How to Manage the (Super) Obese in TKR

David A Parker FRACS

Advanced Course on Knee Surgery

Val D'Isere 2025

Declaration of Interest

The author has the following disclosures:

- editorial board of: *AJSM, JISAKOS, AP-SMART Journal, OJSM*
- hold shares in: *Personalised Surgery*, *Ganymed Robotics*
- received royalties from: *Smith & Nephew*
- done consulting work for: *Smith & Nephew*
- given paid presentations for: *Arthrex, Smith & Nephew*
- received institutional support from: *Smith & Nephew*, *Zimmer*, *Corin*, *Arthrex*

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TKR in the (Super) Obese Patient

- Definitions
- Impact on TKR
  - Complications
  - Outcomes
- Access to Care
- Perioperative Strategies
  - Weight loss / Bariatric Surgery
  - Surgical management

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Definitions

What is “Obesity”

- World Health Organisation:

“ abnormal or excessive fat accumulation that presents a risk to health “

The BMI Scale

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Morbid Obesity / Super Obesity

- World Obesity Federation: Severe Obesity BMI > 40

- Additional Classifications
  - Super Obesity: BMI > 50
  - Super Super Obesity: BMI > 60

Flaws in the BMI Scale

- Simplistic: doesn't take into account:
  - Muscle Mass
  - Bone Density
  - Overall body composition
  - Racial and Gender differences
  - Metabolic Health

BODY MASS INDEX (BMI) IN DIFFERENT BODY TYPES

All 3 women have a BMI over 30, and traditionally are considered "obese" or "severely obese" based on their BMI alone; this highlights the inaccuracy and incomplete diagnosis that occurs when using a patient's BMI as a silver bullet indicator of health.

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Implications for TKR

Registry Data (ANJRR)

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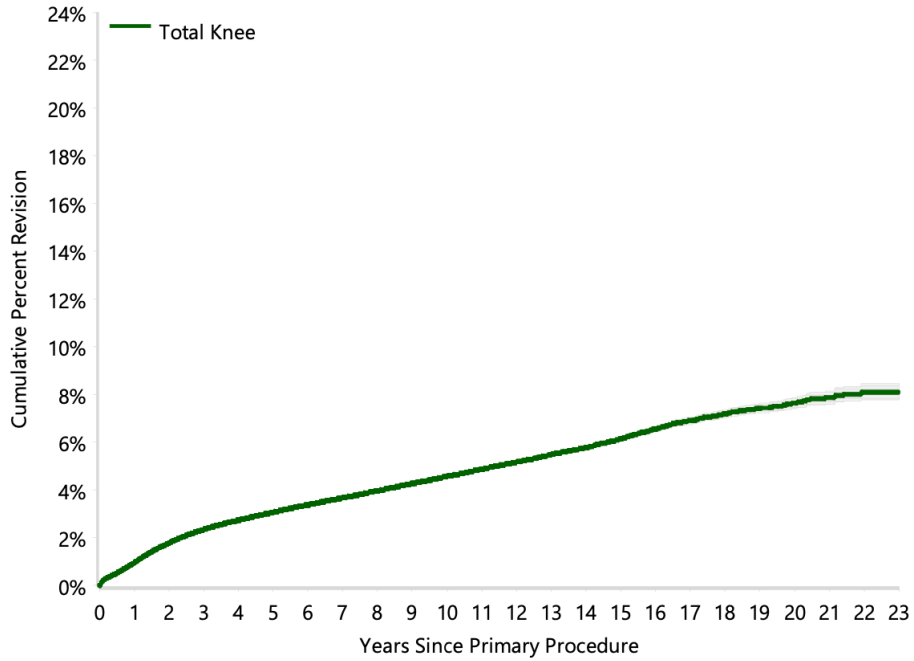
Australian NJRR: 23 years (All-comers)

Figure KT7 Cumulative Percent Revision of Primary Total Knee Replacement (Primary Diagnosis OA)



Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Total Knee	721122	643170	512017	394022	154875	37564	4284

