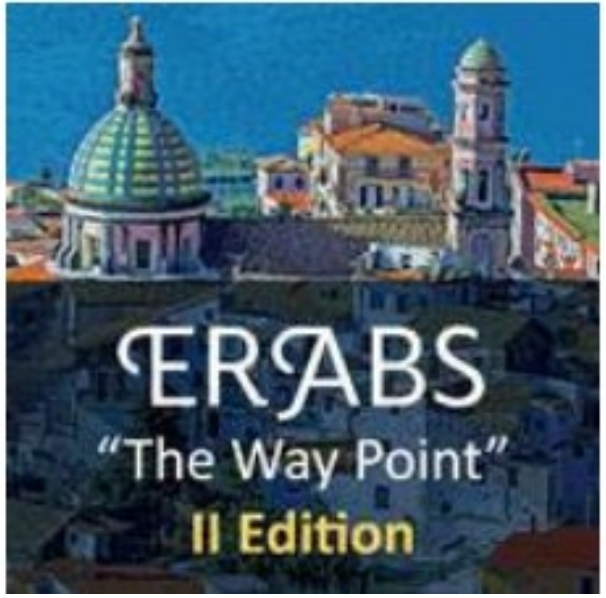


# La Preabilitazione in Chirurgia Bariatrica e le sue Basi Fisiopatologiche

Mirto Foletto, MD

Bariatric Surgery Unit Padova University Hospital

BJA

British Journal of Anaesthesia, 128 (3): 434–448 (2022)

doi: 10.1016/j.bja.2021.12.007
Advance Access Publication Date: 7 January 2022
Review Article

# Prehabilitation, enhanced recovery after surgery, or both? A narrative review

Chelsia Gillis[1,*], Olle Ljungqvist[2] and Francesco Carli[1]

[1]Department of Anesthesia, McGill University Health Center, Montreal, QC, Canada and [2]Faculty of Medicine School of Health and Medical Sciences, Department of Surgery, Örebro University, Örebro, Sweden

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Postoperative morbidity and mortality are largely the product of the *preoperative condition* of the patient, the *quality of surgical care* provided, and the *degree of surgical stress elicited*.[1,2] This narrative review explores these three components to highlight the potential contribution of *prehabilitation* to patient recovery in modern surgical practices.

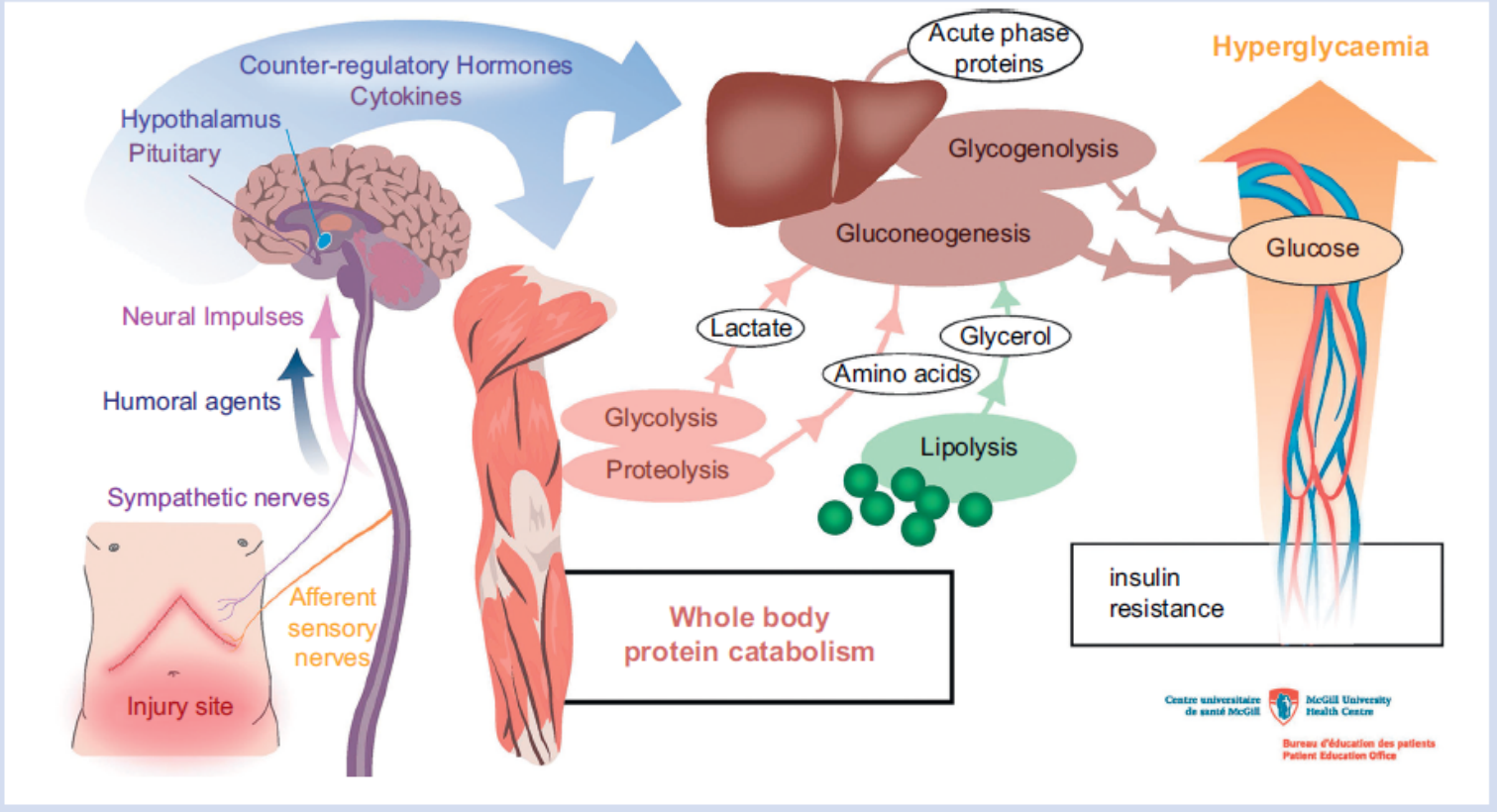
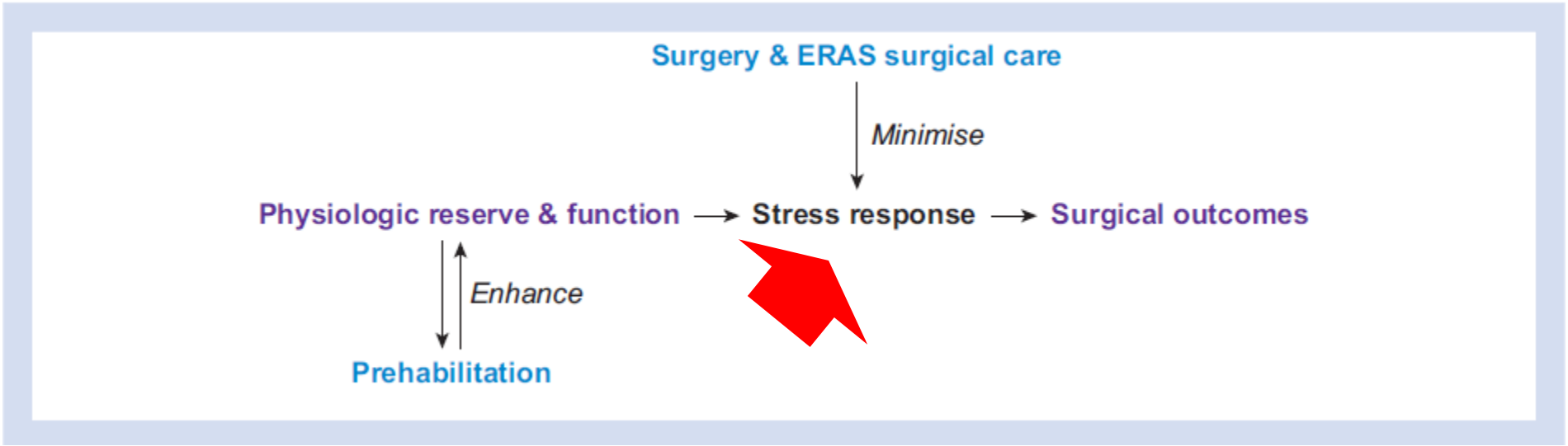
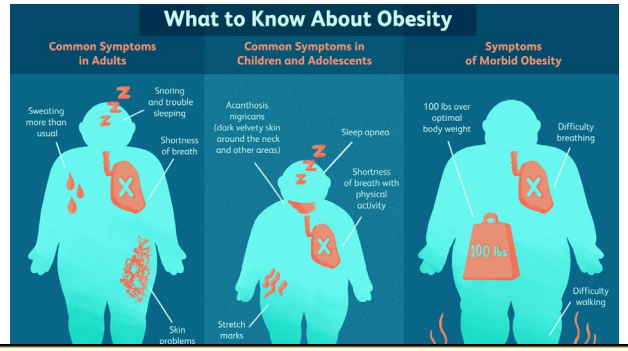



