

Obesity

The Elephant in the Room

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- No Disclosures

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- 60% NZ adults are obese
- 86% Pacific Island adults obese
- One in five children overweight
- **Metabolic Syndrome accounts for 25% of GP visits**



Degrees of Obesity

NORMAL

BMI 18 — 25



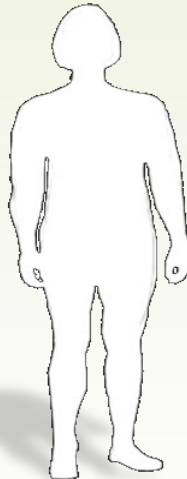
OVERWEIGHT

BMI 25 — 30



OBESE

BMI 30 — 35



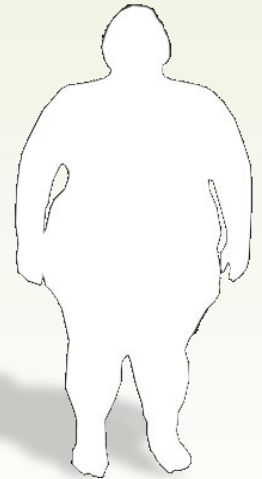
**SEVERELY
OBESE**

BMI 35 — 40



**MORBIDLY
OBESE**

BMI ≥ 40



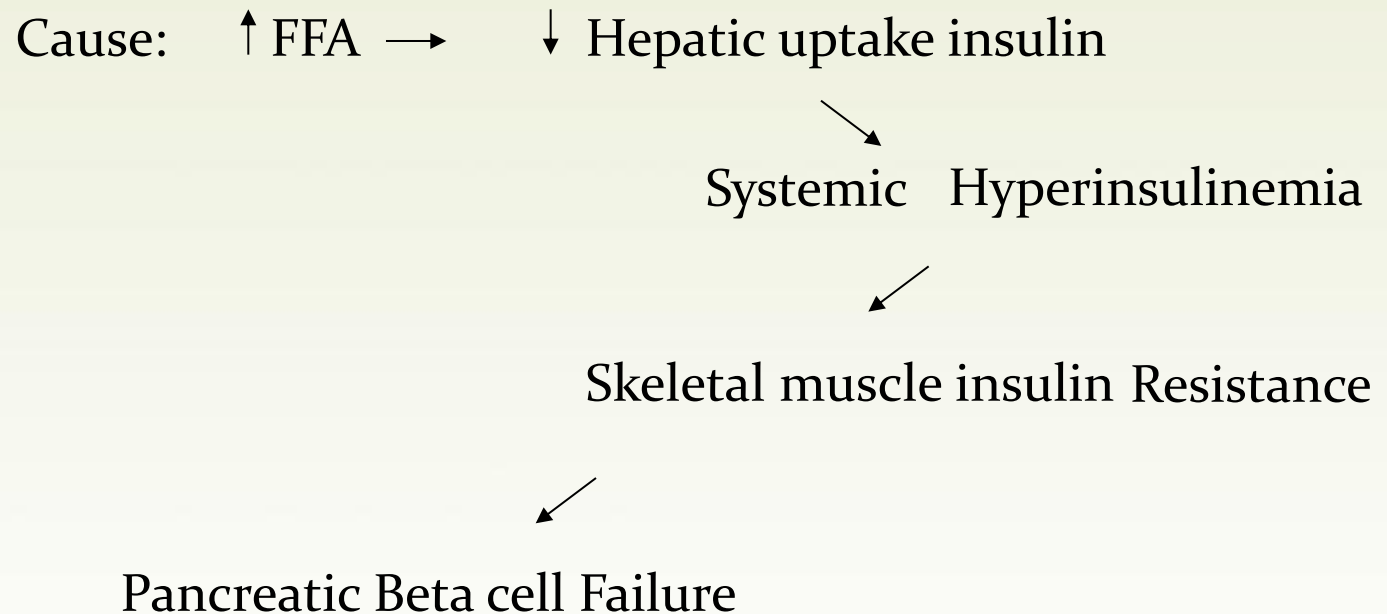
Diseases Caused by Obesity

- Diabetes type 2
- Hypertension
- Lipid disorders
- Heart disease
- Asthma
- Sleep apnoea
- Gallstones
- NASH (non-alcoholic steatohepatitis)
- Urinary incontinence
- Gastro-oesophageal reflux
- Arthritis
- Infertility
- Low back pain
- DVT & thromboembolism
- Depression
- Cancer (breast, colorectal, prostate, endometrial)
- Varicose veins and leg ulcers
- Skin infections

The Metabolic Syndrome

- Any 3 of:
 - Large waist circumference
 - High TGs
 - Low HDL cholesterol
 - Hypertension
 - ↑ Fasting Glucose
- 16% European, 39% Pacific Islanders
 - Jackson et al 2007
- Doubles the risk of stroke or heart attack

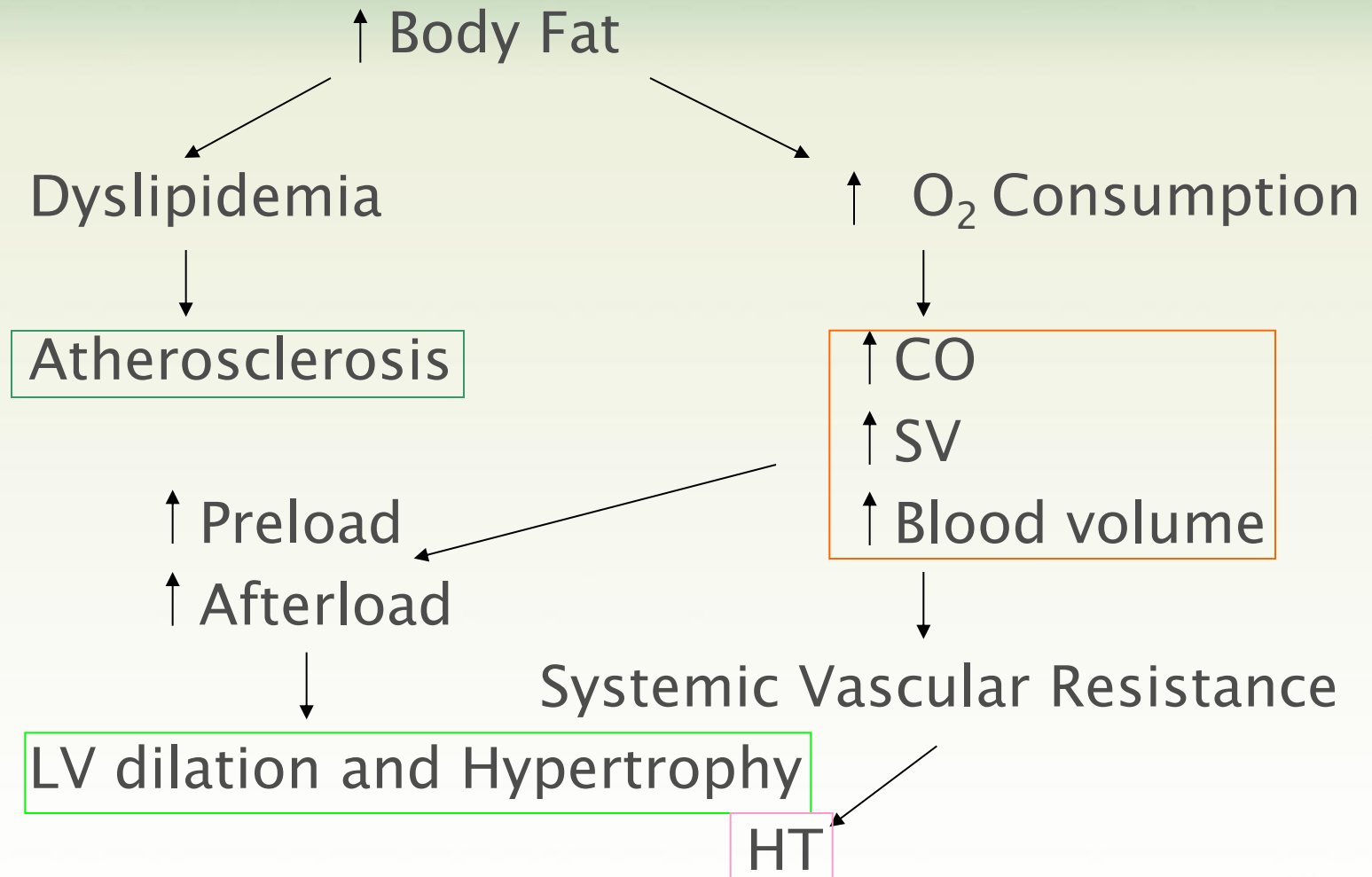
Type 2 Diabetes



Type 2 Diabetes

- Common – 200,000 NZers
 - Generates multiple serious complications
 - Lethal
 - Incidence rates in NZ have doubled between 1996 and 2011
-
- Incidence parallels obesity epidemic¹
 - BMI 25 – 5x risk compared BMI 21
 - BMI 30 – 35x risk compared BMI 21
 - BMI 35 – 93x risk compared BMI 21