Note: Restricted to modern prostheses

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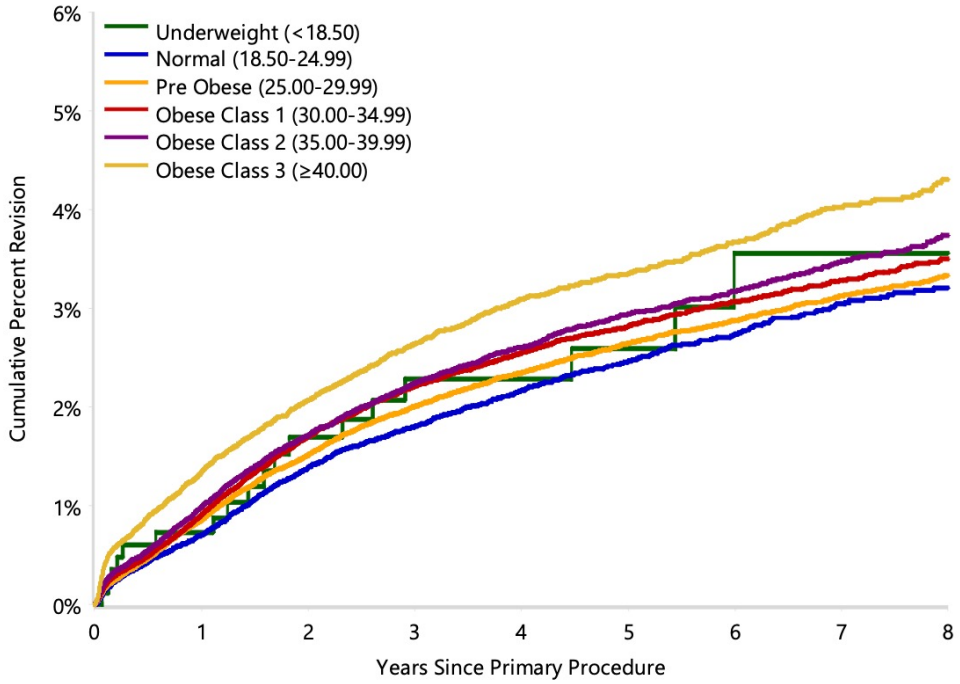
Australian NJRR: Impact of BMI on Revision

Figure KT18 Cumulative Percent Revision of Primary Total Knee Replacement by BMI Category (Primary Diagnosis OA)



HR - adjusted for age and gender

Underweight (<18.50) vs Normal (18.50-24.99)
Entire Period: HR=1.22 (0.76, 1.94), p=0.406

Pre Obese (25.00-29.99) vs Normal (18.50-24.99)
Entire Period: HR=0.99 (0.92, 1.07), p=0.870

Obese Class 1 (30.00-34.99) vs Normal (18.50-24.99)
0 - 1Yr: HR=1.04 (0.95, 1.15), p=0.399
1Yr - 1.5Yr: HR=1.13 (0.99, 1.28), p=0.070
1.5Yr - 3Yr: HR=1.06 (0.96, 1.17), p=0.269
3Yr+: HR=0.90 (0.81, 1.01), p=0.075

Obese Class 2 (35.00-39.99) vs Normal (18.50-24.99)
0 - 1Mth: HR=1.30 (1.07, 1.58), p=0.007
1Mth - 6Mth: HR=1.04 (0.89, 1.21), p=0.615
6Mth - 1Yr: HR=1.09 (0.94, 1.26), p=0.235
1Yr - 1.5Yr: HR=1.06 (0.91, 1.23), p=0.475
1.5Yr+: HR=0.99 (0.90, 1.09), p=0.851

Obese Class 3 (≥40.00) vs Normal (18.50-24.99)
0 - 1Mth: HR=2.34 (1.94, 2.82), p<0.001
1Mth - 6Mth: HR=1.50 (1.28, 1.75), p<0.001
6Mth - 9Mth: HR=1.04 (0.83, 1.31), p=0.714
9Mth - 1Yr: HR=1.17 (0.94, 1.47), p=0.161
1Yr+: HR=1.03 (0.93, 1.14), p=0.518

Number at Risk	0 Yr
Underweight (<18.50)	852
Normal (18.50-24.99)	48439
Pre Obese (25.00-29.99)	143942
Obese Class 1 (30.00-34.99)	142280
Obese Class 2 (35.00-39.99)	77742
Obese Class 3 (≥40.00)	47043