Fig 1. Surgical stress response. An increase in circulating glucocorticoids, catecholamines, and glucagon (i.e. counter-regulatory hormones) is elicited by activation of the hypothalamic–pituitary–adrenal axis and sympathetic nervous system. The response is mediated by afferent nerves and humoral factors including cytokines generated from the site of injury. Mobilisation of energy reserves promotes hyperglycaemia and catabolism. Hyperglycaemia develops as a consequence of insulin resistance coupled with an inappropriately high hepatic glucose production. Proteolysis and lipolysis accelerate to provide precursors for gluconeogenesis. The resultant amino acid efflux also supports the synthesis of proteins involved in the acute-phase response. (Reprinted with permission from Gillis et al[5], figure 1.)


Surgery & ERAS surgical care
Minimise
Physiologic reserve & function
Stress response
Surgical outcomes
Enhance
Prehabilitation




Review

# Perioperative care of the obese patient

M. Carron[1], B. Safaee Fakhr[1], G. Iepparielloo[1] and M. Foletto[2]

*BJS* 2020; **107**: e39–e55

**Fig. 2 Main obesity-related diseases[7–59]**

**Major depression (OR 1·21)**
**Bipolar disorder (OR 1·47)**
**Alzheimer's disease (RR 2·04); any dementia (RR 1·64)**
**Postoperative cognitive dysfunction (RR 1·27)**

**Hypertension (OR 4·8)**
**Heart failure (RR 1·90 M; RR 2·12 F)**
**Ischaemic heart disease (adjusted HR 1·64)**
**Myocardial infarction (adjusted HR 2·02)**
**Atrial fibrillation (adjusted HR 1·52 M; adjusted HR 1·46 F)**

**Diabetes mellitus (adjusted RR 7·28)**
**Dyslipidaemia (adjusted OR 2·2)**

**Metabolic syndrome**
Stroke (OR 2·16)
Myocardial infarction (OR 2·01)
Atrial fibrillation (adjusted HR 1·52 M; adjusted HR 1·46 F)

**Hypercoagulability**
Stroke, myocardial infarction (OR 1·57)
Deep venous thrombosis (RR 2·50)
Pulmonary embolism (RR 2·21)

**Non-alcoholic steatohepatitis (RR 4·6); cirrhosis (RR 4·1)**

**Renal disease (OR 1·38 hypertension; OR 1·4 type 2 diabetes)**

**Obstructive sleep apnoea (OR 6·0 for ↑10% bodyweight)**
DMV (OR 3·39), DEI (OR 3·46) or both (OR 4·12)
Postoperative desaturation (OR 2·27)
Postoperative respiratory failure (OR 2·43)
Postoperative reintubation (OR 2·05)
Postoperative cardiac adverse events (OR 2·07)
Postoperative ICU transfer (OR 2·81)

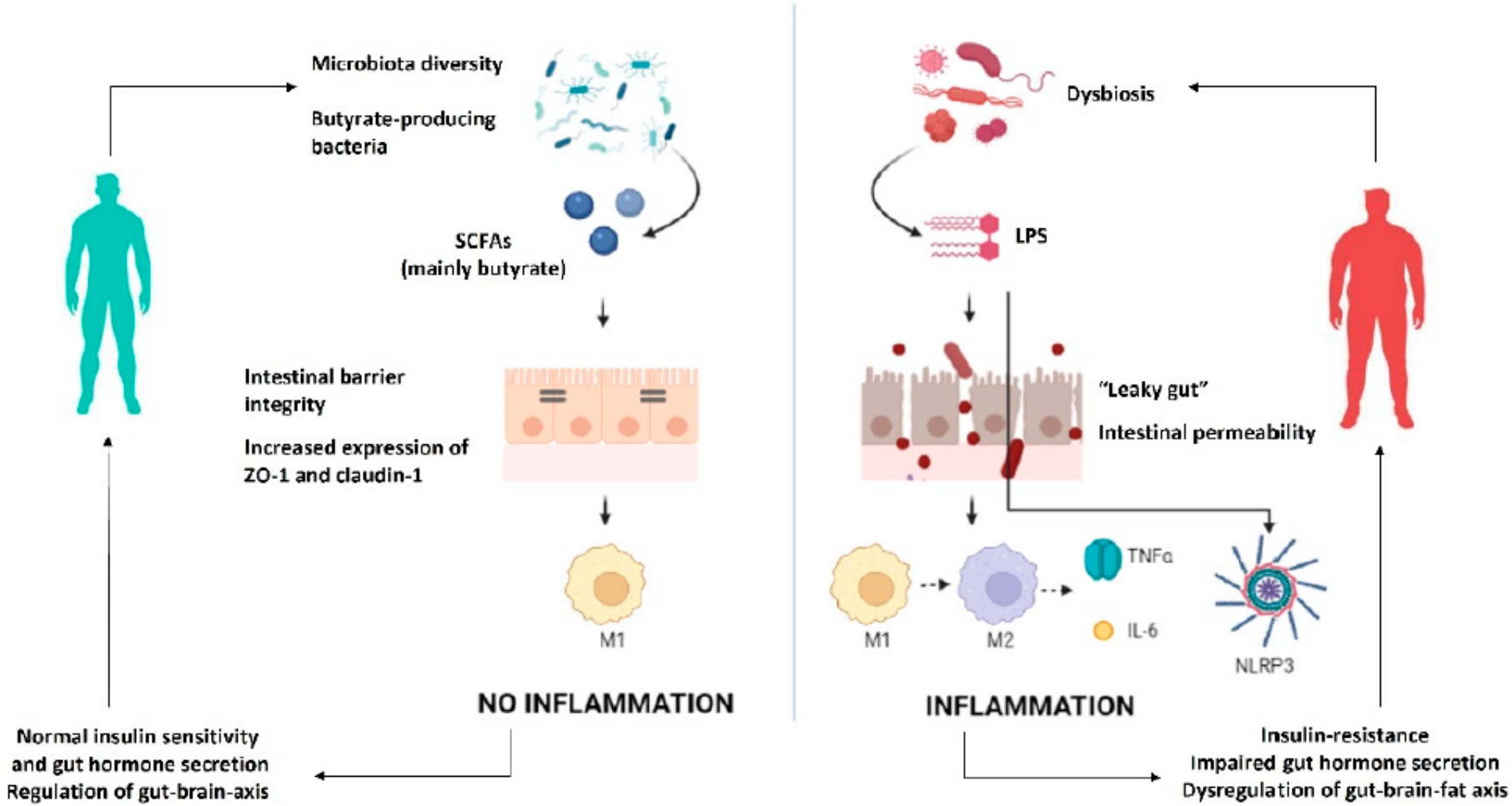
**Obesity hypoventilation syndrome**
Cardiac event or cor pulmonale (OR 9)
Postoperative respiratory failure (OR 10·9)
Postoperative heart failure (OR 5·4)
Postoperative prolonged intubation (OR 3·1)
Postoperative ICU transfer (OR 10·9)

