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Orthopedics and Obesity: Finding a Joint Solution

Preoperative Weight Management

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Name: Najwan Alsulaimi - “Canadian Obesity Weekend – May 2022”

Financial Disclosures

(over past 24 months)

	Speaker	Advisory	Research	Consultant
AbbVie				
Allergan				
Janssen				
Lupin Pharma				
Mylan				
Olympus				
Pendopharm				
Pentax Medical				
Pfizer				
Shire				
Takeda				

Disclosure

- None

CanMEDS Roles Covered: Alsulaimi - “Canadian Obesity Weekend 2022”

X	**Medical Expert** (as *Medical Experts*, physicians integrate all of the CanMEDS Roles, applying medical knowledge, clinical skills, and professional values in their provision of high-quality and safe patient-centered care. *Medical Expert* is the central physician Role in the CanMEDS Framework and defines the physician’s clinical scope of practice.)
X	**Communicator** (as Communicators, physicians form relationships with patients and their families that facilitate the gathering and sharing of essential information for effective health care.)
X	**Collaborator** (as *Collaborators*, physicians work effectively with other health care professionals to provide safe, high-quality, patient-centred care.)
X	**Leader** (as *Leaders*, physicians engage with others to contribute to a vision of a high-quality health care system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers.)
X	**Health Advocate** (as *Health Advocates*, physicians contribute their expertise and influence as they work with communities or patient populations to improve health. They work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilization of resources to effect change.)
X	**Scholar** (as *Scholars*, physicians demonstrate a lifelong commitment to excellence in practice through continuous learning and by teaching others, evaluating evidence, and contributing to scholarship.)
X	**Professional** (as *Professionals,* physicians are committed to the health and well-being of individual patients and society through ethical practice, high personal standards of behaviour, accountability to the profession and society, physician-led regulation, and maintenance of personal health.)

Objectives

At the end of this session, participants should be able to:

- Describe the association between obesity and orthopedic conditions (osteoarthritis)
- Identify the perioperative risks of obesity in patients undergoing orthopedic procedures
- Discuss the current practice of preoperative weight management prior to orthopedic procedures

Case

- Ms. O is a 63 yo F
- PMH: hypertension, diabetes, obstructive sleep apnea, bilateral knee osteoarthritis

  Self-reported Ht 59", wt 205 lbs, calculated BMI 41
- Over the past year, R knee pain is worsening despite PT and intra-articular steroid injections q 3 months with severe difficulty of performing activities of daily living

  She was referred to the Total Joint Assessment Clinic (TJAC) for evaluation for possible R total knee arthroplasty
- Ms. O was giving an appointment to see an orthopedist for first consult in 6 months

To address the weight, what would you do?