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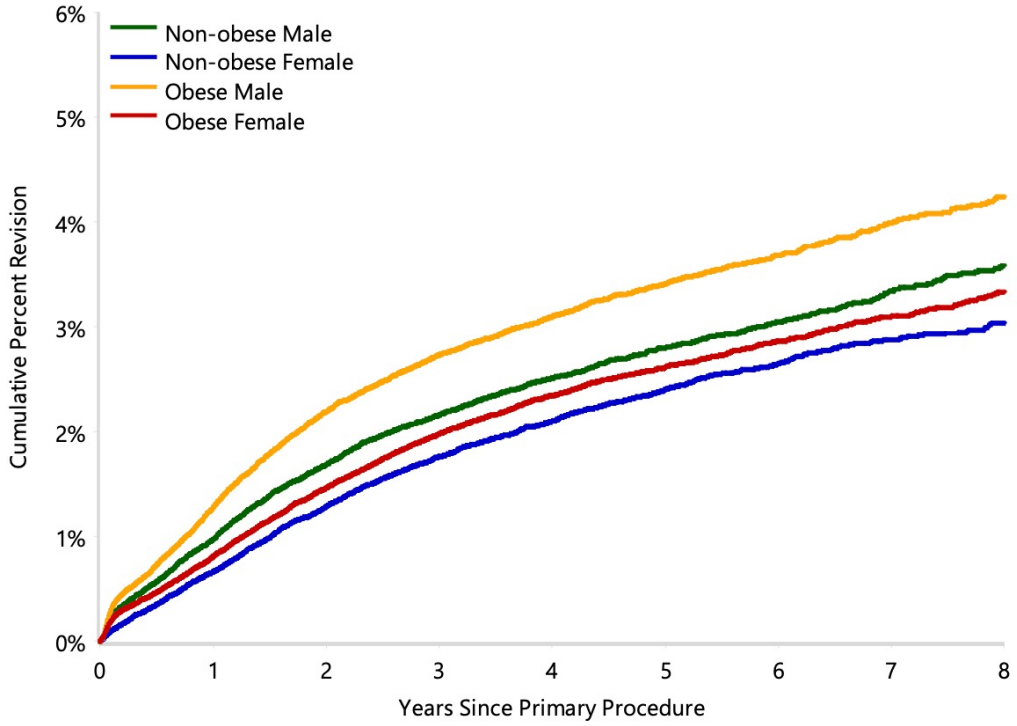
Australian NJRR: Male vs Female

Figure KT20 Cumulative Percent Revision of Primary Total Knee Replacement by Gender and BMI Category (Primary Diagnosis OA)



HR - adjusted for age

Non-obese Male vs Non-obese Female

- 0 - 3Mth: HR=1.89 (1.58, 2.25), p<0.001
- 3Mth - 1.5Yr: HR=1.23 (1.12, 1.35), p<0.001
- 1.5Yr+: HR=0.99 (0.91, 1.08), p=0.891

Non-obese Male vs Obese Male

- 0 - 2Yr: HR=0.85 (0.79, 0.91), p<0.001
- 2Yr+: HR=0.97 (0.89, 1.07), p=0.542

Non-obese Female vs Obese Female

- 0 - 2Wk: HR=0.54 (0.41, 0.72), p<0.001
- 2Wk - 1Mth: HR=0.68 (0.54, 0.85), p<0.001
- 1Mth - 3Mth: HR=0.71 (0.58, 0.87), p<0.001
- 3Mth+: HR=1.06 (1.00, 1.13), p=0.059

