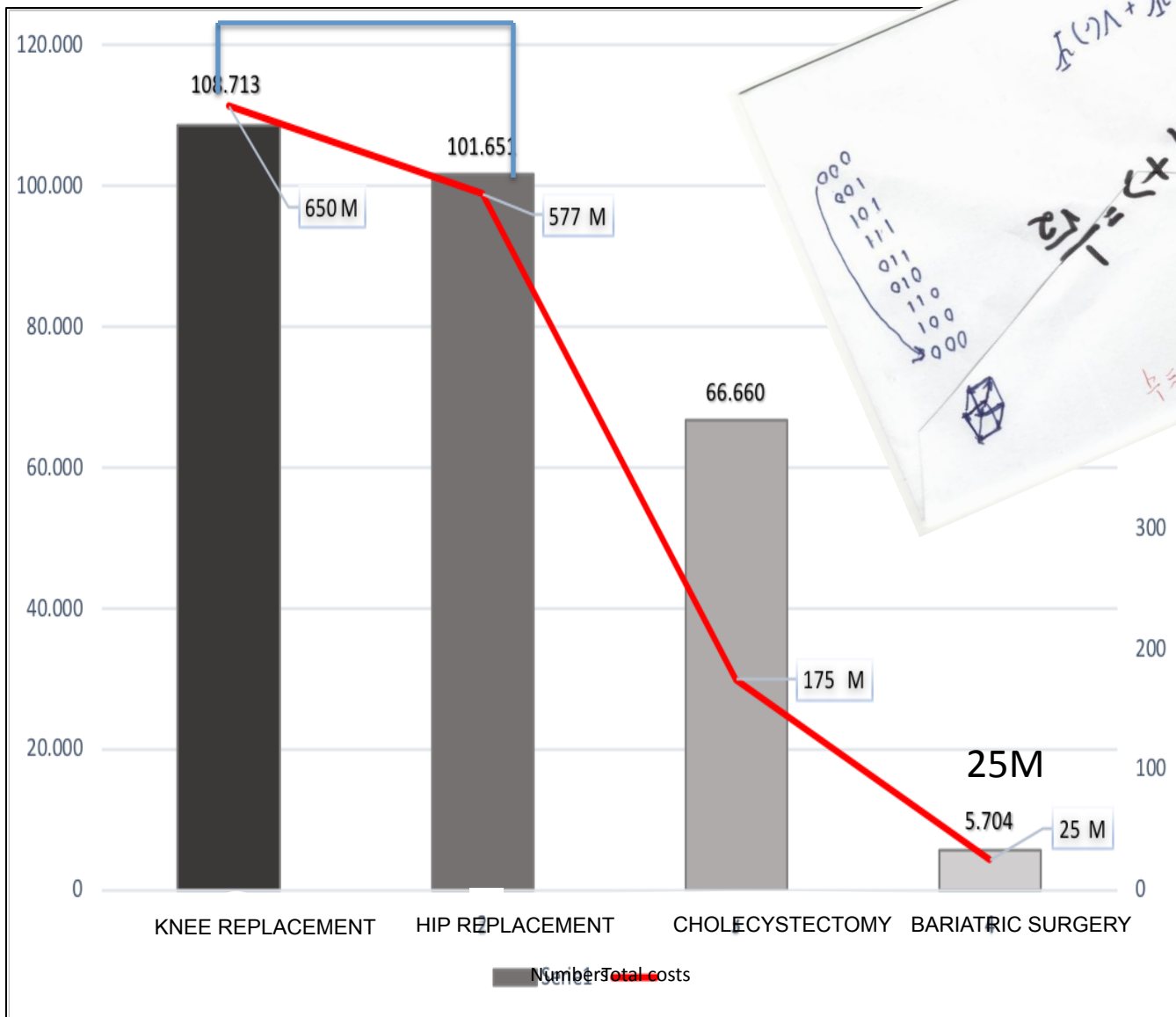
A RECORD number of patients have had “quick-fix” obesity surgery on the NHS at a cost of £29million a year, shocking new figures show.