A. Give the patient brief counseling on weight loss and surgery risks

B. Refer the patient for a supervised weight program

C. Start AOMs

D. Refer the patient for bariatric surgery

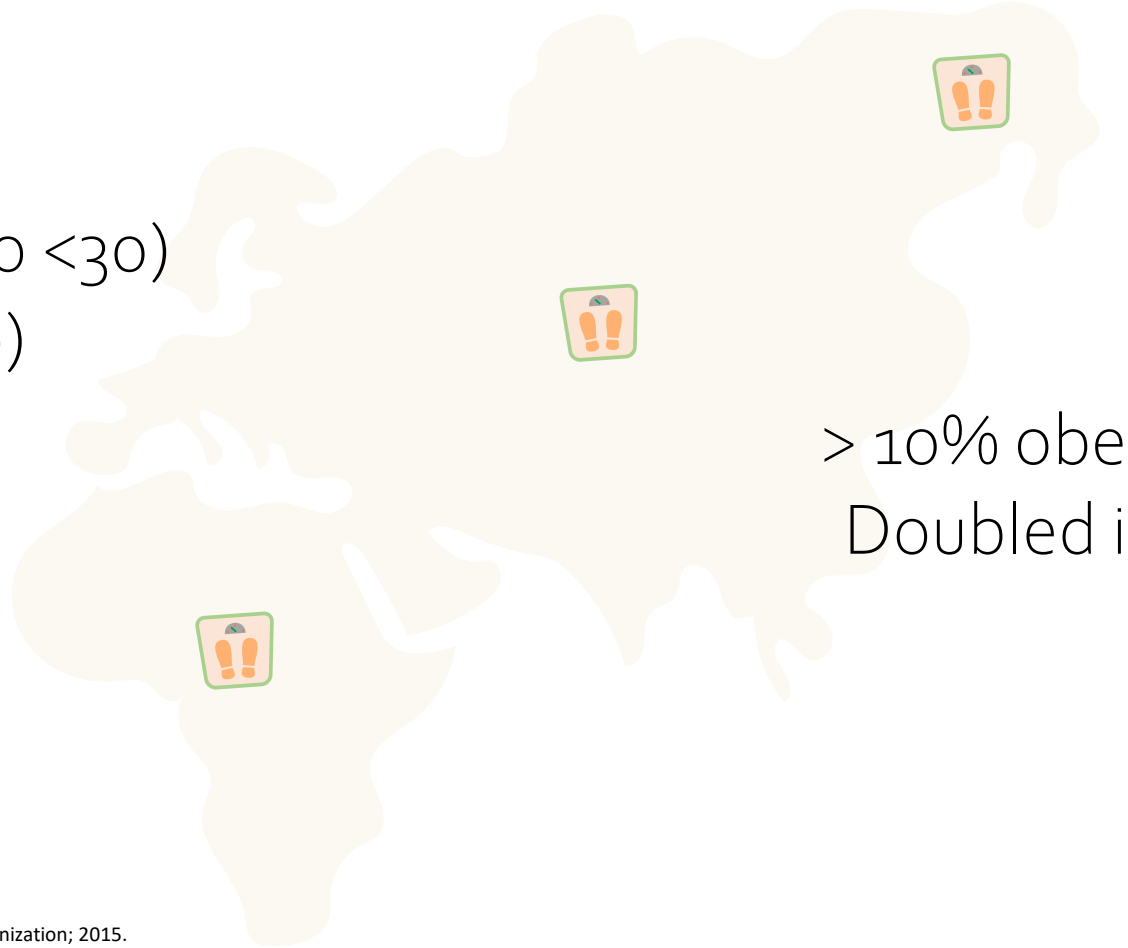
E. None of the above

A global pandemic!

Worldwide:

1.3 billion (BMI >25 to <30)

600 million (BMI ≥30)



> 10% obesity in both genders

Doubled in the past 40 years

WHO. *Obesity and overweight. Fact sheet N°311*. Geneva: World Health Organization; 2015.

Osteoarthritis and Obesity

Worldwide:

~302 million have OA

2010 systemic review; identified obesity as a risk factor for knee OA (pooled OR 2.63, 95% CI 2.28–3.05)