Obese Male vs Obese Female

- 0 - 2Yr: HR=1.47 (1.38, 1.56), p<0.001
- 2Yr+: HR=1.09 (1.00, 1.18), p=0.042

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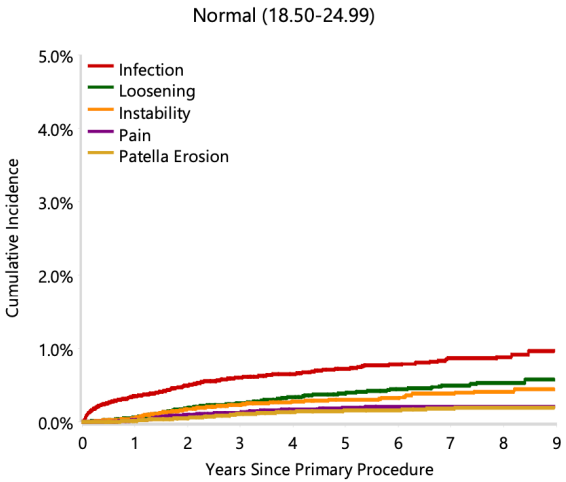
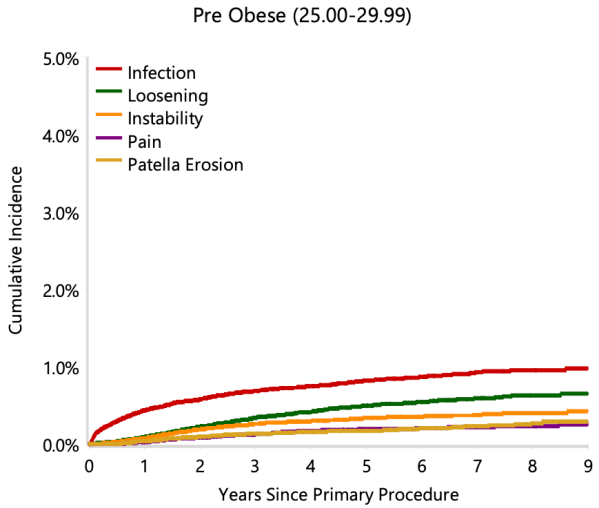
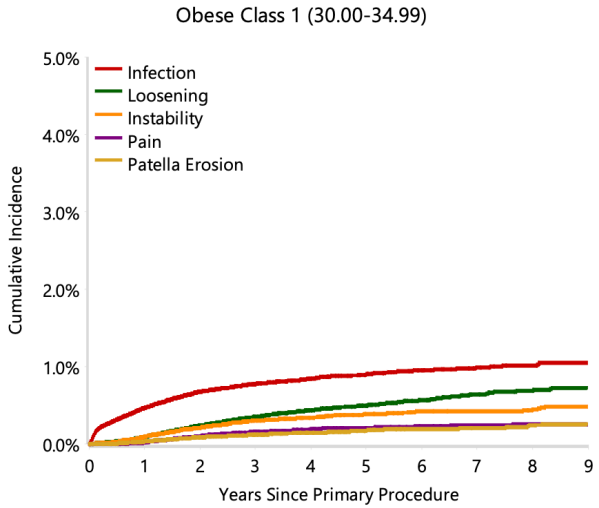
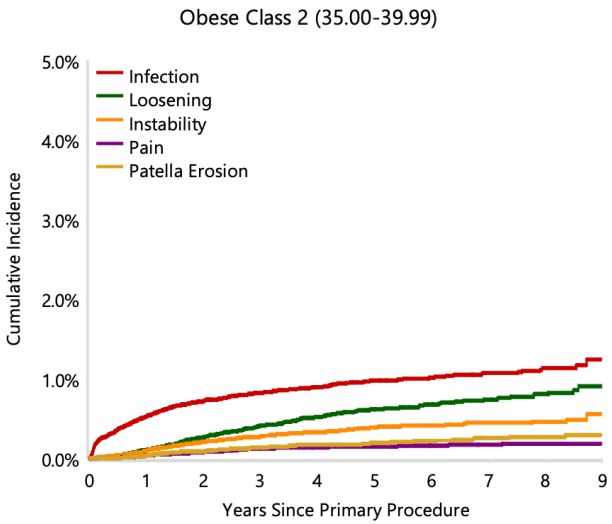
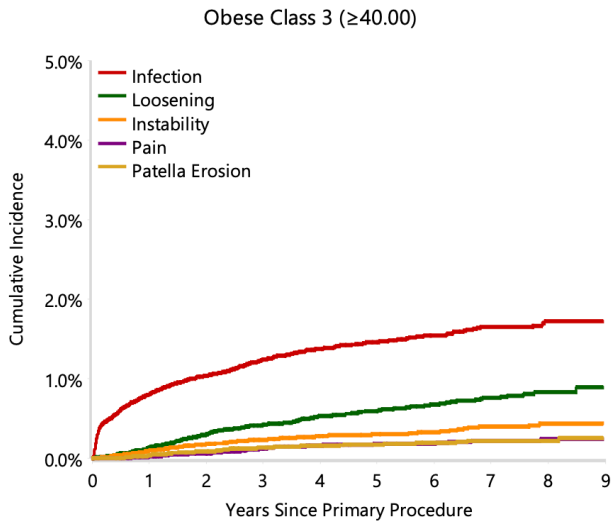
Australian NJRR: Reasons for revision vs Obesity level











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Literature: Complications in Obese

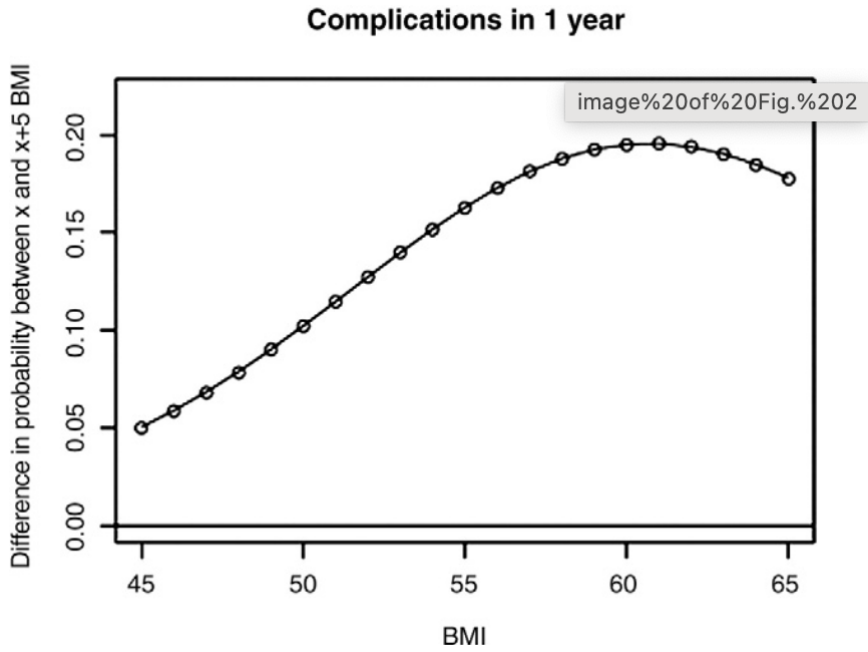
The Journal of Arthroplasty Vol. 27 No. 3 2012