**Respiratory disease**
Respiratory complications with severe ↓FEV1 (OR 2·97)
Cardiovascular complications with severe ↓FEV1 (OR 2·02)

**Asthma (RR 2·7)**
Postoperative respiratory complications (OR 2·94)

**Gastro-oesophageal reflux disease (OR 1·94)**
Postoperative complications (OR 10·9)

**Osteoarthritis (RR 1·12 hip; RR 1·25 knee)**
**Gout (RR 2·67)**




*nutrients*

MDPI

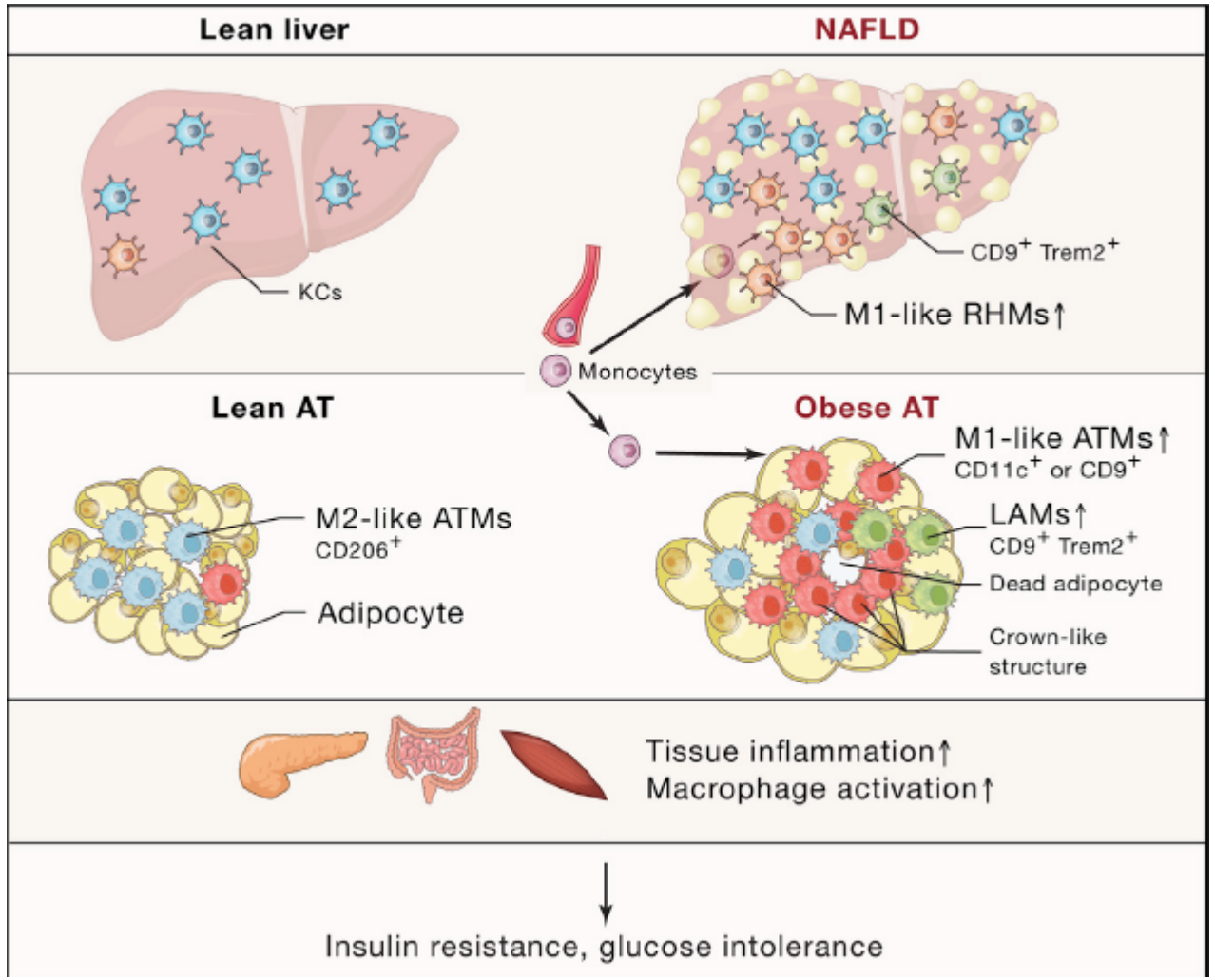
*Review*

# From Gut Microbiota through Low-Grade Inflammation to Obesity: Key Players and Potential Targets

Claudia Vetrani [1], Andrea Di Nisio [2], Stavroula A. Paschou [3], Luigi Barrea [4,5], Giovanna Muscogiuri [1,5,6,*], Chiara Graziadio [1,5], Silvia Savastano [1,5], Annamaria Colao [1,5,6] and on behalf of the Obesity Programs of Nutrition, Education, Research and Assessment (OPERA) Group †