Hip Replacements	47521	53506	59205	60189	66941	73678	71542	71824
Inguinal Hernia	79513	80698	79779	81121	78282	78131	78141	78733
Gallbladder	40690	46685	48064	54202	62099	69728	74096	77126
Colectomies	19478	19173	19391	19785	21865	21436	20790	20983
Bariatric Surgery			1038	1951	7214	8024	6438	

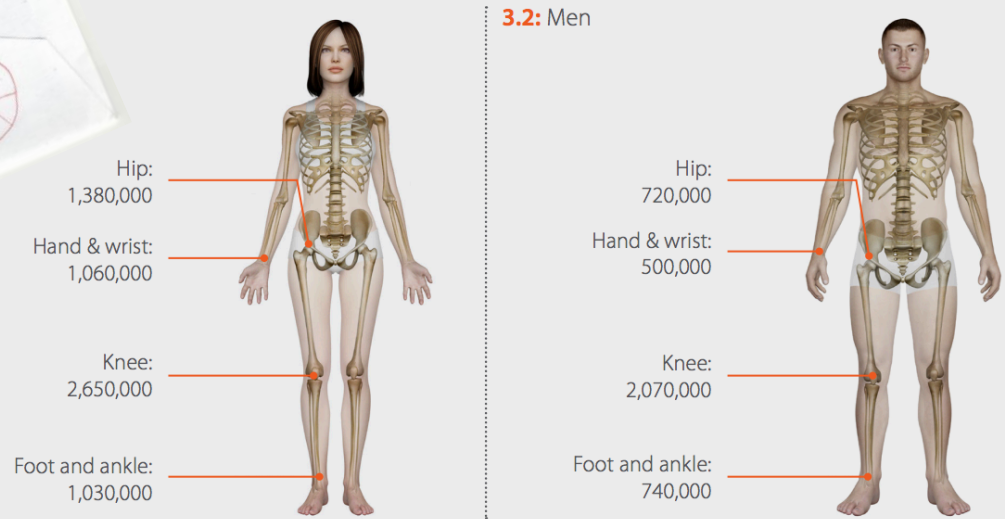
Hospital Admitted Patient Care Activity National Statistics

1.2 B



Osteoarthritis

Osteoarthritis in four regions of the body



This schematic shows the estimated number of women and men in the UK who have sought treatment for osteoarthritis in four regions of the body which are often affected.*

*Based on 7 year consultation prevalence in general practice, see Annex I for methods.