Postoperative Complication Rates in the "Super-Obese" Hip and Knee Arthroplasty Population

2012

Ran Schwarzkopf, MD, MSc,* Sean L. Thompson, MD,* Sean J. Adwar, BSc,*
Victoria Liublinska, PhD,† and James D. Slover, MD, MSc†

- BMI > 45 vs normal BMI
- 8.4x risk of in-hospital complications
- Increased length of stay



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Characteristics and Complications of Super-Obese Patients Who Underwent Total Knee Arthroplasty

2015

Julio J. Jauregui, MD; Randa K. Elmallah, MD; Steven F. Harwin, MD; Todd P. Pierce, MD; Jeffrey J. Cherian, DO; Qais Naziri, MD; Michael A. Mont, MD

- Super obese vs Non-obese / Large National Database
- Super obese patients:
  - Younger
  - Majority women
  - Increased incidence of comorbid conditions eg DM, HT
  - Higher rate of superficial and deep infections
  - Longer operative time and length of stay

  - Can still benefit from TKA surgery

Clin Orthop Relat Res (2013) 471:3523–3530
DOI 10.1007/s11999-013-3154-9

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CLINICAL RESEARCH

Bariatric Orthopaedics: Total Knee Arthroplasty in Super-obese Patients (BMI > 50 kg/m^2). Survivorship and Complications

Qais Naziri MD, Kimona Issa MD, Arthur L. Malkani MD, Peter M. Bonutti MD, Steven F. Harwin MD, Michael A. Mont MD

2013

- 100 TKR in Super Obese vs Matched group with BMI <30
- Mean follow up 5 years
- Super obese group:
  - Significantly higher medical and surgical complication rate
  - Lower mean KSS functional scores
  - Smaller gains in flexion arc
  - Longer surgical times and more blood loss
- No difference in aseptic implant survivorship

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

2015

Primary Total Knee Arthroplasty in Super-obese Patients: Dramatically Higher Postoperative Complication Rates Even Compared to Revision Surgery

Brian C. Werner, MD [a], Cody L. Evans, MD [a], Joshua T. Carothers, MD [b], James A. Browne, MD [a]

- Super obese (BMI>50) versus non-obese
- Large National Database
- 90 day complication rate
- Significantly higher rates of local and systemic complications
  - VTE, Infection, Medical complications
  - Compared to normal and other categories of obesity
  - Higher than revision TKA

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

2016

Health Policy and Economics

Risk and Cost of 90-Day Complications in Morbidly and Superobese Patients After Total Knee Arthroplasty

Menachem M. Meller, MD, PhD [a,*], Nader Toossi, MD [b], Norman A. Johanson, MD [b], Mark H. Gonzalez, MD, PhD [c], Min-Sun Son, PhD [d], Edmund C. Lau, MS [d]

- Medicare database study (USA)
- Morbidly and Super obese compared to Non-obese
- Morbidly obese:
  - Significantly elevated risk of most complications
    - Wound issues, Infection, Medical complications
    - No higher risk of VTE or AMI
- Super Obese
  - Significant increase all risks compared to morbidly obese
- Dose –response trend between BMI level and complication risk

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The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

2024

Primary Knee

Super-Obesity is Associated With an Increased Risk of Complications Following Primary Total Knee Arthroplasty

Ryan C. Palmer [a], Sagar S. Telang [a], Jacob R. Ball, MD [a], Brian C. Chung, MD [a], Kurt M. Hong, MD, PhD [b], Jay R. Lieberman, MD [a], Nathanael D. Heckmann, MD [a, *]

[a] Department of Orthopaedic Surgery, Keck School of Medicine of the University of Southern California, Los Angeles, California
[b] Center for Clinical Nutrition, Keck School of Medicine of the University of Southern California, Los Angeles, California

- Large national database
- 3,376 super obese vs 17,659 normal BMI
- Super obese, increased risk of:
  - Periprosthetic Joint Infection (3.7)
  - Pulmonary embolism (2.2)
  - Acute respiratory failure (4.1)
  - AMI (2.5)
  - Wound dehiscence (2.3)
  - Acute renal failure (4.2)

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Summary: Impact of Super Obesity on Risks

- Super Obese Patients have a higher risk of:
  - Infection
  - Wound complications
  - Medical complications
  - Revision surgery
  - Lower outcome scores