Immunity

CellPress




Review

# Inflammation in obesity, diabetes, and related disorders

Theresa V. Rohm,[1,4] Daniel T. Meier,[2,3,4] Jerrold M. Olefsky,[1,4] and Marc Y. Donath[2,3,4,*]
[1]Division of Endocrinology and Metabolism, Department of Medicine, University of California, San Diego, La Jolla, CA 92093, USA
[2]Clinic of Endocrinology, Diabetes and Metabolism, University Hospital Basel, Basel 4031, Switzerland
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[4]These authors contributed equally
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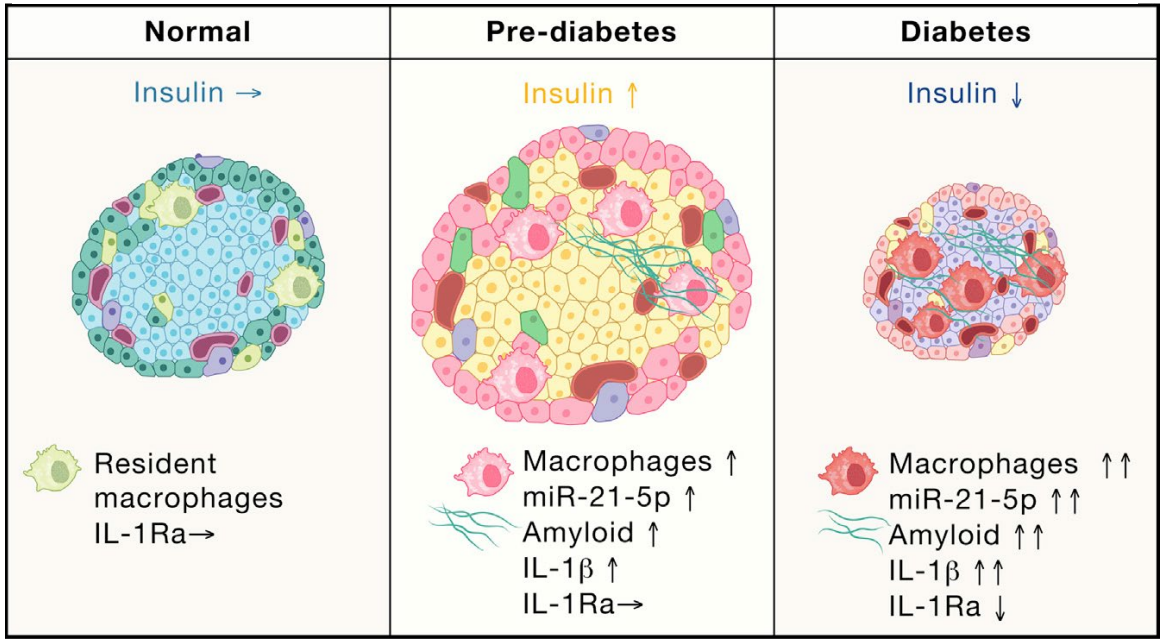
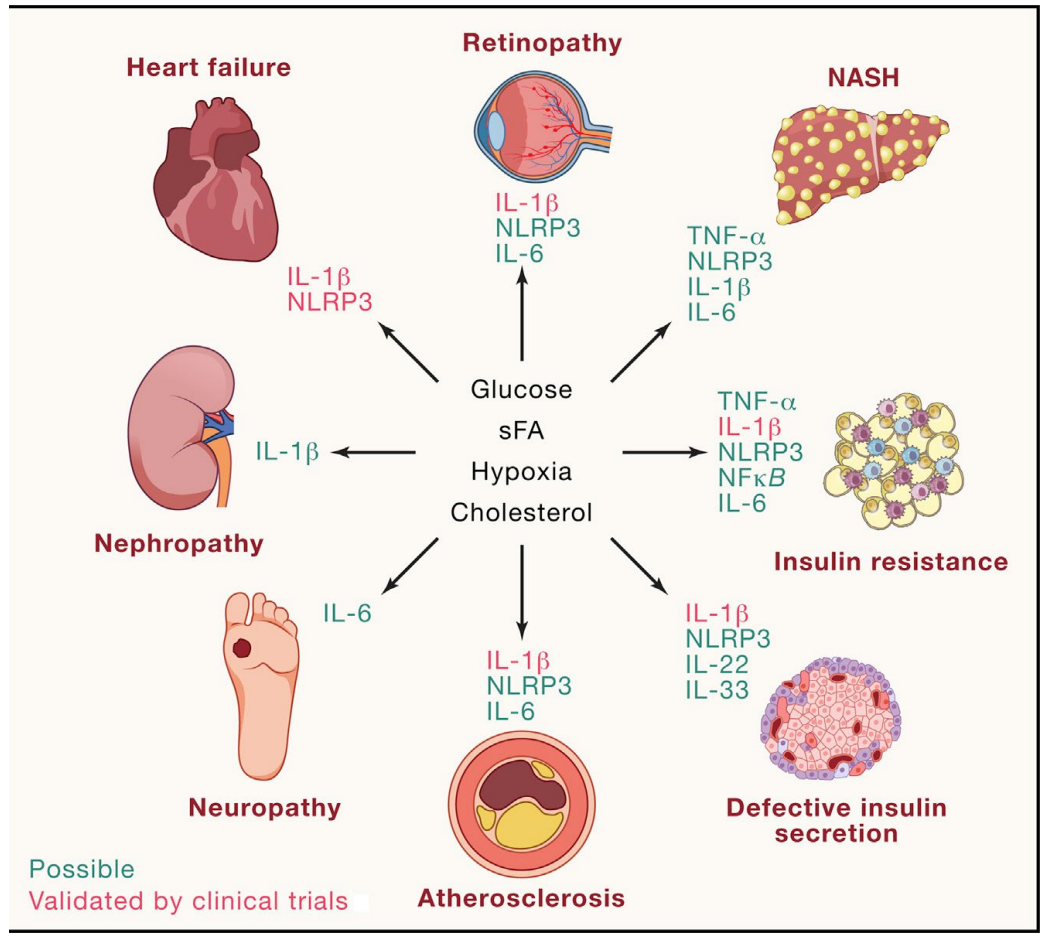
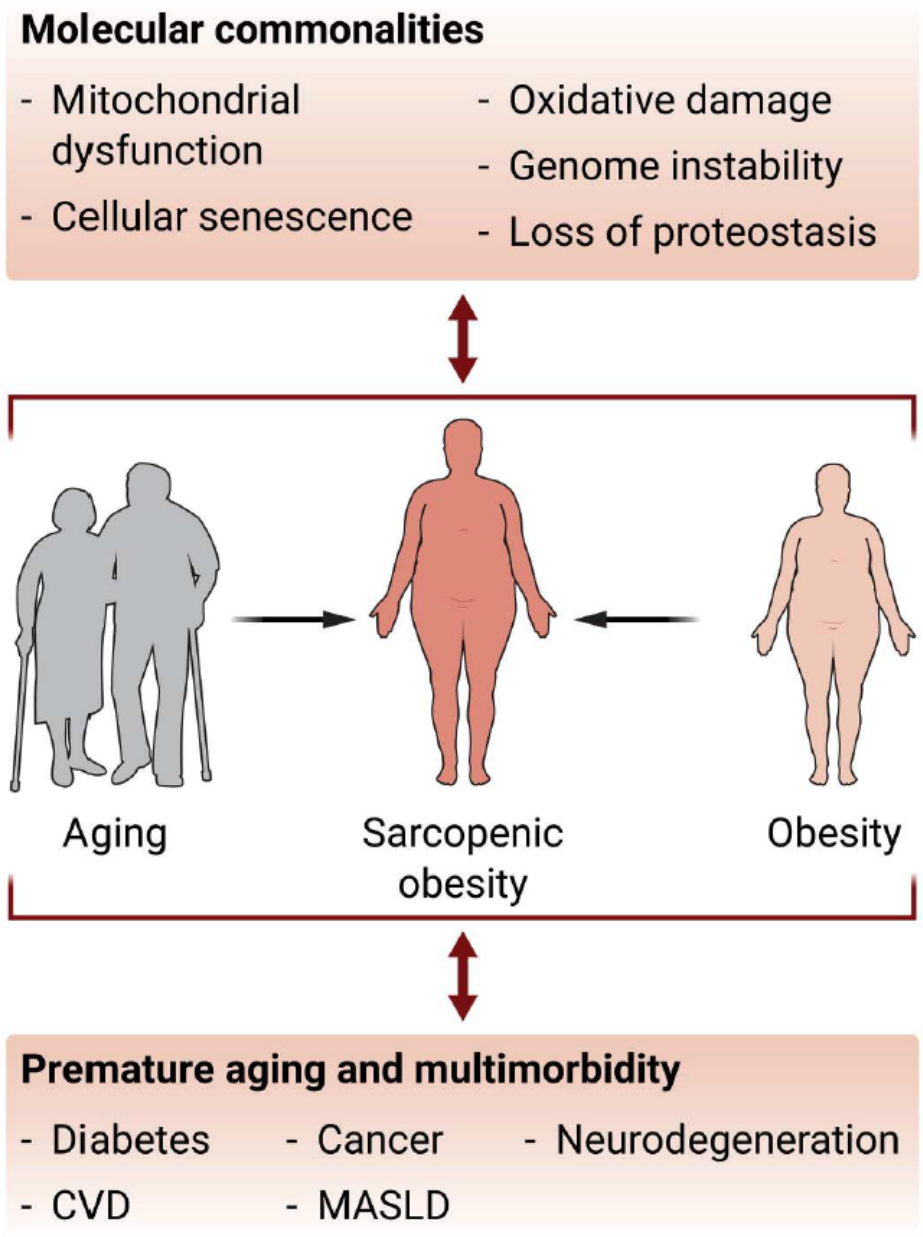
https://doi.org/10.1016/j.immuni.2021.12.013