8.7 M people have symptomatic OA in UK
4.6 M knee/hip
200.000 hip/knee replacement = circa 5%

Costs of diabetes treatment in the UK

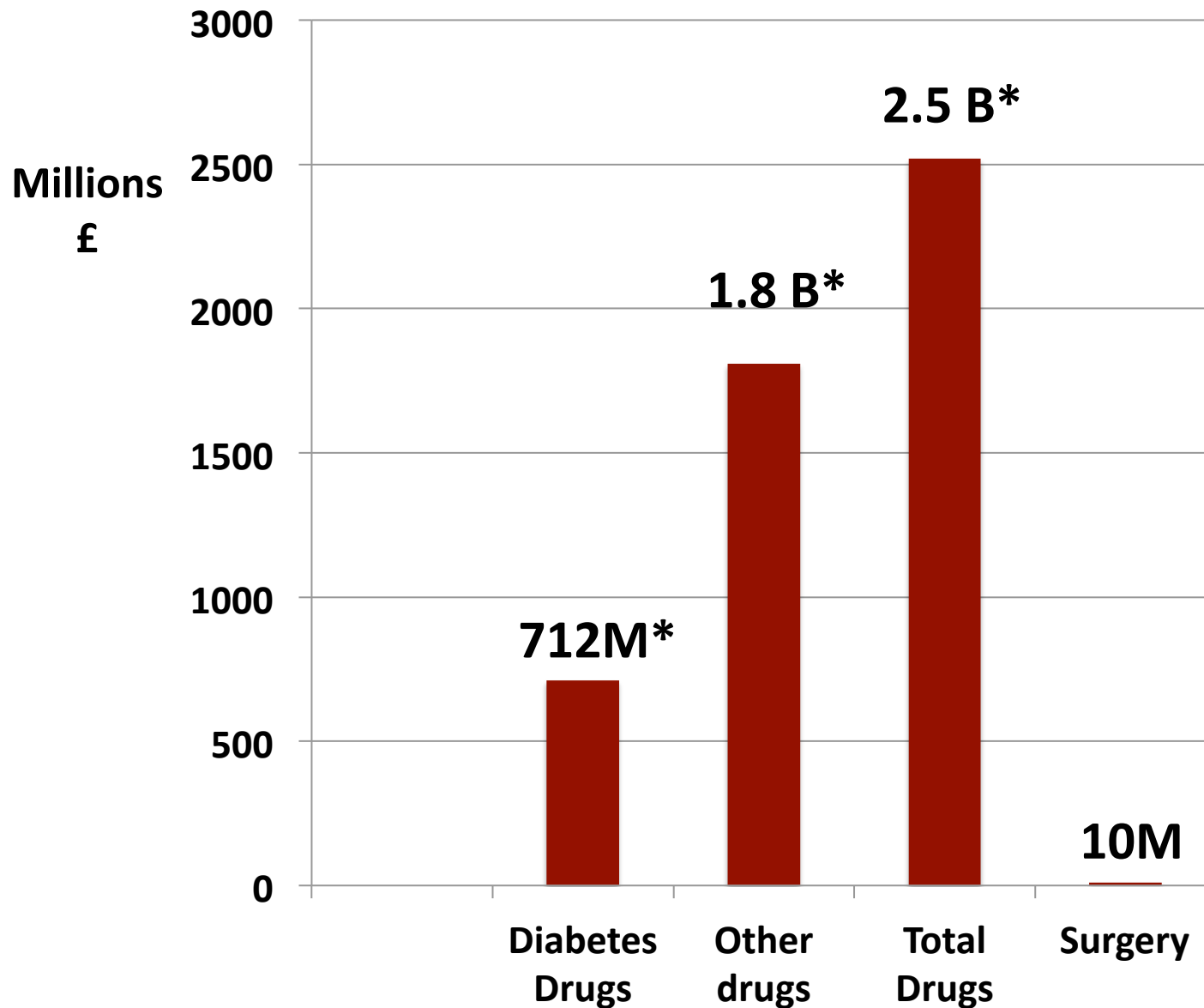
The following table represents the relative cost of diabetes treatment in the UK in 2012.

Cost of diabetes treatment in the UK in 2012

Area of expenditure	Type 1 diabetes	Type 2 diabetes	Total cost	Percentage of costs
Diabetes drugs	£0.344 billion	£0.712 billion	£1.056 billion	7.8%
Non-diabetes drugs	£0.281 billion	£1.810 billion	£2.091 billion	15.2%
Inpatient	£1.007 billion	£8.038 billion	£9.045 billion	65.8%
Outpatient (excluding drugs)	£0.170 billion	£1.158 billion	£1,328 billion	9.7%
Other (including social service)	-	-	£0.230 billion	1.7%
Total	£1.802 billion	£11.718 billion	£13.750 billion	100%

Source: Kanavos, van den Aardweg and Schurer: Diabetes expenditure, burden of disease and management in 5 EU countries, LSE (Jan 2012)