Cardiovascular Disease



Non-Alcoholic Steatohepatitis

- Commonest cause of Cirrhosis in USA
- BMI ≥ 35
 - RR5 for abnormal LFTs

Obstructive Sleep Apnoea

- **Cause:** soft tissue enlargement
↓ muscle tone
→ pharyngeal obstruction
- RR10 if BMI 40
- **Symptoms:** daytime somnolence
psychosocial and cognitive dysfunction
- **Sequelae:** Hypoxia, Hypercapnia →
Pulmonary Hypertension → RV Failure

Polycystic Ovary Syndrome

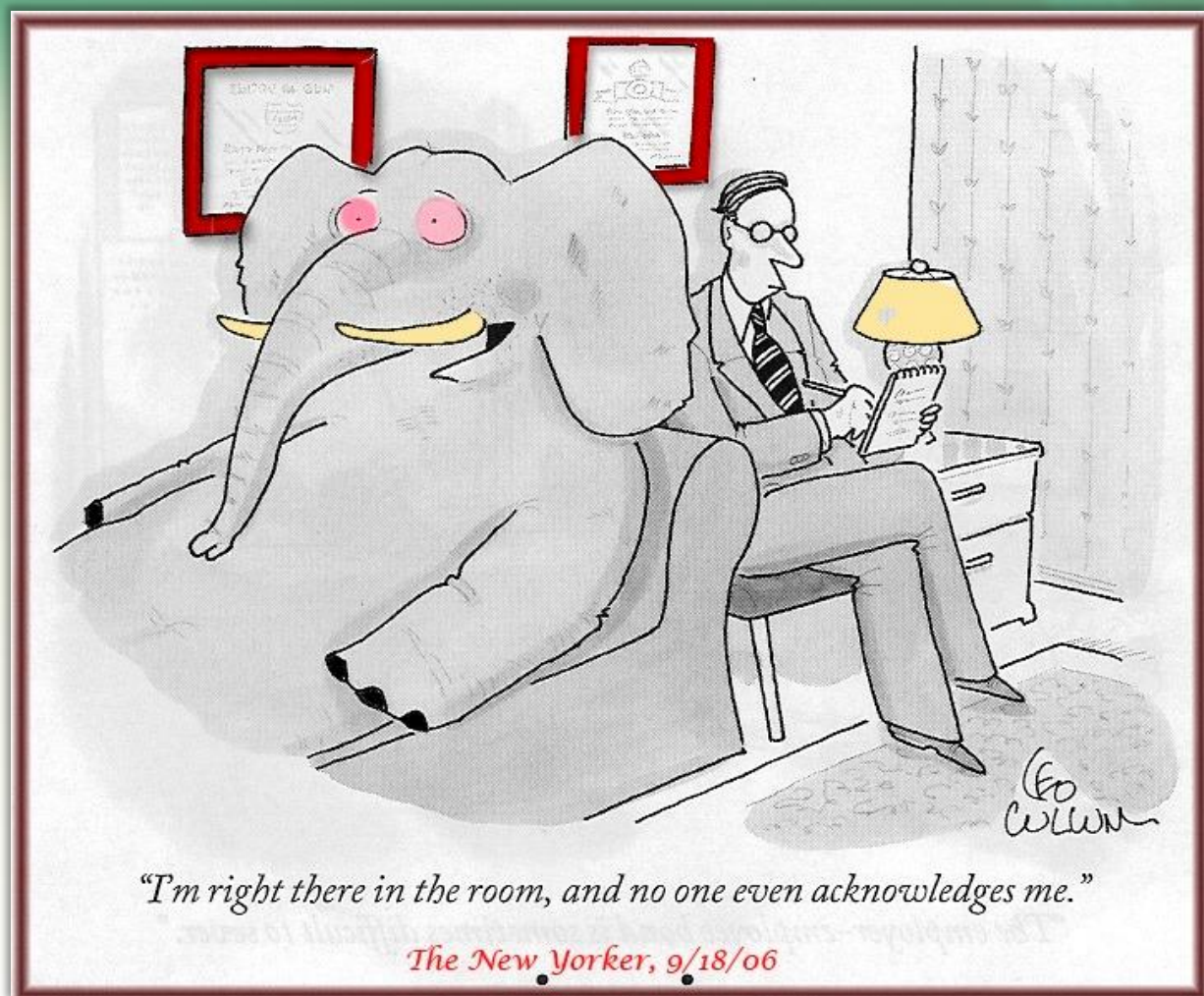
- Signs and Symptoms
 - Ovulatory dysfunction
 - Infertility
 - Androgen Excess
 - ↓ Sex Hormone Binding Globulin

Pregnancy

- Increased Complications of pregnancy
 - Hypertension
 - Pre-eclampsia
 - Late fetal death
 - Gestational diabetes
- Increased rates of
 - Induction of labour
 - Caesarian section
 - NICU admission

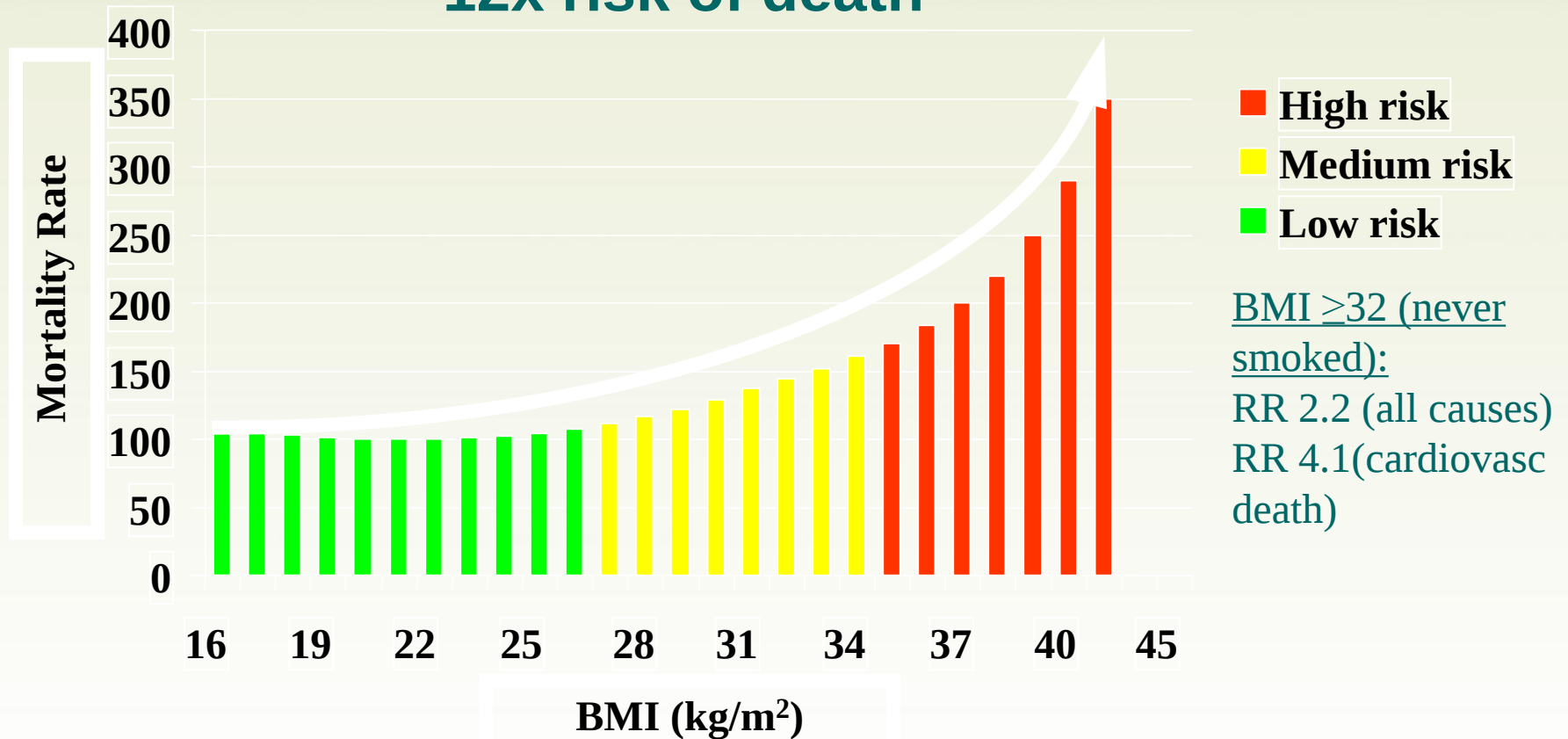
Cancer

- N Engl J Med: 2003 (USA)⁵
 - Obesity and Mortality from Cancer
 - Cohort study (900 053 people)
 - Enrolled 1982; follow up 1998
 - **BMI $\geq$ 40 – ♂ 52% ↑ cancer deaths**
 - ♀ 62% ↑ cancer deaths
 - Breast, Oesophageal, Colorectal, Hepatobiliary
Pancreatic, Kidney, Gynaecological, NHL, MM