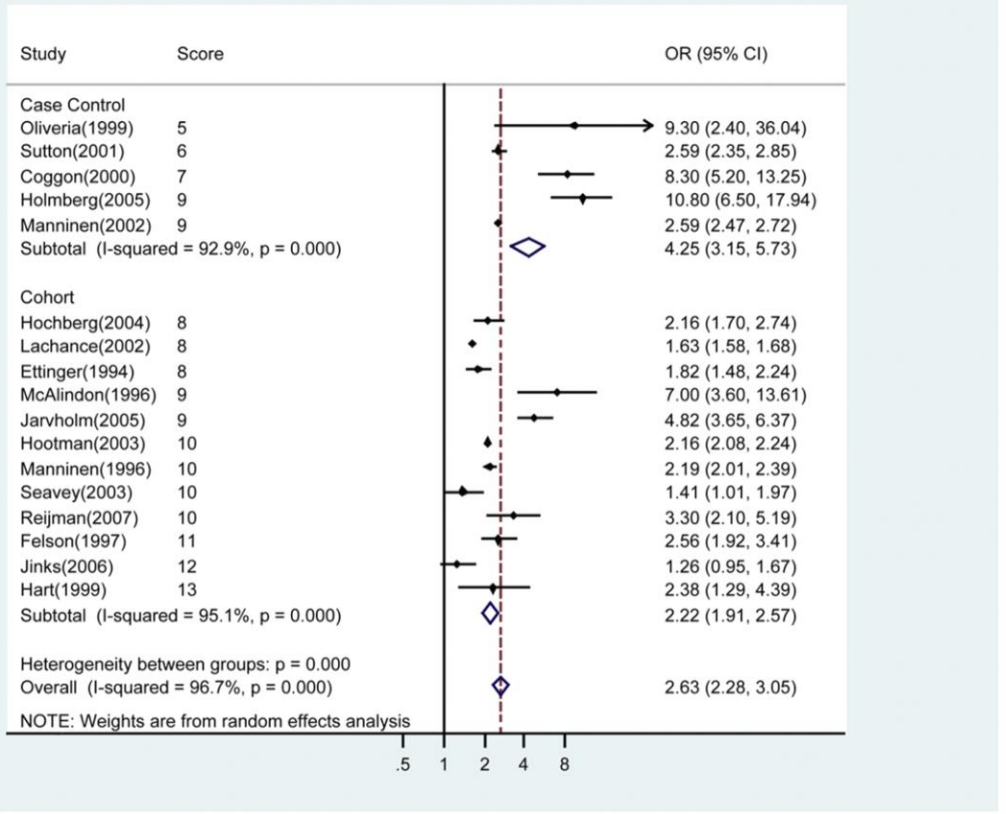


Fig. 1. Forest plot of effect of obesity on onset of knee OA.

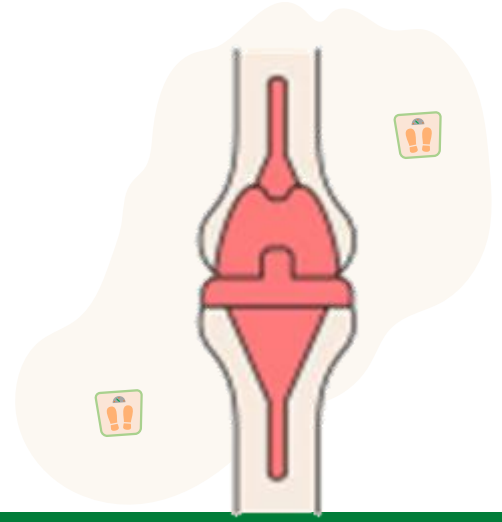
GBD 2015 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016;**388**:P1603–58.

Blagojevic M, Jinks C, Jeffery A, et al. Risk factors for onset of osteoarthritis of the knee in older adults: a systematic review and meta-analysis. *Osteoarthritis Cartilage*. 2010;18(1):24–33. doi:10.1016/j.joca.2009.08.010

Increasing rate of elective procedures

- In one institution in North America; total joint arthroplasty with obesity increased from 30.4% in 1990 to 52.1% in 2005

- Canadian Joint Replacement Registry data; 33 times higher TKA and 9 times higher THA in severe obesity compared to normal weight



Bourne R, Mukhi S, Zhu N, Keresteci M, Marin M. Role of obesity on the risk for total hip or knee arthroplasty. *Clin Orthop Relat Res.* 2007;465:185–188.

T.K. Fehring, S.M. Odum, W.L. Griffin, *et al.***The obesity epidemic: its effect on total joint arthroplasty**
J Arthroplasty, 22 (6 suppl 2) (2007), p. 71

Perioperative risks of obesity in TJA

Intraoperative	Postoperative
Difficult intubation	Increased revision and component malpositioning
Increase risk of blood transfusion	Increase risk of VTE
Prolong OR time	Increase risk of infections
Challenges with ventilatory support	Increase length of stay

Objectives

At the end of this session, participants should be able to:

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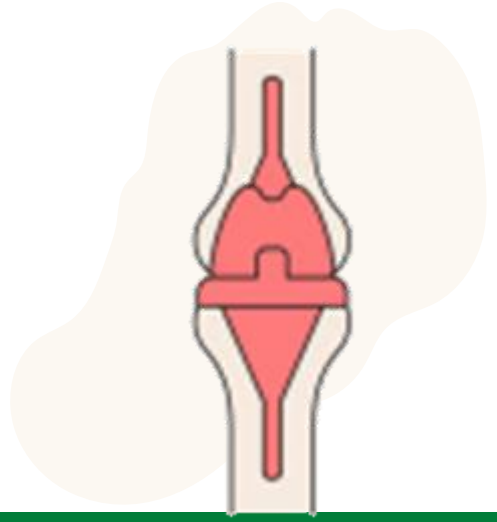
- Discuss the current practice of preoperative weight management prior to orthopedic procedures

Preoperative medical weight management
Practice guidelines

American Association of Hip and Knee Surgeons- Evidence Based Committee position statement (2013):

"Patients who are morbidly obese with (BMI > 40) have complication profiles that may outweigh the functional benefits of total joint arthroplasty."



Workgroup of the American Association of Hip and Knee Surgeons Evidence Based Committee Obesity and total joint arthroplasty: A literature based review. *J Arthroplasty*. 2013;28:714-721.

Preoperative medical weight management
Practice guidelines

AAOS
American Academy of Orthopaedic Surgeons

Surgical Management of Osteoarthritis of the Knee

Evidence-Based Clinical Practice Guideline

BMI AS A RISK FACTOR

Strong evidence supports that obese patients have less improvement in outcomes with total knee arthroplasty (TKA).

Strength of Recommendation: Strong Evidence ★★★★

AAOS
American Academy of Orthopaedic Surgeons

Management of Osteoarthritis of the Hip

Evidence-Based Clinical Practice Guideline

OBESITY AS A RISK FACTOR

a) **Moderate strength evidence supports that obese patients with symptomatic osteoarthritis of the hip, when compared to non-obese patients, may achieve lower absolute outcome scores but a similar level of patient satisfaction and relative improvement in pain and function after total hip arthroplasty.**

Strength of Recommendation: Moderate Evidence ★★★☆

b) **Limited strength evidence supports that obese patients with symptomatic osteoarthritis of the hip, when compared to non-obese patients, have increased incidence of postoperative dislocation, superficial wound infection, and blood loss after total hip arthroplasty.**

Strength of Recommendation: Limited Evidence ★★☆☆

Preoperative weight management

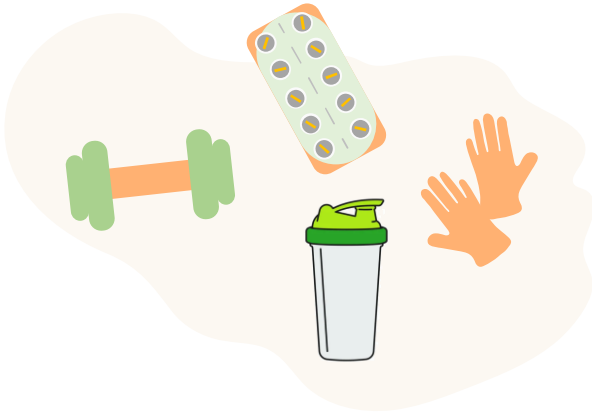
Surgical

Bariatric surgery

Non-surgical

Behavioral, dietary (including meal replacement), exercise programs or pharmacological

Self-directed or supervised



Preoperative medical weight management
Non- surgical interventions

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journal homepage: www.arthroplastyjournal.org

Systematic Review and Meta-Analysis

Preoperative Nonsurgical Weight Loss Interventions Before Total Hip and Knee Arthroplasty: A Systematic Review

Check for updates

Michael W. Seward, MD [a, b, *], Logan G. Briggs [c], Paul A. Bain, PhD, MLIS [d], Antonia F. Chen, MD, MBA [a]

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[b] *Department of Orthopedic Surgery, Mayo Clinic, Rochester, MN*
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Preoperative medical weight management
Non- surgical interventions

Table 3
Characteristics of Studies Included in the Review.