Heart failure
Retinopathy
NASH
IL-1β
NLRP3
IL-6
TNF-α
NLRP3
IL-1β
IL-6
IL-1β
NLRP3
Glucose
sFA
Hypoxia
Cholesterol
IL-1β
Nephropathy
TNF-α
IL-1β
NLRP3
NFκB
IL-6
Insulin resistance
IL-6
IL-1β
NLRP3
IL-6
IL-1β
NLRP3
IL-22
IL-33
Neuropathy
Atherosclerosis
Defective insulin secretion
Possible
Validated by clinical trials




SCIENCE TRANSLATIONAL MEDICINE | VIEWPOINT

OBESITY SYSTEMS

# Obesity and lifespan, a complex tango

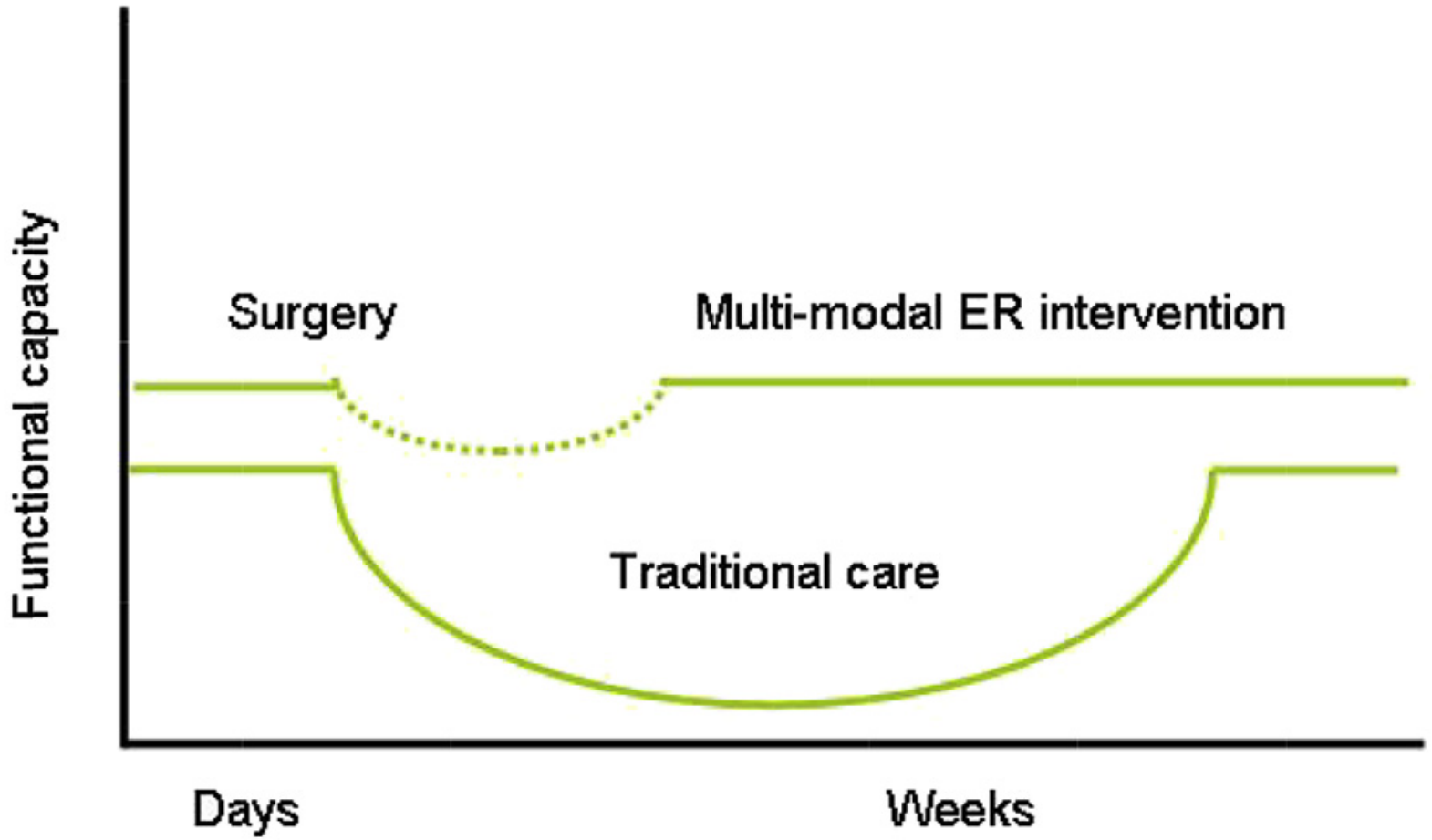
**Alberto Diaz-Ruiz[1,2,3]*, Nathan L. Price[1], Luigi Ferrucci[1], Rafael de Cabo[1,4]***