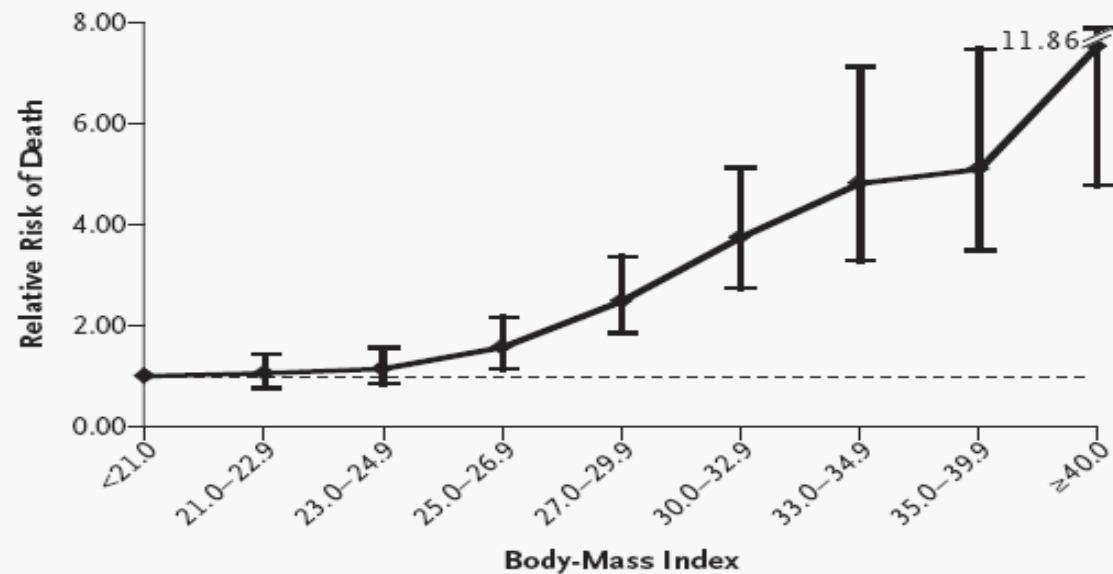
Obese people die more!

12x risk of death

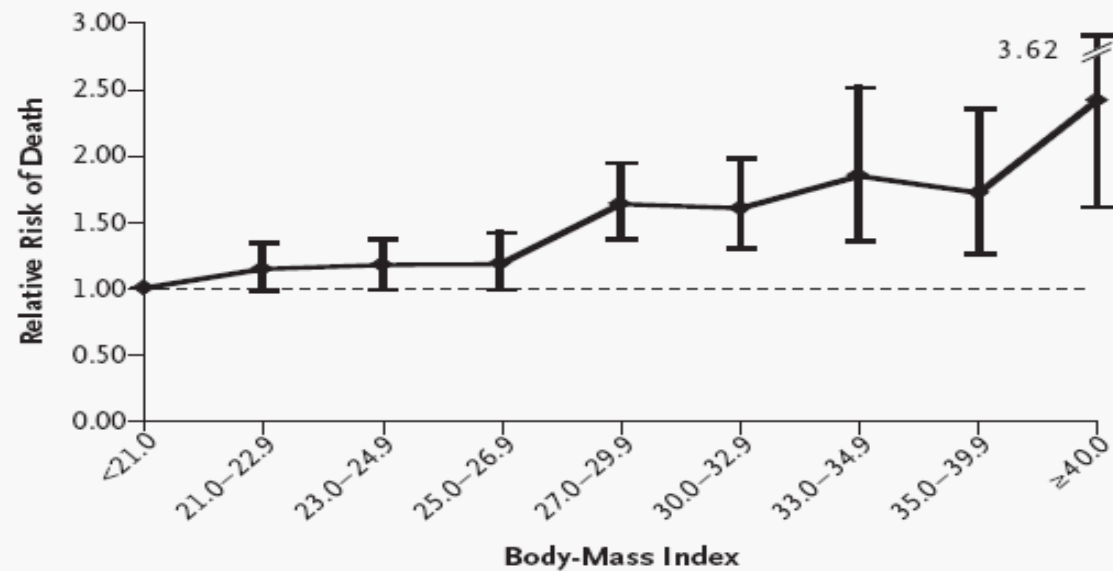


Source: NIH, NEJM, 1995.⁶

A Death from Cardiovascular Disease (684 cases)



B Death from Cancer (1740 cases)



Mortality attributable to higher-than-optimal body mass index in New Zealand

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Abstract

Objectives: To estimate the burden of mortality in New Zealand due to higher-than-optimal body mass index (BMI) in 1997, as well as mortality that could be avoided in 2011 with feasible changes in mean population BMI.

Setting: New Zealand.

Design: Comparative risk assessment methodology was used to estimate the attributable and avoidable mortality due to high BMI. Outcomes assessed were ischaemic heart disease (IHD), ischaemic stroke, type 2 diabetes mellitus, colorectal cancer and postmenopausal breast cancer.

Results: In 1997, 3154 deaths (11% of all deaths) in New Zealand were due to higher-than-optimal BMI ($> 21 \text{ kg m}^{-2}$). This amounted to 83% of diabetes deaths, 24% of IHD deaths, 15% of ischaemic stroke deaths and 4% of all cancer deaths. If the projected increase in mean population BMI by 2011 was limited to 1.0 kg m^{-2} rather than 1.3 kg m^{-2} , approximately 385 deaths could be prevented annually, mainly from diabetes.

Conclusions: These results quantify the importance of higher-than-optimal BMI as a major modifiable cause of premature death in New Zealand. Intervention policies that would have only modest effects on slowing the rate of increase in mean population BMI by 2011 could still prevent hundreds of deaths annually.

Aim: To estimate the burden of mortality in NZ due to high BMI

11% deaths due to BMI (3154 people)

Keywords
Body mass index
Obesity
Mortality
New Zealand

Hundreds of deaths preventable by slowing mean population BMI increase

Mortality Rate after Weight Loss

- Am J Epidemiol: 1995 (Williamson et al)⁴
 - Intentional Weight Loss and Mortality
 - 43 457 women (40–64yo)
 - initial questionnaire 1959
 - mortality outcomes gathered 1972
 - Women with obesity related health conditions
 - Intentional wt loss (any) → **20% decrease in all cause Mortality**

Ten Questions

your patients
are likely to ask you
regarding their weight...

Question 1

Hey Doc,
I'm fat... any suggestions?

- Diet
- Pharmacotherapy
- Exercise
- Behavioural Therapy
- Surgery

Diet

- Simple concept
 - Low calorie diet (800–1 500kcal/day)
 - Very low calorie diet (<800kcal/day)
- Good **weight loss**
- Poor **weight regain**





Long-term weight-loss maintenance: a meta-analysis of 29 US studies¹⁻³

James W Anderson, Elizabeth C Konz, Robert C Frederich, and Constance L

ABSTRACT

Background: Current perception is that participants of a structured weight-loss program regain all of their weight loss within 5 y.

Objective: The objective was to examine the long-term weight-loss maintenance of individuals completing a structured weight-loss program.

Design: Studies were required to 1) have been conducted in the United States, 2) have included participants in a structured weight-loss program, 3) have provided follow-up data with variance estimates for ≥ 2 y. Primary outcome variables were weight-loss maintenance in kilograms, weight-loss maintenance as a percentage of initial weight loss, and weight loss as a percentage of initial body weight (reduced weight).

Results: Twenty-nine studies met the inclusion criteria. Successful very-low-energy diets (VLEDs) were associated with significantly greater weight-loss maintenance than were successful hypoenergetic balanced diets (HBDs) at all years of follow-up. The percentage of individuals at 4 or 5 y of follow-up for VLEDs and HBDs were 55.4% and 79.7%, respectively. The results for VLEDs and HBDs, respectively, were as follows: weight-loss maintenance, 7.1 kg (95% CI: 6.1, 8.1 kg) and 2.0 (1.5, 2.5) kg; percentage weight-loss maintenance, 29% (25%, 33%) and 17% (13%, 22%); and reduced weight, 6.6% (5.7%, 7.5%) and 2.1% (1.6%, 2.7%). Weight-loss maintenance did not differ significantly between women and men. Six studies reported that groups who exercised more had significantly greater weight-loss maintenance than did those who exercised less.

Conclusions: Five years after completing structured weight-loss programs, the average individual maintained a weight loss of >3 kg and a reduced weight of $>3\%$ of initial body weight. After VLEDs or weight loss of ≥ 20 kg, individuals maintained significantly more weight loss than after HBDs or weight losses of <10 kg. *Am J Clin Nutr* 2001;74:579-84.

KEYWORDS: Weight maintenance, weight loss, meta-analysis, very-low-energy diet, hypoenergetic balanced diet

Objective: to examine the long-term weight loss maintenance of individuals completing a structured weight loss program.

29 studies included

Conclusions: On average, at 5 years there was a weight loss of 3kg. (45% loss to follow up)

term, leading to the common wisdom that persons who successfully lose weight will regain it all within 5 y (2, 3).