COST OF TREATMENT OF TYPE 2 DIABETES IN UK



*Source: Kavanos et al; LSE 2002

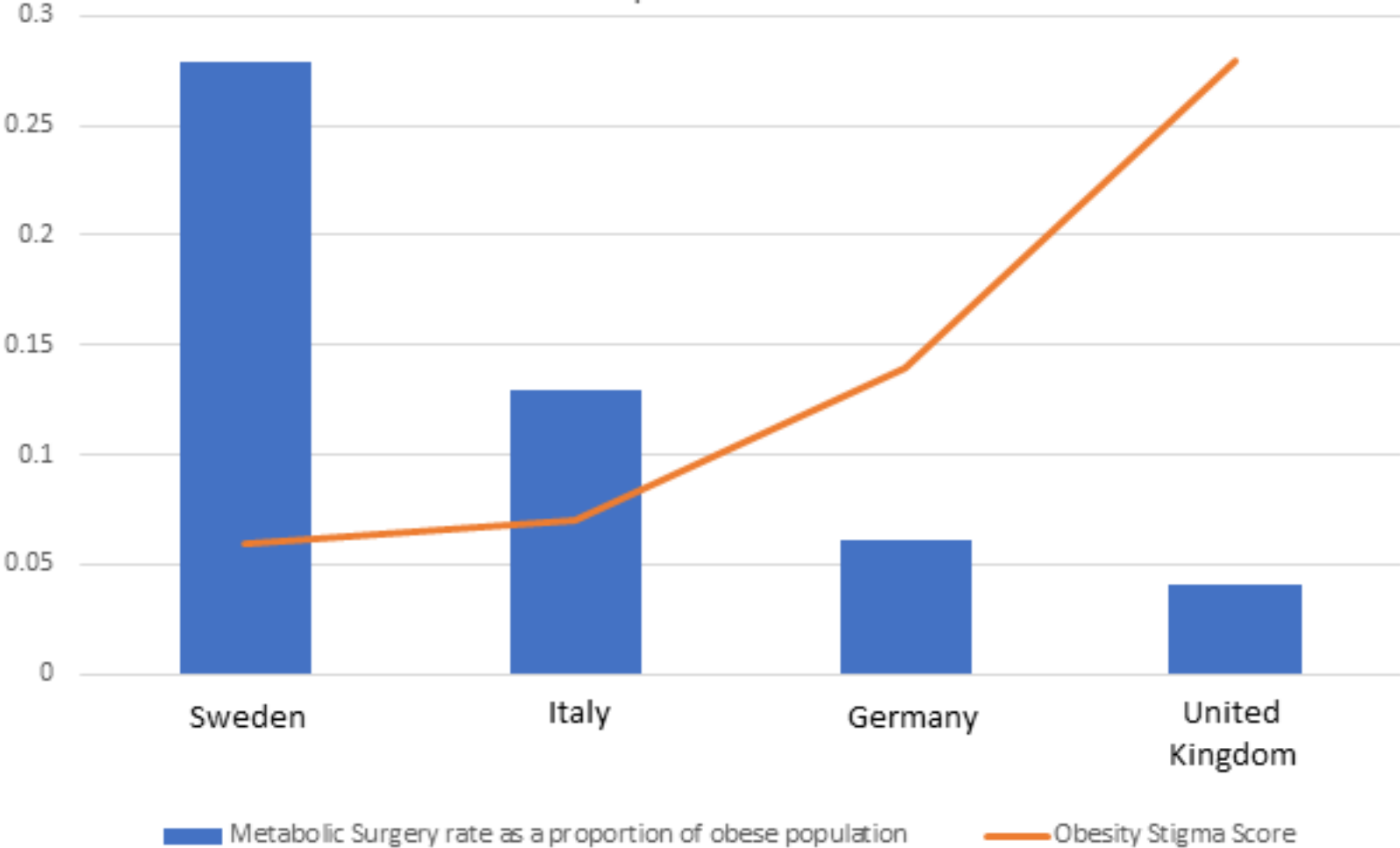
**Are Misconceptions and Stigma Holding
Back Evidence-Based Metabolic Surgery?**