Study, Design	Total	THA	TKA	Gender: Female, % (n)	Age (y), Mean ± SD	Baseline BMI, Mean ± SD	Domains	Interventions	Duration, Mean ± SD/Range	Control
Liljensoe et al 2019 [40], Denmark, RCT[a]	38	0	38	71% (27)	65 (range 46-81)	31.6 (95% CI 30.6-32.6)	D, MR	Low-calorie liquid diet (810 kcal/d) using commercial formula foods and group nutritional education sessions	Eight weeks	None, no preoperative control group[a]
de Luis et al 2012 [41], Spain, RCT	40	4	36	82.5% (33)	65.0 ± 8.5	38.6 ± 4.7	D, MR	Low calorie diet (goal: 1109 kcal/d) with commercial hypocaloric meal replacement shakes for lunch and dinner	Three months	Dietary advice to reduce daily caloric intake by 500 calories
Chaplin et al 2020 [42], USA, case series	16	3	13	87.50% (14)	66.06 ± 9.67	40.25 (10.50), median (IQR)	D, E, P	Pharmacists offered evaluations of medications, education on weight loss management techniques (eg, carbohydrate and calorie counting, water aerobic exercise), and recommendations to primary care providers for weight loss medications	20-262 d	None
Lingamfelter et al 2020 [43], USA, case series	133 ITT, 111 PP[b]	39[b]	94[b]	60.2% (80)[b]	62.6 ± 8.50 (range 25-82)[b]	44.6 ± 4.0, (range 40.1-61.9)	D	Counseling with a registered dietitian and a follow-up with the orthopedic surgeon	154 ± 141 d (range 8-601)	None
Coriolano et al 2013 [44], Canada, case series	34 ITT (25 at 3 mo, 17 at 6 mo [PP])	0	34	100% (34)	58.2 ± 5.8	47.1 ± 4.9	D	Medically monitored low-fat, low-calorie (<900 calories/d), and low-carbohydrate diet with weekly vitamin B injections. Patients ate only certain food and tracked everything	Six months	None
Larsen and Sorensen 1980 [45], Denmark, case series	130	130	0	NR	NR	NR	NR	One-time counseling on weight reduction. Patients were asked to record weights at home q1-2 wk	One consultation	None
Lopez-Gomez et al 2018 [46], Spain, case series	81	0	81	100% (81)	62.23 ± 8.50	40.80 ± 4.40	D, MR	Low-fat, high-protein, low-calorie (1035 calories/d) diet structured in 6 meals. Lunch and dinner were replaced by an oral nutritional supplement. Dietitians also called subjects to provide nutrition education	Three months	None

Preoperative medical weight management
Non- surgical interventions

Table 4
Weight Outcomes From Studies Included in the Systematic Review.