The combination of very-low-energy diets (VLEDs) with behavior modification represents an important advance in enabling obese individuals to initially lose substantial amounts of weight, typically 20-25 kg (4). However, the National Task Force on the Prevention and Treatment of Obesity (5) indicated that weight loss after VLEDs is no longer considered an obesity treatment. The present study challenges that contention by examining weight-loss maintenance from 2 to 5 y after successful weight loss in structured weight-loss programs. Furthermore, because the recommended rate and amount of weight loss is a focus of debate (6), we examined long-term weight-loss maintenance and weight reduction at 5 y after either VLEDs or hypoenergetic balanced diets (HBDs).

MATERIALS AND METHODS

Study identification

For this meta-analysis, we searched for studies that reported follow-up weights with variance estimates must have been available for ≥ 2 y. We performed a thorough literature search by using MEDLINE (National Library of Medicine, Bethesda, MD) for the period of 1970-1999 to identify candidate studies and also used the "ancestry approach" (7) by consulting reference lists from

¹ From the VA Medical Center, Graduate Center for Nutritional Sciences, University of Kentucky Health Management Resources Weight Management Program, Lexington, and the Departments of Internal Medicine and Biostatistics, University of Kentucky, Lexington, KY.

Pharmacotherapy

- Duromine – Sympathomimetic
 - SEs – insomnia, tachycardia, anxiety, dependence
 - Not tolerated long term
- Reductil – Serotonin agonist
 - SEs – insomnia, xerostomia, tachycardia, HT
- Xenical – Lipase inhibitor
 - SEs – freq BMs, foul flatus, abdo discomfort

Efficacy of Pharmacotherapy

- NEJM: 2005 (USA)⁸
 - Randomised Trial : Pharmacotherapy vs Lifestyle Modification
 - 3 groups: Reductil alone
Lifestyle modification alone
Reductil + Lifestyle modification
 - N=224; all groups prescribed low cal diet
 - FU – 1 yr

Efficacy of Pharmacotherapy

- Reductil alone – 4.7% of initial wt
 - Lifestyle mod alone – 6.6% of initial wt
 - Combined therapy – 11.4% of initial wt
-
- Conclusion: Pharmacotherapy alone is not an effective treatment for obesity

Behavioural Therapy

- Includes ;
 - Exercise Programmes
 - Nutrition
 - Self monitoring
 - Hypnotherapy
 - Accupuncture
 - Cognitive re-structuring
- No RCTs
- Weight regain common with cessation

“Day Care Treatment” of Obesity

- Obesity Rev: 2008, (Sweden)⁹
 - Long term weight loss maintenance strategies
- Day Care Treatment: physician, nurse, dietician, physiotherapist, health educators, psychologist
 - 1 day/wk for 12 wks,
 - 1 day/mth for 3 months,
 - booster sessions for 18 months
- Programme: breakfast, lectures (nutrition, exercise, motivational, psychosocial), homework

“Day Care Treatment” of Obesity

- N=385
- 60% completion 2 year course
- Weight loss: 12 mth: ♀ 5.1% initial weight
♂ 4.7% initial weight
24 mth: ♀ 3.8% initial weight
♂ 3.8% initial weight

Question 2

Doc, do you think I should have
Surgery?

Surgery vs Medicine

- Ann Intern Med: 2006 (O'Brien)¹¹
 - Randomised Controlled Trial: Gastric Banding vs Intensive Medical Programme
 - Non-surgical Gp: VLCD, Pharmacotherapy, Behavioural Therapy
 - Surgical Gp: Lap Gastric Banding
 - At 2 yrs FU: Non-surg – 5% of initial wt lost
22% excess wt lost
: Surg – 22% of initial wt lost
87% excess wt lost

Surgery vs Medicine

- Metabolic Syndrome: Non-surg – 38% → 24%
Surg – 38% → 3%
- Quality of Life: SF-36
 - : Non-surg – improvement in 3 of 8 subscores
 - : Surg – improvement in 8 of 8 subscores

Impact of Bariatric Surgery on Comorbidities

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KEYWORDS

• Bariatric surgery • Comorbidity • Diabetes mellitus
• Hypertension • Sleep apnea

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The obesity epidemic are not limited to concerns about bulk and the associated physiologic, psychosocial, and economic disability. A loss of weight of approximately 10 kg, carries significant benefits. A 5% weight loss improves comorbid conditions,² and 10% of initial weight loss has been shown to improve long-term comorbidity control.³ The likelihood of comorbidity resolution depends on many factors, including the length and severity of disease, the amount of weight loss attained, and the contribution of obesity to the severity of the disease. Bariatric surgery (BS) can significantly reduce body weight, resolve obesity-related comorbidities, and improve long-term survival.^{4,5} Overall mortality of BS in a meta-analysis was 0.28%,⁶ placing these procedures in the lowest category of mortality for elective operations performed in the United States.^{7,8}

An observational cohort study based on submitted claims for reimbursement of services or medication showed that, after a mean of 5.3 years, BS was associated with a mean excess weight loss (EWL) of 67.1%; produced significant relative risk reductions in cardiovascular, endocrine, respiratory, infectious, and psychiatric diseases, as well as cancers; and was associated with an 89% reduction in the relative risk of mortality.⁹ These benefits improved patients' quality of life and significantly decreased (71.6%) obesity-related claims to insurance companies as early as 4 months following BS.¹⁰ The impact on comorbidities depends on the type of procedure, amount of weight loss achieved, alterations in hormones and incretins, degree of malabsorption, change in motility, and effect on eating habits.

This article reviews published literature on the impact of BS on some major obesity-associated comorbidities.

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Type 2 Diabetes Mellitus

- Decreased risk of developing diabetes by >3 times in 10 years
- 3 times rate of resolution of diabetes

TYPE 2 DIABETES MELLITUS

The prevalence of type 2 diabetes mellitus (DM) is increasing worldwide and, from an epidemiologic point of view, almost 90% of diabetes cases could be prevented by avoiding obesity.^{11,12} The estimated attributable risk of excess body weight leading to development of type 2 DM is extremely high and no other modifiable factor has such an impact on the health of the general population.¹² Total costs of diabetes care were estimated to be \$132 billion in 2002.¹³ Most (67%) people with type 2 DM have a body mass index (BMI) greater than or equal to 30, and thus diabetes is a major source of morbidity in the obese.¹⁴ Roux-en-Y gastric bypass (RYGB) greatly reduces obesity-related type 2 DM.¹⁵

In the Obese Subjects (SOS) study, surgery, compared with nonsurgical interventions, decreased the risk of developing diabetes by more than 3 times, whereas resolution of diabetes was 3 times more frequent at 10 years.¹⁶ Other studies have shown similar significant, sustained advantages of BS compared with medical management.^{17,18} In a landmark article, Pories and colleagues¹⁹ found substantial and maintained long-term control of DM after RYGB in 121 of 146 patients (82.9%) with DM, and 150 of 152 patients (98.7%) with glucose impairment maintained normal levels of plasma glucose, glycosylated hemoglobin, and insulin.¹⁹

A meta-analysis of all BS studies from 1990 to 2006⁷ assessing type 2 DM after BS found that 78.1% of diabetic patients had completely resolved, improved or resolved in 86.6% of patients. Diabetes resolution in patients undergoing biliopancreatic diversion (BPD)/duodenal switch (DS) (86.6%), followed by RYGB (80.3%), gastropasty (79.7%), and adjustable gastric banding (AGB; 56.7%). The proportion of patients with diabetes resolution was constant at time points less than, equal to, and greater than 2 years. Insulin levels declined significantly after surgery, as did hemoglobin A1c and fasting glucose.

Resolution of DM is related to weight loss after surgery⁷ but it is not a direct cause-and-effect relationship because resolution can occur within days after surgery, even before any significant weight loss.^{19,20} Mechanisms underlying these results are interesting, although only partially understood. These mechanisms include caloric reduction,²¹ appetite suppression,²² weight loss after surgery,⁷ decreased hepatic glucose production,²³ increase in glucose uptake,²⁴ changed gastric emptying,²⁵ decreased leptin levels,²⁶ increased leptin sensitivity,²⁷ decreased insulin resistance,^{28,29} increased insulin levels, enhanced insulin sensitivity and β -cell responsiveness to glucose,³⁰ reduction in ghrelin levels,³¹ change in gastric inhibitory peptide (GIP) levels,³² and increased levels of derivatives of L-cells (GLP-1, PYY).^{22,33,34} GLP-1 and its agonists promote β -cell replication and differentiation, increase β -cell mass, stimulate insulin secretion, and have an antiapoptotic effect on β -cells in the pancreas.^{35,36} In addition, peptide YY (PYY) might ameliorate insulin resistance.³⁷ RYGB has been shown to decrease the activity of an incretin-inactivating enzyme called dipeptidyl peptidase-4 (DPP-4).³⁸ This may result in higher incretin levels, and improved incretin levels may result in better blood sugar control.³⁸ Both rat models^{39,40} and human studies^{41,42} have shown the role of nutrients being excluded from the foregut or rapidly delivered to the hindgut in controlling DM.