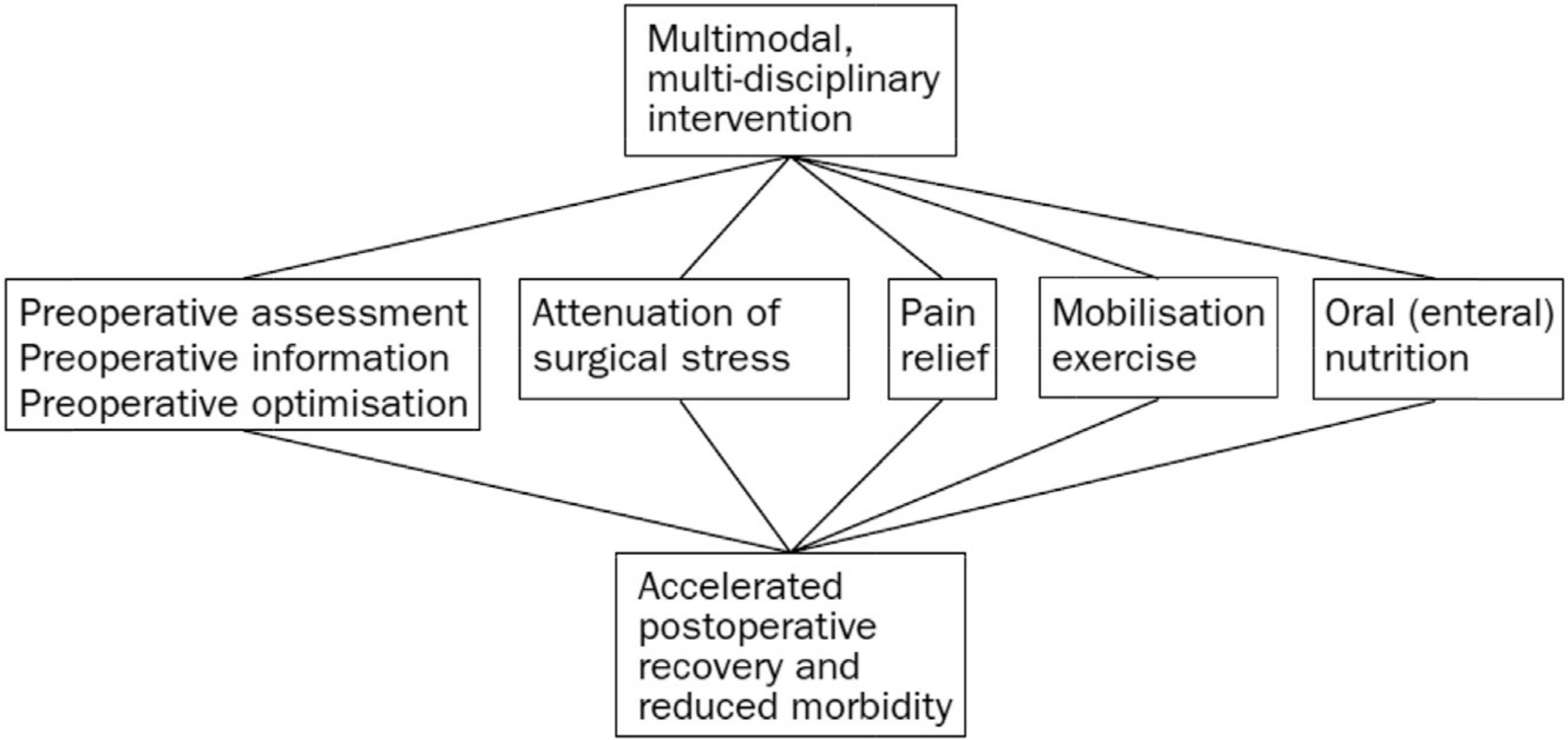
**Obesity and aging share comorbidities, phenotypes, and deleterious effects on health that are associated with chronic diseases. However, distinct features set them apart, with underlying biology that should be explored and exploited, especially given the demographic shifts and the obesity epidemic that the world is facing.**

ERAS® Society

The mission of the Society is to develop peri-operative care and to improve recovery through research, education, audit and implementation of evidence-based practice.

## Enhanced recovery after surgery




Multimodal, multi-disciplinary intervention
Preoperative assessment
Preoperative information
Preoperative optimisation
Attenuation of surgical stress
Pain relief
Mobilisation exercise
Oral (enteral) nutrition
Accelerated postoperative recovery and reduced morbidity

World J Surg (2022) 46:729–751
https://doi.org/10.1007/s00268-021-06394-9

SCIENTIFIC REVIEW

# Guidelines for Perioperative Care in Bariatric Surgery: Enhanced Recovery After Surgery (ERAS) Society Recommendations: A 2021 Update

Erik Stenberg[1] · Luiz Fernando dos Reis Falcão[2] · Mary O'Kane[3] · Ronald Liem[4,5] · Dimitri J. Pournaras[6] · Paulina Salminen[7,8] · Richard D. Urman[9] · Anupama Wadhwa[10] · Ulf O. Gustafsson[11] · Anders Thorell[12,13]

**Table 1** ERAS recommendations for preadmission care in bariatric surgery

| Element | Recommendation | Level of evidence | Recommendation grade |
|---|---|---|---|
| 1. Information, education and counselling | *Preoperative information and education, adapted to the individual requirements, should be given to all patients* | Low | Strong |
| 2. Indications and contraindications for surgery | *Indications for bariatric surgery should follow updated global and national guidelines* | Moderate | Strong |
| 3a. Smoking and alcohol cessation | *All patients should be screened for alcohol and tobacco use. Tobacco smoking should be stopped at least 4 weeks before surgery. For patients with alcohol abuse, abstinence should be strictly adhered to for 1–2 years. Moreover, the risk for relapse after bariatric surgery should be acknowledged* | Smoking: Moderate<br>Alcohol: Low | Strong<br>Strong |
| 3b. Preoperative weight loss | *Preoperative weight loss using very low or low-calorie diet prior to bariatric surgery should be recommended* | Postoperative complications: Moderate | Strong |
| | *While feasible, patients with diabetes and treatment with glucose-lowering drugs should closely monitor treatment effects, and be aware of the risk for hypoglycaemia. Very low calorie diet improves insulin sensitivity in patients with diabetes* | Postoperative weight loss: Low<br>Diabetes: Low | Strong<br>Strong |
| 4. Prehabilitation and exercise | *Although prehabilitation may improve general fitness and respiratory capacity, there is insufficient data to recommend prehabilitation before bariatric surgery* | Low | Weak |

Surgical Endoscopy (2022) 36:7171–7186
https://doi.org/10.1007/s00464-022-09498-y

CONSENSUS STATEMENT

# Enhanced recovery after bariatric surgery: an Italian consensus statement

Giuseppe Marinari[1] · Mirto Foletto[2] · Carlo Nagliati[3] · Giuseppe Navarra[4] · Vincenzo Borrelli[5] · Vincenzo Bruni[6] · Giovanni Fantola[7] · Roberto Moroni[8] · Luigi Tritapepe[9] · Roberta Monzani[10] · Daniela Sanna[11] · Michele Carron[12] · Rita Cataldo[13]



**Table 4** Effectiveness, safety, and items of Enhanced Recovery after Bariatric Surgery (ERABS) compared to standard approach

| | Evidence | | Strength of | Expert task force statement |
|---|---|---|---|---|
| | Level | Quality | Recommendation | |
| *Effectiveness and safety of ERABS* | | | | |
| Length of hospital stay | 1 | A | A | ERABS reduces the duration of hospital stays |
| Risk of complications | 1 | A | A | ERABS is a safe approach for obese patients |
| Cost of surgery | 2 | B | A | Adopting an ERABS protocol does not increase the cost of surgery |
| *Items ERABS. Preoperative care* | | | | |
| Information and counseling | 2 | B | A | The information provided to the patient should not be limited to what is required for informed consent for both surgery and anesthesia; it should be adequate to provide realistic expectations of the ERABS approach |
| Patient optimization | 1 | A | A | Pre-operative optimization through smoking cessation, weight loss, blood glucose control, and the use of non-invasive ventilation (when indicated) is recommended in ERABS |