- But….
  - Can still get significant improvements and benefit from surgery

Strategies for TKR in Super Obese

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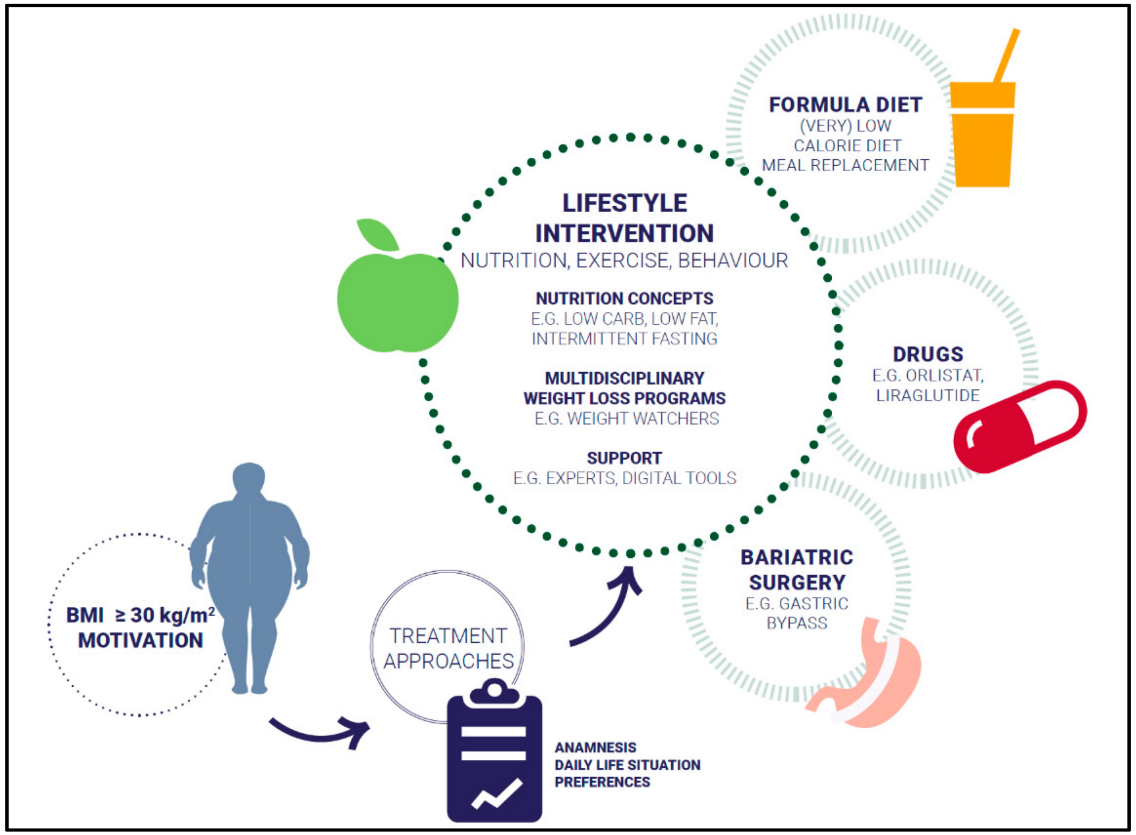
Tell them to lose weight!

- Multidisciplinary approach
- Bariatric Surgery
- Medication



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Does that work?

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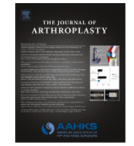
The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org



Primary Hip and Knee Arthroplasty

The Fate of Morbidly Obese Patients With Joint Pain: A Retrospective Study of Patient Outcomes

Russell A. Reeves, MD, MS [a], Glenn D. Hefter, MS [b], Vincent D. Pellegrini Jr., MD [c], Jacob M. Drew, MD [d], William R. Barfield, PhD [e,*], Harry A. Demos, MD [e]

2021

- Aim: determine effectiveness of orthopaedic surgeon's recommendation to lose wgt
- Morbidly obese and super obese patients
- Super obese: more likely to be referred for wgt mgt, less likely to receive TJA
- 23% of nonop treated patients achieved meaningful wgt loss
- 18% of surgical patients lost weight before surgery
- 30% lost weight after surgery

"Weight loss is an inconsistently modifiable risk factor for joint replacement surgery"

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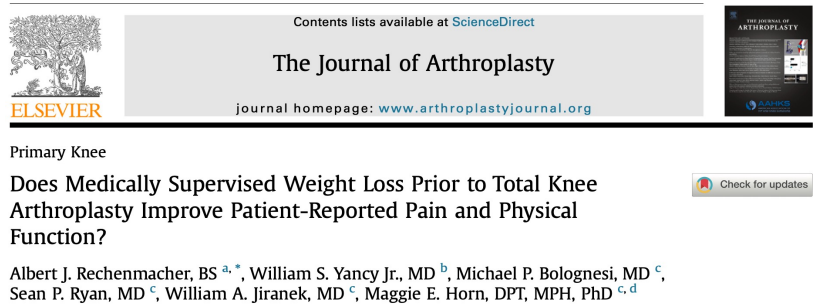
Weight loss preop: does it help?


Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Primary Knee

Does Medically Supervised Weight Loss Prior to Total Knee Arthroplasty Improve Patient-Reported Pain and Physical Function?

Albert J. Rechenmacher, BS [a,*], William S. Yancy Jr., MD [b], Michael P. Bolognesi, MD [c], Sean P. Ryan, MD [c], William A. Jiranek, MD [c], Maggie E. Horn, DPT, MPH, PhD [c,d]

2024

- Medical weight management within 18 months of TKR
- Compared patients with and without clinically significant weight loss
- 57% had clinically significant weight loss
  - Improved physical function at 3 months
  - No difference in adverse events
  - No difference in pain scores

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Preop Weight Loss

REVIEW Open Access

Preoperative weight loss interventions before total hip and knee arthroplasty: a systematic review of randomized controlled trials

Lawrence Chun Man Lau[1*†], Ping Keung Chan[1*†], Tak Wai David Lui[2], Siu Wai Choi[1], Elaine Au[1], Thomas Leung[3], Michelle Hilda Luk[3], Amy Cheung[3], Henry Fu[1], Man Hong Cheung[1] and Kwong Yuen Chiu[1]

2024

- Meta-analysis of 3 RCTs
  - 2 studies diet modification; 1 study bariatric surgery
  - Hip and Knee Arthroplasty
- Significant reductions in BW and BMI
- Less postoperative complications

Weight loss preop: does it help?

Contents lists available at ScienceDirect

Joint Bone Spine

journal homepage: www.elsevier.com

Review

A critical review of weight loss recommendations before total knee arthroplasty

Kristine Godziuk[a,*], Carla M. Prado[b], Lauren Beaupre[c], C. Allyson Jones[c], Jason R. Werle[d], Mary Forhan[a]

suppl. Informations

2021

- Review of literature;
  - No clear relationship between weight loss and reduction in TKA complications
  - No indication that individual risk reduced by lowering BMI from >40 to <40
  - Unclear evidence of benefit of pre-surgical weight loss

" Evidence to support a benefit of weight loss prior to TKA is lacking"

"Consider individual patient needs and risk before recommending weight loss"

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Bariatric Surgery?

JAMA Network Open

Original Investigation | Orthopedics

Effect of Bariatric Surgery on Risk of Complications After Total Knee Arthroplasty
A Randomized Clinical Trial

Michelle M. Dowsey, BHealthSci, MEpi, PhD; Wendy A. Brown, MBBS (Hons), PhD; Angela Cochrane, BHealthSci, MPH; Paul R. Burton, MBBS (Hons), PhD; Danny Liew, MBBS(Hons), BMedSc, (Hons), PhD; Peter F. Choong, MBBS, MD

2022

- RCT: Bariatric surgery vs Usual wgt management advice
- 82 patients with mean BMI 44
- Lap banding
- Reduced complications
- More patients deferred TKA surgery

Bariatric Surgery

Original Article

Can bariatric surgery delay the need for knee replacement in morbidly obese osteoarthritis patients

Lajja Rishi, Mohit Bhandari, Ravindra Kumar[1]

Department of Physiotherapy, Sri Aurobindo Medical College and PG Institute, Mohak Bariatrics and Robitics, [1]Central Research Laboratory, Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India

2017

- 30 patients with BMI > 40
- Met criteria for TKR
- Bariatric surgery + diet and exercise protocol
- Improved knee function and pain
- Deferred surgery in majority
- Only 6 months follow up

Bariatric Surgery

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Impact of Bariatric Surgery on Inpatient Complication, Cost, and Length of Stay Following Total Hip or Knee Arthroplasty

Yicun Wang, PhD [a], Zhantao Deng, PhD [b], Jia Meng, PhD [a], Qiying Dai, MD [c], Tao Chen, PhD [d], Nirong Bao, MD, PhD [a,*]

2019

- Bariatric Surgery:
  - Lower risk of pulmonary embolism, respiratory complications & death
  - Shorter stay
  - Higher risk of blood transfusion & anaemia

Bariatric Surgery

Research Article

Preoperative Bariatric Surgery Utilization Is Associated With Increased 90-day Postoperative Complication Rates After Total Joint Arthroplasty

- Preoperative bariatric surgery didn’t change patient co-morbidities at time of TJA
- Bariatric surgery group
  - More 90 day complications
  - Higher costs

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Impact on Outcomes

The impact of pre-operative obesity on weight change and outcome in total knee replacement

A PROSPECTIVE STUDY OF 529 CONSECUTIVE PATIENTS

M. M. Dowsey,
D. Liew,
J. D. Stoney,
P. F. Choong

We carried out a prospective, continuous study on 529 patients who underwent primary t
knee replacement between January 2006 and December 2007 at a major teaching hospit
The aim was to investigate weight change and the functional and clinical outcome in nor
obese and obese groups at 12 months post-operatively. The patients were grouped accor

2010

- 529 TKA patients
- Weight change and outcomes at 12 months: obese vs non-obese

- Obese patients
  - 12.6% had clinically significant weight loss
  - 21% gained weight
  - Less improvement of PROMs
  - Adverse events more common

Is TKR in the Super-Obese Justified?