The cost of diabetic medications after BS is significantly lower compared with controls, likely because of decreased use.^{43,44} A retrospective review of reimbursement claims of 5502 obese patients comparing presurgery and postsurgery data reported a statistically significant decrease in DM at 3 years (19.9% vs 7.7%, respectively).¹⁰ In another cohort study at 12 months follow-up, diabetic medication use decreased 76% in patients undergoing surgery compared with an increase of 4% in controls.⁴⁵

T2D resolved in 78% at 2 years

Metabolic surgery is equally effective in patients with low BMI ($<35 \text{ kg/m}^2$) type 2 DM, producing postoperative euglycemia in a high proportion (85.3%) of these patients without undesirable weight loss. A desirable level of change was obtained with some patients moving from the overweight category into the normal weight category.⁴⁶

Patients with DM typically have more preoperative comorbidities, despite having no difference in preoperative weight, than those without DM.⁴⁷ Patients with preoperative DM had lower EWL after RYGB at 1 year (67.6% for those without DM, 63.5% for those with diet-controlled DM, 60.5% for those with DM controlled by oral hypoglycemic agents, and 57.5% for those requiring insulin). Nevertheless, DM resolved in 89.8% of those with diet-controlled DM, 82.7% of those taking oral hypoglycemic medication, and 53.3% of those requiring insulin.⁴⁷ Duration of DM and preoperative C peptide levels also affect resolution rates. Subpopulations within the obese also have remission of DM after BS. For example, older populations have adequate resolution of type 2 DM after BS.⁴⁸ Compared with RYGB, duodenal switch showed better DM resolution at 3 years in superobese patients, with BMI greater than 50 kg/m^2 (60% vs 100% respectively, $P = .04$).⁴⁹ Studies have also shown that type 2 diabetics who underwent an RYGB have fewer disease complications.⁵⁰ More morbidly obese individuals after BS-induced DM resolution tend to have a longer life span.^{9,51} Case-control studies have reported late-onset severe hypoglycemic hypoglycemia after BS, implying that these procedures may have a β -cell stimulatory effect.^{52,53}

BS is an effective and sustained treatment of obesity-induced type 2 DM. The best results are achieved with, in decreasing order, BPD, RYGB, gastropasty, and AGB. BS reduces DM-induced complications and costs. Comorbidity remission rates are best if surgery is performed early in the disease process.

HYPERTENSION

Hypertension is one of the most common comorbidities associated with obesity. About 40% to 70% of patients undergoing BS are hypertensive.^{7,54} Mechanisms proposed to explain the contribution of obesity to the development of hypertension include an altered renin-angiotensin-aldosterone system, increased intra-abdominal pressure,⁵⁵ increased sympathetic nervous system activity, development of insulin resistance, hyperleptinemia, leptin resistance, altered coagulation factors, as well as inflammation and endothelial dysfunction.^{54,56}

The SOS study, in which most of the BS procedures were vertical-banded gastropasty (VBG) and banding, showed a reduction in systolic blood pressure at 2 years in the surgical group. The pulse-pressure increase was less pronounced in the surgery group than in the control group even after 10 years.¹⁶ BS substantially improved and/or resolved hypertension in most patients (37%–53%) or reduced the need for antihypertensive agents (18%–36%).^{54,57–59} This trend persisted in people more than 60 years of age.⁵⁸ Patients with vitamin D deficiency have significantly lower rates of resolution of hypertension compared with those with adequate vitamin D levels (42% vs 61%; $P = .008$).⁵⁹ Correction of deficiency with vitamin D supplementation (50,000 IU weekly) resulted in resolution of hypertension (75% vs 32%; $P = .029$).⁶⁰

Obesity and hypertension places patients at a higher cardiovascular risk, which can be markedly reduced (risks of coronary arterial disease [CAD] decreased by 39% in men and 25% in women) after weight loss-induced resolution of hypertension.⁶¹ BS decreases CAD risk to rates lower than the age-adjusted and gender-adjusted estimates for the general population.⁶¹

Hypertension

Resolved in
between 60–90%
(differing between
studies and types of
surgery)

Cardiovascular Disorders

SG results in marked improvement in hyperlipidemia, with improvement or resolution rates of more than 70% in most studies.^{57,67,68,76} By causing malabsorption of fats to reduce enterocolic circulation and reabsorption of cholesterol, both RYGB and BPD lead to marked improvement in lipid profile.^{48,77,78} A retrospective study⁷³ of 94 patients who had RYGB and who were diagnosed with hyperlipidemia showed optimization of serum TC, TG, and LDL profiles in all patients within 6 months after surgery. The HDL cholesterol levels improved more slowly, reaching desirable levels within 12 months after surgery, and reached the greatest level at 4 years. None of the patients taking lipid-lowering agents required the medication at the end of the study period. The overall improvement in serum lipid levels included a 27% improvement in serum TC, 47% improvement in serum TG, 40% improvement in serum LDL cholesterol, and a 12% increase in serum HDL cholesterol at the end of the 6-year follow-up period.⁷³ A Veterans Affairs study⁴⁸ of 298 patients with hyperlipidemia found a 40% medication discontinuation rate at 1 year after BS. The veterans with hyperlipidemia were more likely to discontinue medication if they had only been taking fibrates (odds ratio [OR] 6.15, $P < .01$) as opposed to statins and fibrates. Another insurance data review showed a 59% reduction of hyperlipidemia medication use in patients undergoing BS compared with a 20% increase in those without surgery at 12 months.⁴⁵ When comparing SG with RYGB, some studies showed comparable results (75% and 78%, respectively),⁶⁷ whereas others found that the improvement/resolution rate was significantly higher in the RYGB group (100%) than in the SG group (75%). BPD with duodenal switch shows marked improvement, if not complete resolution, of hyperlipidemia after surgery in most cases.^{77,79} In superobese patients ($\text{BMI} > 50 \text{ kg/m}^2$), resolution of dyslipidemia at 3 years compared with baseline was 100% in the RYGB group.⁴⁹ Even in mildly obese or nonobese patients, duodenal switch with BPD resolution has shown better results.⁸⁰

In conclusion, hyperlipidemia is a major modifiable risk factor for atherosclerosis, and BS greatly improves secondary hyperlipidemia and leads to improved HDL cholesterol levels, with significant reduction in need of medications for treatment.

CARDIOVASCULAR DISORDER

Congestive Heart Failure

The combination of increased adipose cells and increased lean mass in obese patients results in high cardiac output and an increased stroke volume. Weight loss caused by caloric restriction or surgery promotes favorable hemodynamic changes referred to as reverse remodeling. Regression of left ventricle (LV) mass and chamber size has been shown universally.⁸¹

BS in morbidly obese patients decreases the thickness of the LV wall and the overall ventricular mass,^{82,83} promotes both structural and functional myocardial changes that improve cardiac performance,⁸⁴ improves the right ventricle (RV) end-diastolic area, and might prevent progression to RV dysfunction.⁸⁵ The benefits of BS on LV mass continue even when weight loss has stopped, and these effects may be caused by neurohumoral factors. These factors may contribute to improved long-term survival.⁸⁶

In patients undergoing BS with left ventricular ejection fraction (LVEF) less than or

'reverse remodelling'

- Decreased thickness of LV wall
- Improves RV end diastolic capacity

Bariatric Surgery Saves Lives!

- Effect of Bariatric Surgery on Cardiovascular Risk Profile
 - American Journal of Cardiology Nov 2011
 - 52 studies; 1950–2010
 - 16 867 patients
 - Average %EWL 52 at 3 years FU
 - 40% Relative Risk Reduction for CHD risk (Framingham Risk score)

OBSTRUCTIVE SLEEP APNEA AND ASTHMA

Obstructive sleep apnea (OSA) is a common problem among obese patients,⁷ with a prevalence rate as high as 77%.⁹⁸ Neck circumference more than 17 inches in men and 16 inches in women is a good predictor of OSA.⁹⁹ Some studies suggest that, despite availability of prediction models, the diagnosis of OSA cannot be made easily^{98,100} without routine polysomnography testing for all patients considering BS.⁹⁸ Chronic obstructive pulmonary disease (COPD) and other pulmonary disorders (including OSA) decrease significantly after BS (from 57.7% to 16.2% after surgery at 3 years).¹⁰

A study investigating the effects of surgical weight loss on inflammatory biomarkers associated with OSA reported that BS resulted in significant decrease in apnea-hypopnea index, cytokines (eg, interleukin-6, soluble tumor necrosis factor [sTNF] α 1, and sTNF α 2), and leptin levels. Of all the biomarkers, BS-related amelioration of sleep apnea independently determined the decrease in sTNF α 2. These results suggest that sTNF α 2 may be a specific OSA biomarker.¹⁰¹

High rates of OSA resolution after BS have been shown in many studies.^{66,76} Continuous positive airway pressure (CPAP) use ceased in 52.9% of patients with OSA who underwent BS in 1 year.¹⁰² Two retrospective studies found complete resolution of OSA in an Indian morbidly obese population at 1 or 3 years after BS.¹⁰³

Obesity and increased neck circumference lead to difficult intubation and management of the airway. After BS, patients had an increased interincisor gap, thyromental distance, and reduction in neck circumference.¹⁰⁴ A meta-analysis to identify the effects of surgical weight loss on the apnea-hypopnea index showed a reduction in a random-effects pooled baseline value of 54.7 events/h to 38.2 events/h and subsequent final value of 15.8 events/h. BS thus significantly reduces the apnea-hypopnea index, but postoperative apnea-hypopnea index was consistent with moderately severe OSA. Thus, these patients likely need continued treatment to minimize their future OSA-associated morbidity and complication rate.¹⁰⁵

Excess BMI increases both the risk and severity of asthma. In a follow-up questionnaire, BS was found to decrease the number of medications required to control patients' asthma symptoms, although AGB seems to produce less significant effects.¹⁰⁶ BS thus shows significant improvement in OSA and other pulmonary diseases.