1. Empowerment
2. Compenso metabolico
3. «Funzionalizzazione»

# 3 major COMPONENTS



**MDT**

**Multimodal Approach (EBM)**

**Interactive and continuous audit**

Table 2 Summary of our experience with the prehabilitation components and their effect on functional walking capacity before colorectal surgery for cancer. *Note that adherence to the prehabilitation program and sample sizes were not equal in these studies, which may have influenced the findings of an improvement in function before surgery. The ability to adhere to both individual prehabilitation components and multi-components before surgery needs to be investigated.

| Studies | Proportion of patients that experienced a clinically important improvement in functional walking capacity before surgery (measured with the 6-min walking test) | Potential mechanism for observed improvement* |
|---|---|---|
| Exercise prehabilitation, RCT | 33% | • Enhance substrate utilisation/metabolic flexibility<br>• Enhance cardiorespiratory capacity |
| Nutrition prehabilitation, RCT | 50% | • Provide substrate to correct deficiencies and augment physiological reserve |
| Multimodal prehabilitation, RCT | 53% | • Provide substrate to correct deficiencies and augment physiological reserve<br>• Enhance substrate utilisation/metabolic flexibility<br>• Enhance cardiorespiratory capacity |
| Multimodal prehabilitation in patients with low functional capacity at baseline (pooled, retrospective analysis) | 72% | • Patients with greatest functional deficits, attain greatest functional benefits from participating in prehabilitation |

References: Exercise only PMID: 20602503; nutrition only PMID: 26208743; multimodal is reference 162 or PMID: 25076007; low functional capacity: PMID:

| Table 1 Preoperative assessment for obese patients undergoing anaesthesia |
| --- |
| **Physiological parameters** |
| Fat distribution* |
| Waist circumference; waist-to-hip ratio† |
| Upper airway |
| Obstructive sleep apnoea syndrome‡ |
| **Laboratory tests§** |
| Electrocardiography |
| Complete blood count |
| Haemostasis |
| Fasting serum glucose¶ |
| Lipid profile# |
| Kidney function** |
| Hepatic function†† |
| **Additional assessments (if indicated)** |
| Echocardiography |
| Ergometry |
| Chest radiography |
| Spirometry |
| Arterial blood gas analysis |
| Polysomnography‡ |
| Index of inflammation‡‡ |
| Serum uric acid |
| Endocrine function |

World Journal of Diabetes

Submit a Manuscript: https://www.fspublishing.com World J Diabetes 2022 December 15; 13(12): 1096-1105

DOI: 10.4239/wjd.v13.i12.1096 ISSN 1948-9358 (online)

MINIREVIEWS

# Prehabilitation of overweight and obese patients with dysglycemia awaiting bariatric surgery: Predicting the success of obesity treatment

**Table 1 Proposed recommendations for the perioperative care of all bariatric surgery patients, especially those with associated dysglycemia**

| Prehabilitation- treatment modality | Potential advantages and clinical rationale |
|---|---|
| Exercise | |
| Resistance and endurance training | Short- and long-term improvements in weight and functional capacity, comorbidities, quality of life, improvements in tissue insulin sensitivity |
| Aerobic training | Short-term decrease in calorie intake, improvement in quality of life, improved whole-body insulin sensitivity, decrease in glucose levels, shorter hospital stay |
| Nutritional interventions | |
| Low and very low calorie and ketogenic diet | Better weight reduction, visceral fat reduction, improvement in glycemic and lipid profiles, mean 30% reduction in liver volume |
| Pharmacotherapy | |
| GLP 1 receptor agonists | Higher T2DM remission rates, better body weight reduction, improvement in glycemic and lipid profiles |
| Psychological support | |
| Preoperative counseling and education | Reduced anxiety, depression, and fear, positive influence on eating disorders |

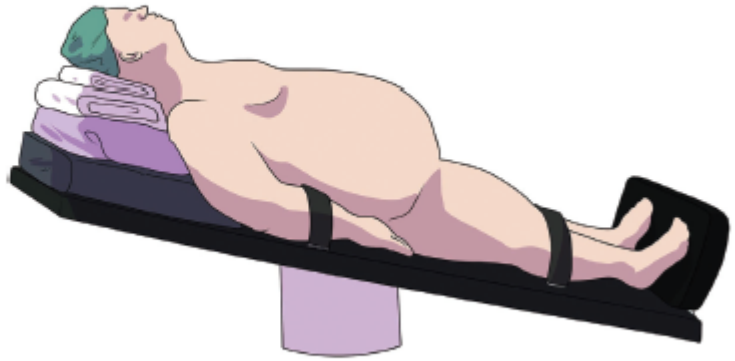
**Fig. 3 Obese patient positioning**

**Patient positioning**
- Adequate immobilization (wide hook and loop fastener strapping)
- Arms and feet supported
- Protection of pressure areas (gel pads and padding)
- Prevention of neural injury

**Ramped position**
- Using ramping device/pillows and/or blankets under a patient's head and shoulders
- Configuring the operating table into a back-up position

**Reverse Trendelenburg position**

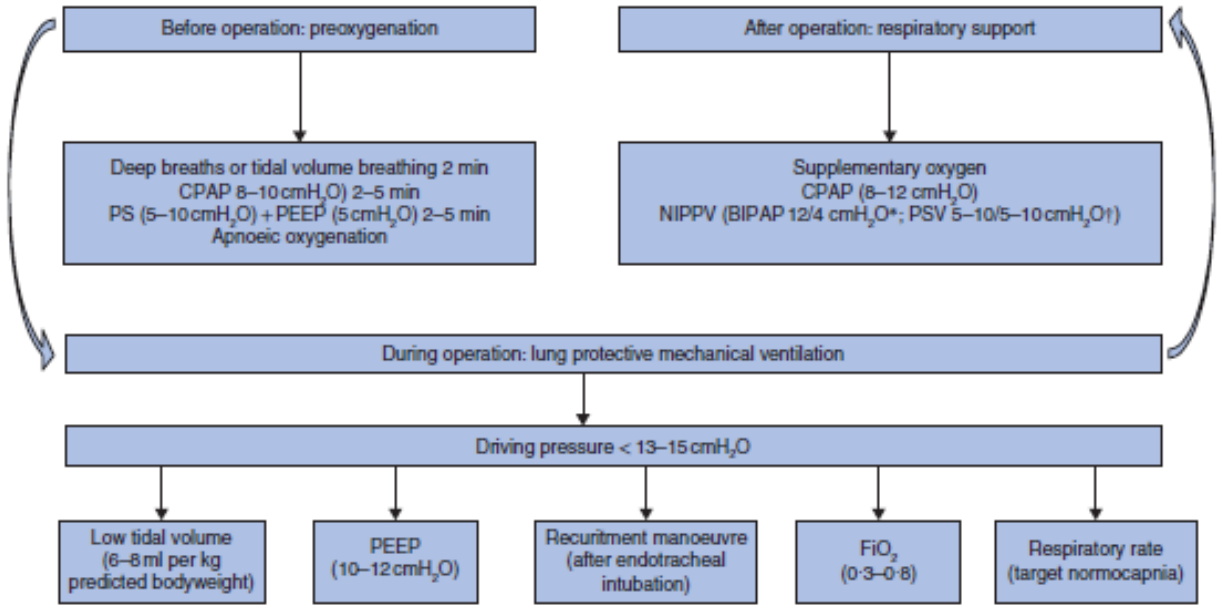
**Ear to sternal notch in the same horizontal plane**