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Access to TKR?

Revision Rates and Functional Outcomes Among Severely, Morbidly, and Super-Obese Patients Following Primary Total Knee Arthroplasty

A Systematic Review and Meta-Analysis

2019

- 37 studies included
- Risk ratios for super obese patients
  - All-cause revision 4.75
  - Septic revision 4.58
- No significant difference in aseptic revision
- Functional outcome improvements similar (slightly lower in super obese)

"these findings demand that current policies aimed at reducing access to TKR for patients with high BMI obesity be critically reevaluated"

Is it Cost-Effective?

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The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Health Policy & Economics

Cost-Effectiveness of Total Knee Arthroplasty vs Nonoperative Management in Normal, Overweight, Obese, Severely Obese, Morbidly Obese, and Super-Obese Patients: A Markov Model

Karthikeyan E. Ponnusamy, MD, Edward M. Vasarhelyi, MD, MSc, FRCSC, Lyndsay Somerville, PhD, Richard W. McCalden, MD, MSc, FRCSC, Jacquelyn D. Marsh, PhD *

Division of Orthopaedic Surgery, University of Western Ontario, London, Ontario, Canada

2018

- TKR vs Nonoperative Mx in 6 BMI categories
- Higher costs in morbidly obese and super obese
- But..
  - Substantial improvements in outcomes makes it cost effective

" Withholding TKA care based on a BMI would lead to an unjustified loss of health care access "

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Perioperative Strategies

Perioperative Strategies

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[a] Department of Orthopaedic Surgery, Keck School of Medicine of the University of Southern California, Los Angeles, California
[b] Center for Clinical Nutrition, Keck School of Medicine of the University of Southern California, Los Angeles, California

2024

- Multidisciplinary medical optimization
  - eg DM, Sleep Apnea, HT
- Perioperative counselling
- Nutritional optimization
- Weight loss
- Shared decision making

- Preventative strategies
  - Extended oral antibiotics
  - Negative pressure wound therapy
  - VTE prophylaxis

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Surgery: Technical Aspects

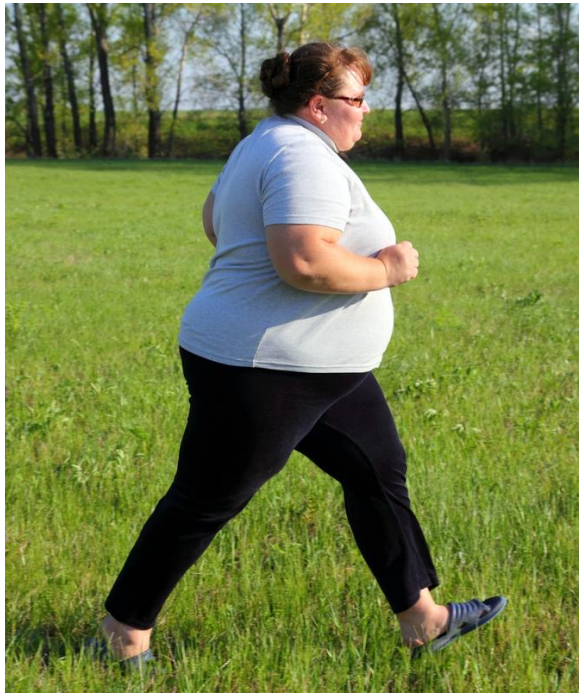
- Anaesthesia: Spinal / Sedation
- No tourniquet
- Longer incision
- Larger retractors
- Second assistant if possible
- Navigation / Robotics – accuracy & safety
- Tibial stem extension
- Negative pressure dressings
- Extended oral antibiotics
- Early mobilisation

Personal Approach

- Criteria / Indications for surgery same
- Optimise non-surgical treatment
- Discussions around weight loss
  - Potential benefits
  - Previous attempts
  - Likelihood of realistic weight loss
- No specific BMI cut-off
- Careful surgical technique and perioperative management

→ These are usually very happy patients

Conclusions



- Obesity
  - Risk factor for OA
  - Increasingly common
  - Higher risk of complications in TKR

- TKR in super obese patients
  - Technically challenging
  - Careful decision making process / counselling
    - Not a reason to deny surgery
    - Specialist centres
  - Risks can be mitigated
  - Majority should have successful outcomes
  - Improving mobility is part of the management

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Thank You

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MUNICH GERMANY

June 8–11

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2025

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