THE  TIMES

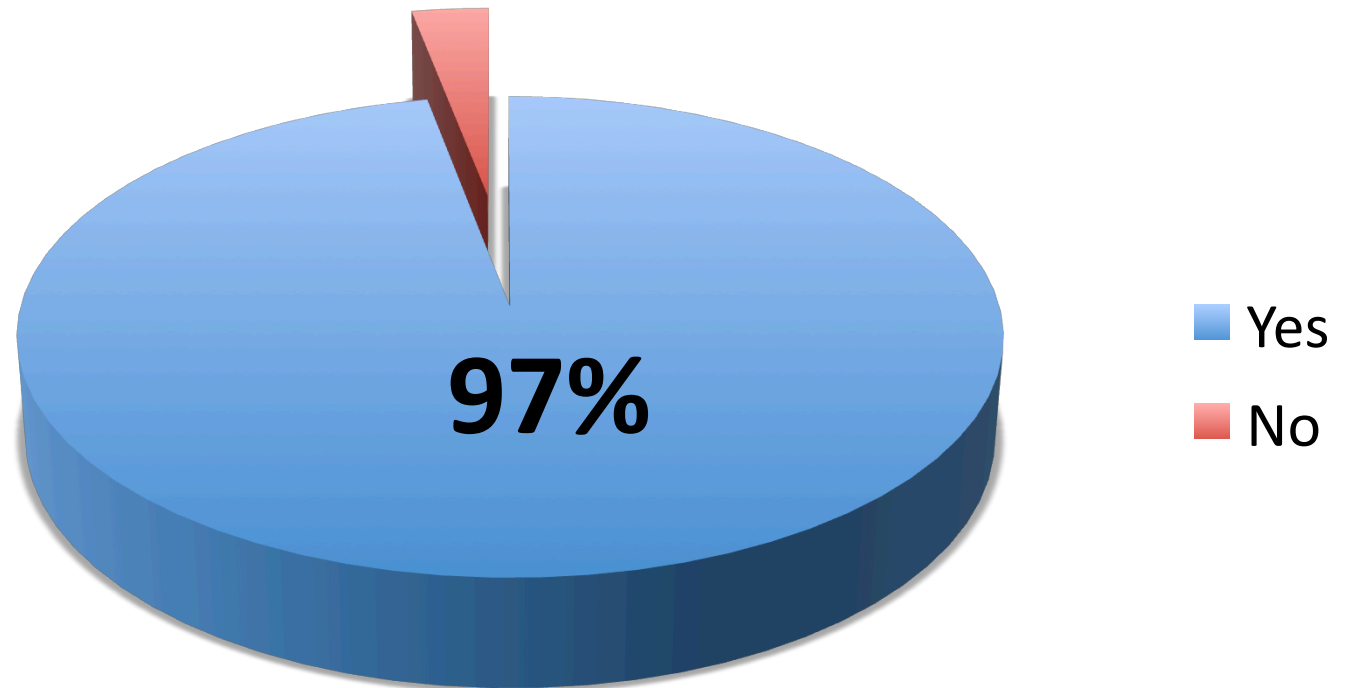
Britain 'prejudiced against fat people'



Obesity Stigma plotted against rate of Metabolic Surgery across four European Countries



Do You Think that STIGMA is Responsible for Inadequate Provision of Care for People with Obesity?



Metabolic Surgery for T2DM: Evidence, Indications, and the Rome of Stigma/Misconceptions in Preventing Access to Care. London, UK, Sept 10, 2018



4TH WORLD CONGRESS ON INTERVENTIONAL THERAPIES FOR TYPE 2 DIABETES

HILTON MIDTOWN, NEW YORK CITY
APRIL 8-10, 2019

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FROM GUIDELINES
TO IMPLEMENTATION





4TH WORLD CONGRESS
ON INTERVENTIONAL THERAPIES
FOR TYPE 2 DIABETES

in partnership with:



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APRIL 8-10, 2019

Congress Director: Francesco Rubino

Program Co-Chairs: William Cefalu, David Cummings, Lee Kaplan, Philip Schauer

Program:

Comprehensive coverage of latest research in field

Specific Goals/Symposia

- **Consensus Development Projects > White Papers:**
 - Policies to Facilitate Implementation of DSS-Guidelines
 - Standardization of Methods of novel surgical operations and device-based procedures
 - Consensus on Definition of Diabetes Remission (ADA/DUK)
- Symposium on roles of the gut in the physiology and pathophysiology of glucose metabolism
- **Conference on “Diabesity” Stigma (in collaboration with ADA –)**



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