RENAL DISORDERS

The pathophysiology underlying obesity-associated renal disorders includes insulin resistance, adiponectin deficiency, hyperaldosteronism, and many other pathogenetic factors.¹⁰⁷ The abnormalities of renal structure in obese and morbidly obese individuals include increased kidney weight, glomerulomegaly, disorder of podocytes, mesangial expansion, and abnormalities of the renal interstitium. These abnormalities are accompanied by functional abnormalities like renal hyperperfusion, increased renal plasma flow, increased filtration fraction, and albuminuria.¹⁰⁸⁻¹¹⁰ Both obesity and metabolic syndrome have been identified as powerful predictors of chronic kidney disease and end-stage renal disease.¹⁰⁷

Obesity is an independent risk factor for developing chronic or end-stage renal disease with 23% increased odds in patients with high BMI (>30 kg/m²).¹¹¹ The mechanisms and mediators of obesity's effects on renal function are not yet well known. A

Obstructive Sleep Apnoea

53% patients stopped using CPAP 1 year following Sleeve Gastrectomy

Bariatric Surgery Saves Lives!

- Does Intentional Weight Loss Reduce Cancer Risk?

- Diabetes, Obesity and Metabolism Dec 2011
 - Review of literature
 - “Fairly immediate reductions in cancer incidence following intentional weight loss.”
 - Decrease in levels of circulating cancer biomarkers
 - » Oestradiol
 - » CRP
 - » TNF
 - » IL-6
 - » IGF-1

hirsutism, total and free testosterone, androstenedione and dehydroepiandrosterone sulfate, and restoration of regular menstrual cycles and/or ovulation paralleled weight loss after BS.¹⁴² Testosterone levels in men also improved after surgery.¹⁴³

Intracranial Hypertension

Morbid obesity is associated with responds well to BS. Ninety-seven have resolution of papilledema after resolution of visual field deficits, and ously progressive vision loss. BS m intracranial hypertension in obese p outcome.¹⁴⁴

In addition, migraine may be exace of symptoms and reduced incidence

CANCER

In the United States, approximately 8 obesity. Recent research has found t mortality increases by 10%.¹⁴⁶ The strongest for obesity-related tumors may involve both weight-dependent include the improvement of insulin syndrome as well as decreased ox modulation of sex steroids, gut horm adipokines.¹⁴⁷

After 13 years of follow-up in the decrease the incidence of first cancer anism for cancer reduction is that RYGB of cytokines related to natural killer cell fu

SUMMARY

Published data show that BS not only leads to significant and sustained weight loss but also resolves or improves multiple comorbidities associated with morbid obesity. Evidence suggests that the earlier the intervention the better the resolution of comorbidities. Patients with metabolic syndrome and comorbidities associated with morbid obesity should be promptly referred for consideration for BS earlier in the disease process.

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1. Pender JR, Pories WJ. Epidemiology of obesity in the United States. *Gastroenterol Clin North Am* 2005;34(1):1-7.
2. Busetto L, Pisent C, Rinaldi D, et al. Variation in lipid levels in morbidly obese patients operated with the LAP-BAND adjustable gastric banding system: effects of different levels of weight loss. *Obes Surg* 2000;10(6):569-77.
3. Kuhlmann HW, Falcone RA, Wolf AM. Cost-effective bariatric surgery in Germany today. *Obes Surg* 2000;10(6):549-52.

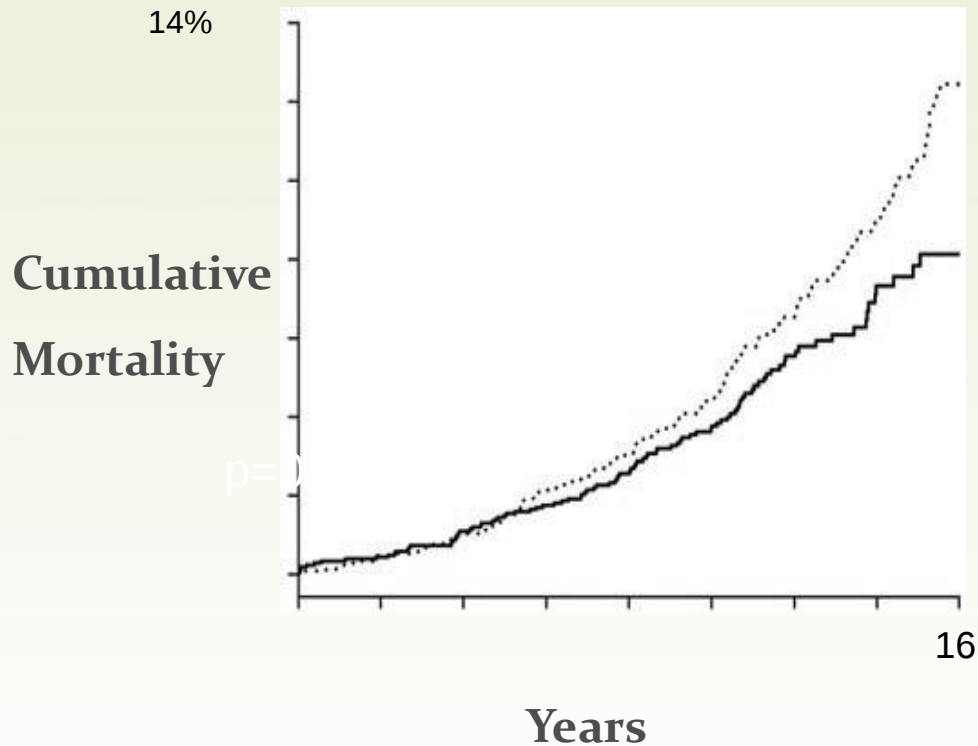
Summary

Published data show that Bariatric Surgery not only leads to significant and sustained weight loss but also resolves or improves multiple comorbidities associated with morbid obesity. Evidence suggests that the earlier the intervention the better the resolution of comorbidities. Patients with metabolic syndrome and comorbidities associated with morbid obesity should be promptly referred for consideration for Bariatric surgery earlier in the disease process.

Bariatric Surgery Saves Lives!

- N Eng J Med: (2007) – Swedish Obese Subjects (SOS) trial¹²
 - Effects of Bariatric Surgery on Mortality
 - Case Control Trial
 - N=4047 (2010 surgery; 2037 conventional treatment)
 - Average FU; 11 years
 - Rate of FU; 99.9%
 - % initial wt loss at 10 years:
 - 23% Surgery
 - 0% Conventional treatment

Mortality rates



- Hazard ratio 0.71 for surgical group
 - Most common causes of death:
 - MI, Cancer

Bariatric Surgery Truisms

- Bariatric Surgery
 - is the only known cure for Type 2 Diabetes
 - Is better than Medical Management for the following conditions:
 - Hypertension
 - Congestive Heart Failure
 - Polycystic Ovarian Syndrome
 - Depression
 - Has the biggest impact on OSA resolution
 - Is the best Cancer prevention strategy that medicine currently has

Question 3

Which operation should I have?

Types of Surgery

- **1. Malabsorptive**

procedures bypass the digestive tract

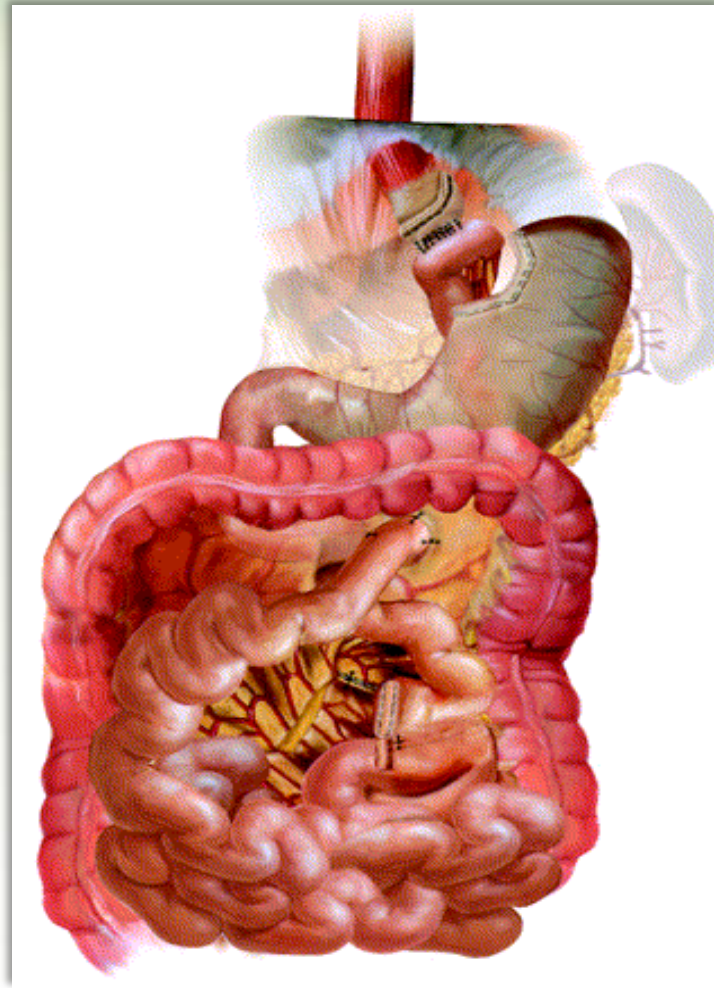
- eg Gastric Bypass, Biliopancreatic Diversion /Duodenal Switch