**Bariatric operating table**
- High capacity operating table
- Shoulder, leg and foot supports
- Armboards and table extensions

The correct ramped position involves elevation of the upper body, neck and head so that an imaginary horizontal line can be drawn from the sternal notch to the external ear[92]. This position facilitates mask ventilation and improves intubating conditions (odds ratio 2·4)[92–95]. The 30° reverse Trendelenburg position improves lung volumes and pulmonary compliance[3,19,96]. It provides a longer safe apnoea period than the 30° back-up Fowler or horizontal supine position[3,19,96].

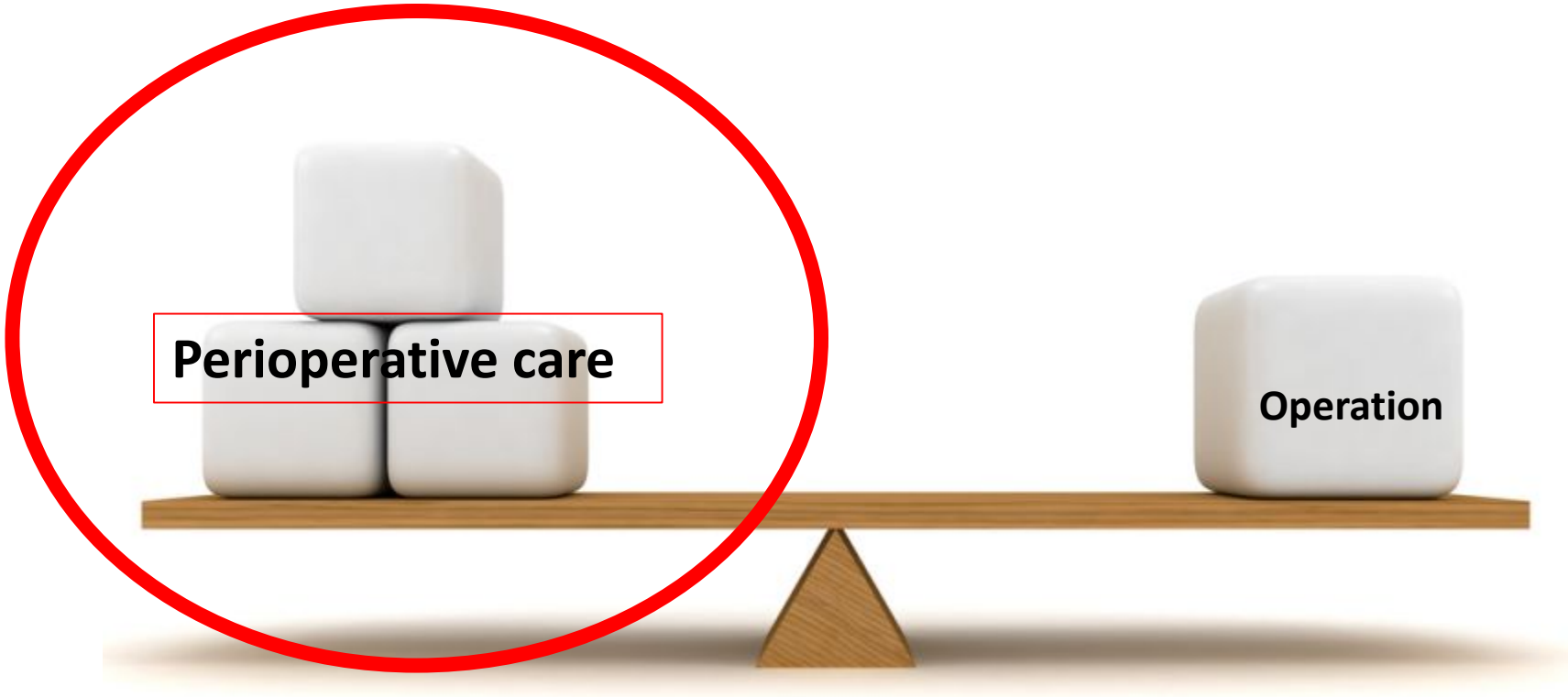
**Fig. 4 Perioperative respiratory support**



Minimizing pt’s stress response to surgery = quicker recovery and shorter LOS

ERAS ≠ FAST TRACK

QUALITY rather than SPEED




outcomes

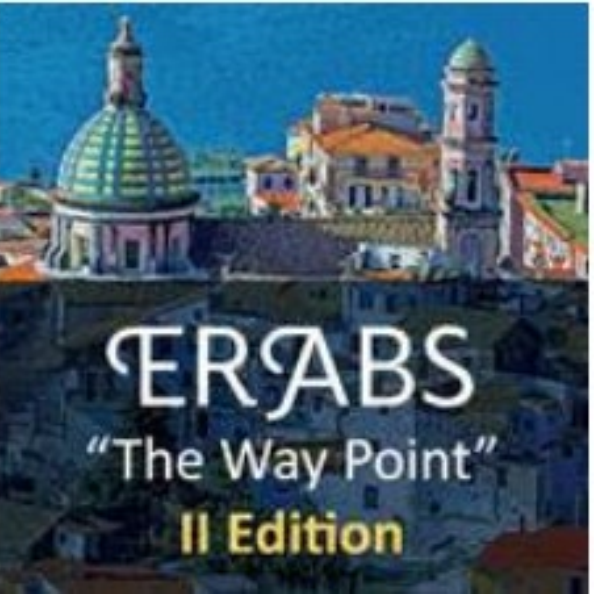
Table 3 Phases with impact on surgical recovery.

| Phase of recovery | Definition | Time frame | Example measures |
|---|---|---|---|
| Pre-admission (proposed) | Preparation for postoperative recovery | Weeks to months | Adequate functional capacity to withstand surgical stress; resolution of malnutrition; sense of control and self-efficacy; prophylactic measures provided such as antibiotics and carbohydrate loading |
| Intraoperative | During the course of the surgical procedure | Hours | Fluid balance, pain and anaesthesia management |
| Postoperative | | | |
| Early | Until discharge from PACU | Hours | Vital signs |
| Intermediate | Until discharge from hospital | Days | Bowel recovery; length of hospital stay |
| Late | Until illness no longer disrupts everyday life | Weeks to months | Patient-reported resolution of symptoms; return to pre-surgery activities and functional capacity |

1. Empowerment
2. Compenso metabolico
3. «Funzionalizzazione»

Interdisciplinarietà + multiprofessionalità

Sostenibilità (!?)




# Domande?

Grazie per l'attenzione!