- **2. Restrictive**

procedures decrease stomach capacity

- eg Gastric Band, Sleeve Gastrectomy

Gastric Bypass



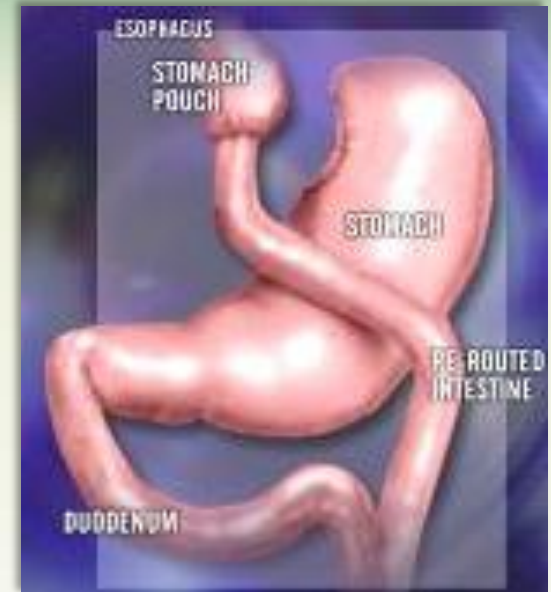
Gastric Bypass

Advantages:

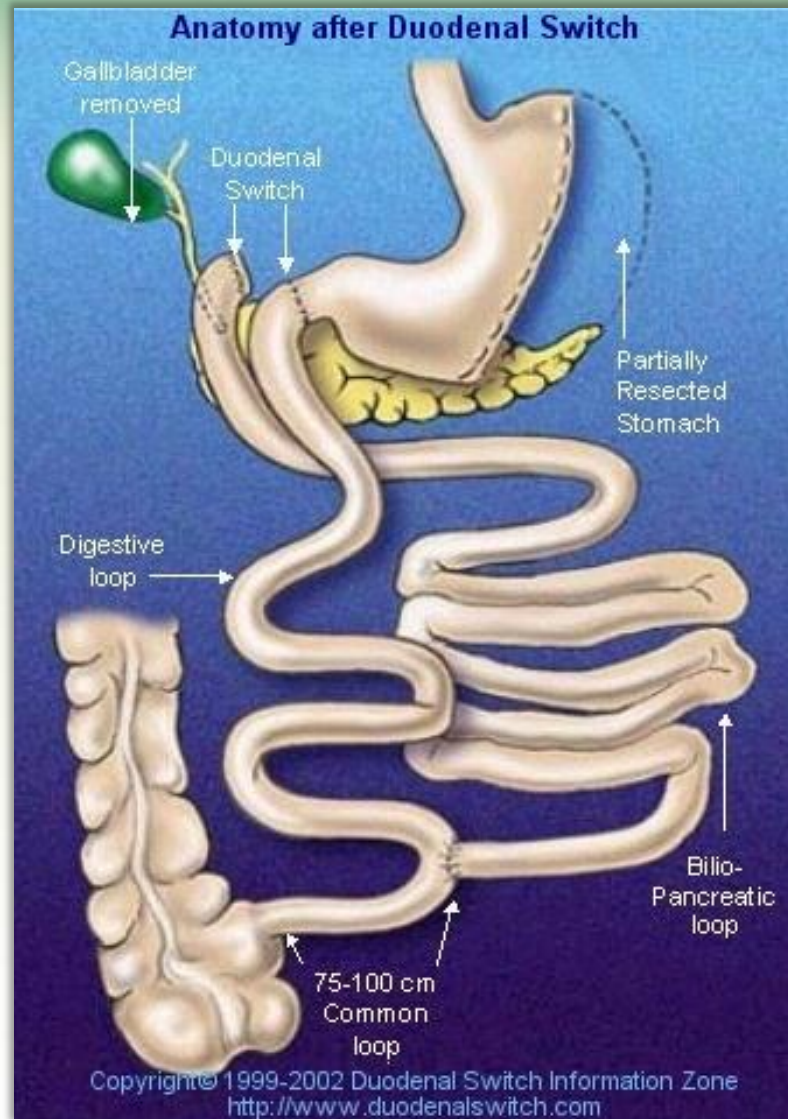
- Excellent weight loss and longest track record
- Keyhole surgery
- Rapid improvement in Type II Diabetes

Disadvantages:

- Irreversible
- Malabsorption
- Nonadjustable
- Cutting and stapling of stomach
- Increased risk major long term complications – Vit def 30%, Dumping Syndrome 70%¹⁰
- Highest post-op morbidity and mortality



Duodenal Switch



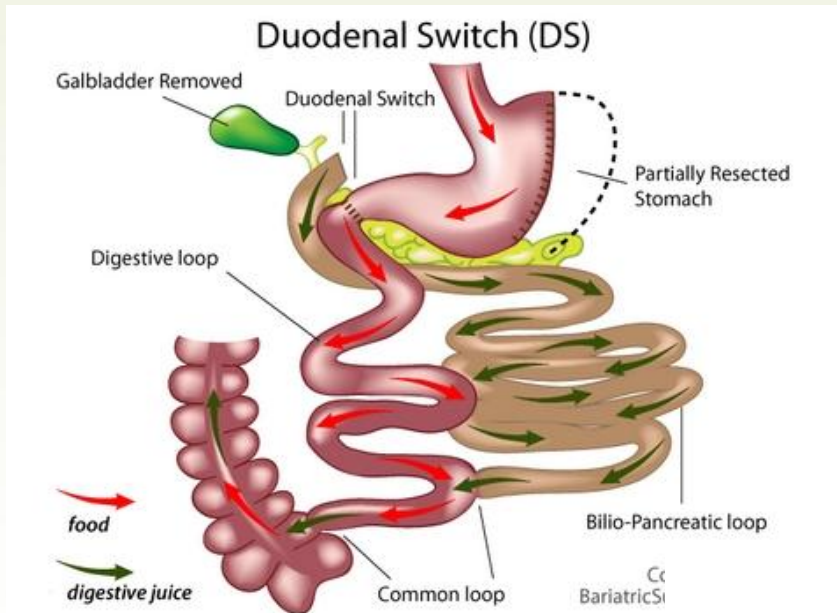
Duodenal Switch

- Advantages

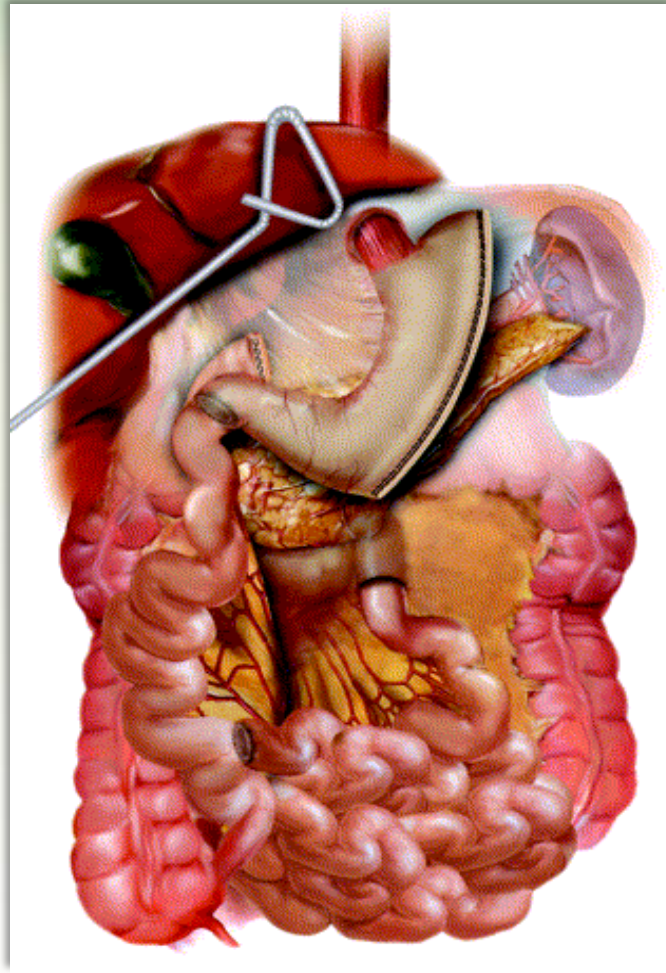
- Best weight loss
- Best resolution of Diabetes

- Disadvantages

- Malabsorptive+++
 - Fat soluble vitamins (A,D,E and K)
 - Vitamin B12 and Folate
 - Iron
 - Calcium
- Often performed Open
- Highest morbidity and mortality rate
- High longterm complication rate



Sleeve Gastrectomy



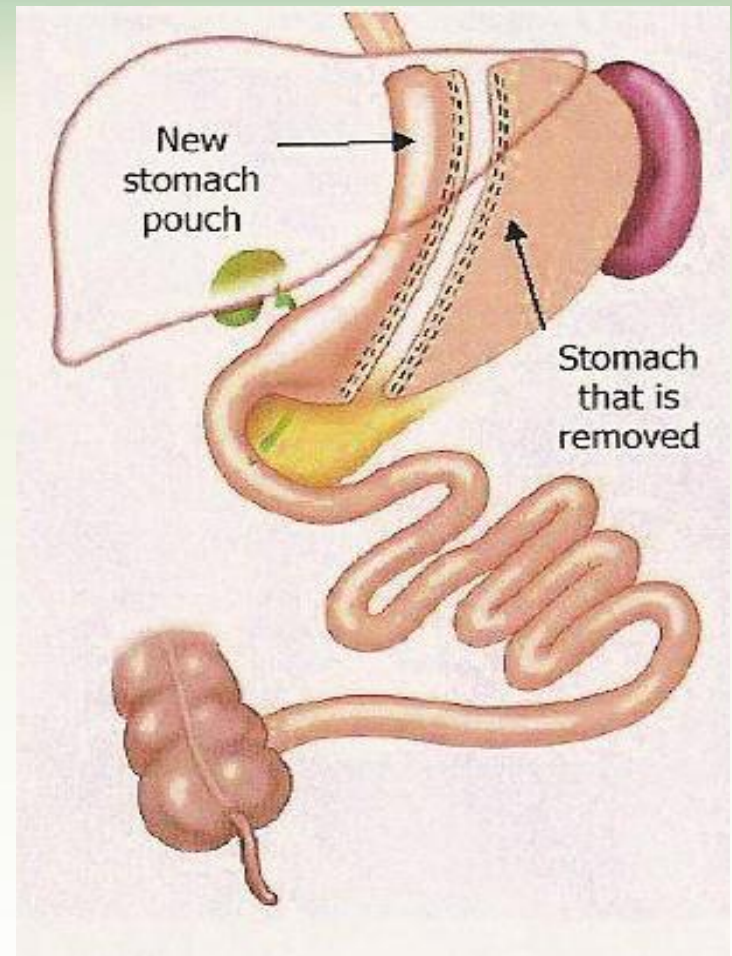
Sleeve Gastrectomy

Advantages

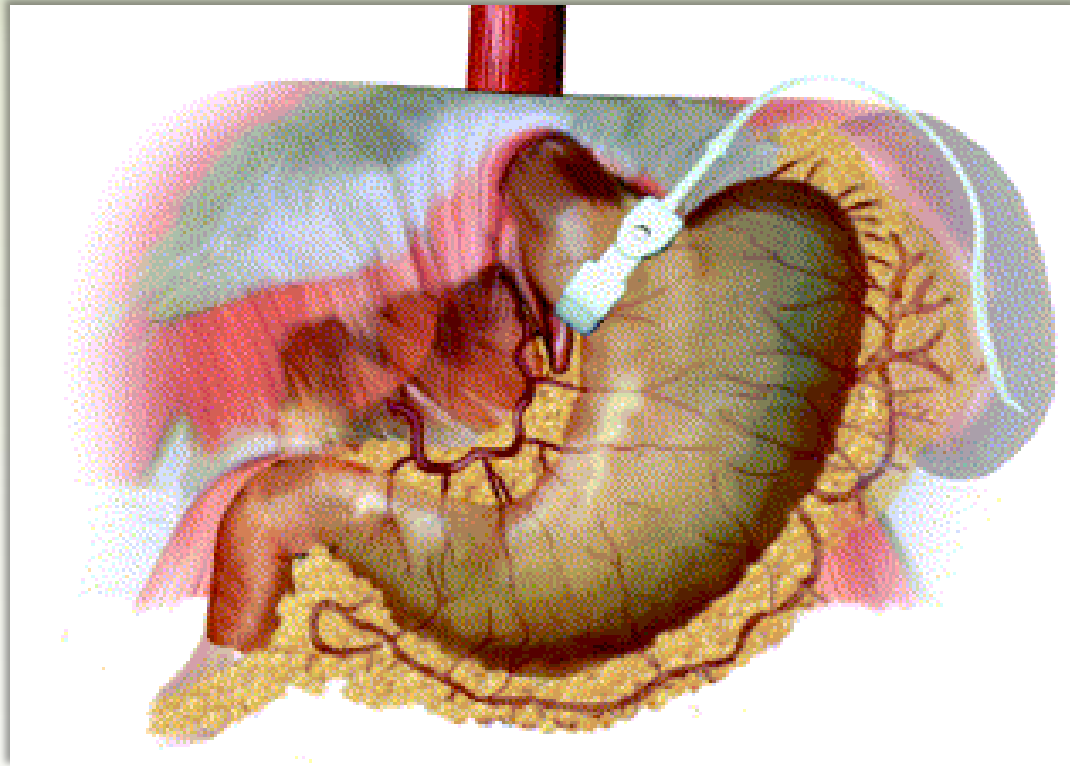
- Excellent weight loss
- Keyhole surgery
- No malabsorption

Disadvantages

- Cutting and stapling of stomach
- Irreversible
- Durability unproven



Gastric Band



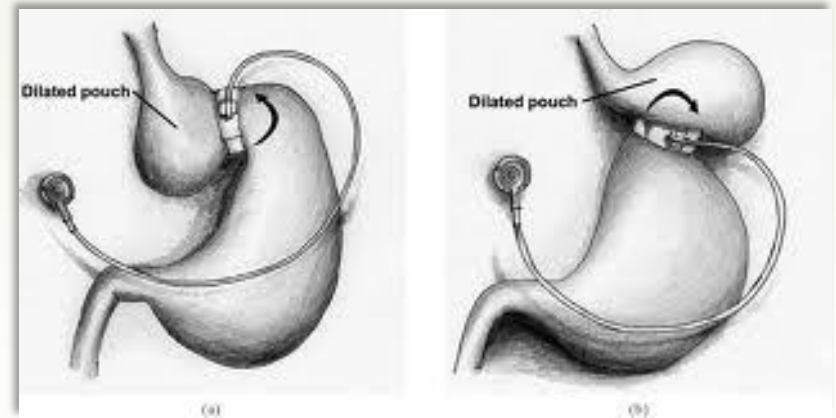
Gastric Band

- Advantages

- Safest bariatric procedure
- Adjustable
- Fully reversible
- Keyhole surgery
- No malabsorption

- Disadvantages

- Poor Long term complication rate
- Intensive Follow up requirements
- Use of Foreign Body



So... which operation is the
best??

Gastric Sleeve Surgery

Question 4

How much will I be able to eat?

- Start on a pureed diet following the operation
- By about 6 weeks should be on a 'normal' diet
 - 2 dsp/ quarter cup food
 - Minimal food avoidance

Gastric Sleeve Surgery

Question 5

Will I be able to eat out?

- Yes, but you will either eat an entrée sized or have soup as your Main
 - Doggy bag
 - Cheap!!

Gastric Sleeve Surgery

Question 6

What about alcohol?

- Yes, you can drink alcohol but less is more!

Gastric Sleeve Surgery

Question 7

How long will I need off work?

- Keyhole surgery so pain is less of an issue
 - 2 nights in hospital
 - 2 weeks off work is the norm
 - Self employed

Gastric Sleeve Surgery

Question 9

Will my Medical Insurance cover my operation?

- Tower, Sovereign – No
- Southern Cross: BMI >40 – \$7500 Ultra Care, \$5500 with other Hospital policies
BMI 35–40 – only if medical co-morbidities

Total Price \$18 900

Question 10

Will my weight loss last forever?

Long Term Performance

- Gastric Bypass – longest track record – 30+years
 - 50%EWL maintained at 10 years
 - Complications – Vitamin/mineral deficiency
 - Stenosis/ stretching Gastrojejunal anastomosis
 - Gastric pouch ulceration
 - Dumping syndrome
- Gastric Banding – approx. 10–15 year
 - 20%EWL maintained
 - 10–15% will require re-do surgery in longterm (slippage, erosion, port complications etc)
 - Foreign body
- Gastric Sleeve – newest procedure – results to 7 years only
 - 50%EWL maintained
 - Potential for stretching of sleeve – ??weight regain

Who Qualifies?

- $BMI \geq 30$



Conclusion

- Obesity is the elephant in the room
- Surgery is the most successful treatment for Obesity and its co-morbidities.

Mr NW

- Dec 2011
 - Ht 1.82m, Wt 170kg, BMI 51
 - PMH: OSA – using CPAP since 1998
 - No previous surgery
 - Op Date 20 Feb 2012