Study, Design	Weight Loss (kg), Mean ± SD (Range)	Percent Weight Change, Mean ± SD	BMI Change (kg/m^2), Mean ± SD	Body Fat Mass Change (kg), Mean ± SD	Percent Body Fat Change, Mean ± SD	Lean Mass Change (kg), Mean ± SD	Percent Lean Mass Change, Mean ± SD	Percent Achieving at Least 5% Weight Loss	Percent Achieving at Least 20 lbs of Weight Loss
Liljensoe et al 2019 [40], Denmark, RCT[a]	10.7	−10%	−3.2	−6.7	−2.6%	−3	2.3%	NR	NR
de Luis et al. 2012 [41], Spain, RCT	I: 7.56 ± 5.2 C: 5.18 ± 5.1 ($P < .05$) Diff: −2.37 (95% CI −5.89, −1.14) ($P = .045$)	NR	I: −3.15 ± 2.2 C: −2.1 ± 1.9 ($P < .05$) Diff: −1.04 (95% CI −2.44, −0.35) ($P = .040$)	I: −5.5 ± 5.9 C: −3.0 ± 2.6 ($P < .05$) Diff: −2.5 (95% CI −5.65, −0.63) ($P = .028$)	NR	Diff: −3.27 (95% CI −3.99, 0.63) ($P = .121$)	NR	NR	NR
Chaplin et al 2020 [42], USA, case series	4.99 (median)	−4.56% (median)	−1.05 (median)	NR	NR	NR	NR	NR	NR
Lingamfelter et al 2020 [43], USA, case series	7.8 ± 6.4 (range −13.6, 37.6)	NR	−2.70 ± 2.6 (range −6.3, 17.7)	NR	NR	NR	NR	NR	NR
Coriolano et al 2013 [44], Canada, case series	11.5 ± 17.1 at 6 wk 19.9 ± 16.3 at 3 mo 32.5 ± 17.9 at 6 mo 32.5 (95% CI 24.5-40.4) at 6 mo	−9.5% at 6 wk ($P = .000$) −16.5% at 3 mo ($P = .000$) −27% at 6 mo ($P = .000$)	−12.7 (95% CI −9.72, −14.47) at 6 mo	NR	NR	NR	NR	NR	NR
Larsen and Sorensen 1980 [45], Denmark, case series	8.6 (range 1-25)	NR	NR	NR	NR	NR	NR	NR	35%-69%
Lopez-Gomez et al 2018 [46], Spain, case series	8.31 ± 19.56	−8.23% ± 4.04	−3.78 ± 6.66	−6.41 ± 14.04	−2.66% (95% CI 0.53-3.92)	−2.62 ± 16.15	2.30% ± 3.72	NR	NR

I, intervention; C, control; Diff, difference between intervention and control; NR, not reported; CI, confidence interval; SD, standard deviation; BMI, body mass index; RCT, randomized controlled trial.
[a] The RCT by Liljensoe et al did not measure preoperative weight loss in the control group, so while it was an RCT overall, it was unable to compare preoperative weight loss between the intervention and control groups.

Preoperative medical weight management

Non- surgical interventions - dose response relationship

Preoperative Weight Loss for Morbidly Obese Patients Undergoing Total Knee Arthroplasty

Determining the Necessary Amount

Benjamin J. Keeney, PhD, Daniel C. Austin, MD, MS, and David S. Jevsevar, MD, MBA

Investigation performed at Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire

Preoperative medical weight management
Safety concerns

	Unadjusted			Adjusted		
	OR	95% CI	p-value	OR	95% CI	p-value
THR						
Surgical site infection deep*	3.10	1.33 to 7.20	0.009	3.77	1.59 to 8.95	0.003
Surgical site infection superficial†	0.95	0.27 to 3.30	0.936	0.95	0.27 to 3.30	0.936
Re-admission within 90 days‡	1.26	0.77 to 2.04	0.360	1.18	0.72 to 1.93	0.502
TKR						
Surgical site infection deep§	1.43	0.66 to 3.08	0.360	1.67	0.77 to 3.61	0.195
Surgical site infection superficial*	1.24	0.36 to 4.26	0.734	1.41	0.41 to 4.85	0.589
Re-admission within 90 days**	1.60	1.14 to 2.24	0.006	1.63	1.16 to 2.28	0.005

- Retrospective cohort
- 444 patients underwent THR
- 937 patients underwent TKA
- BMI 30 and above
- Exposure: weight loss and maintenance at 1 y of 5% and more
- Outcomes: SSI and 90-day readmission

Inacio MC, Kritz-Silverstein D, Raman R, Macera CA, Nichols JF, Shaffer RA, et al. The risk of surgical site infection and re-admission in obese patients undergoing total joint replacement who lose weight before surgery and keep it off post-operatively. Bone Joint J 2014;96-B:629e35.

Preoperative medical weight management
Safety concerns

A retrospective review of 3058 primary TKAs

Follow up for 3.2 years

Change in BMI by 5% predicted:

- Longer mean hospital LOS
- More 90-day ED visits (post op loss and gain)
- More 90-day readmissions (post op gain)
- Higher risk of revisions (pre op loss)
- Higher risk of PJIs (post op gain)

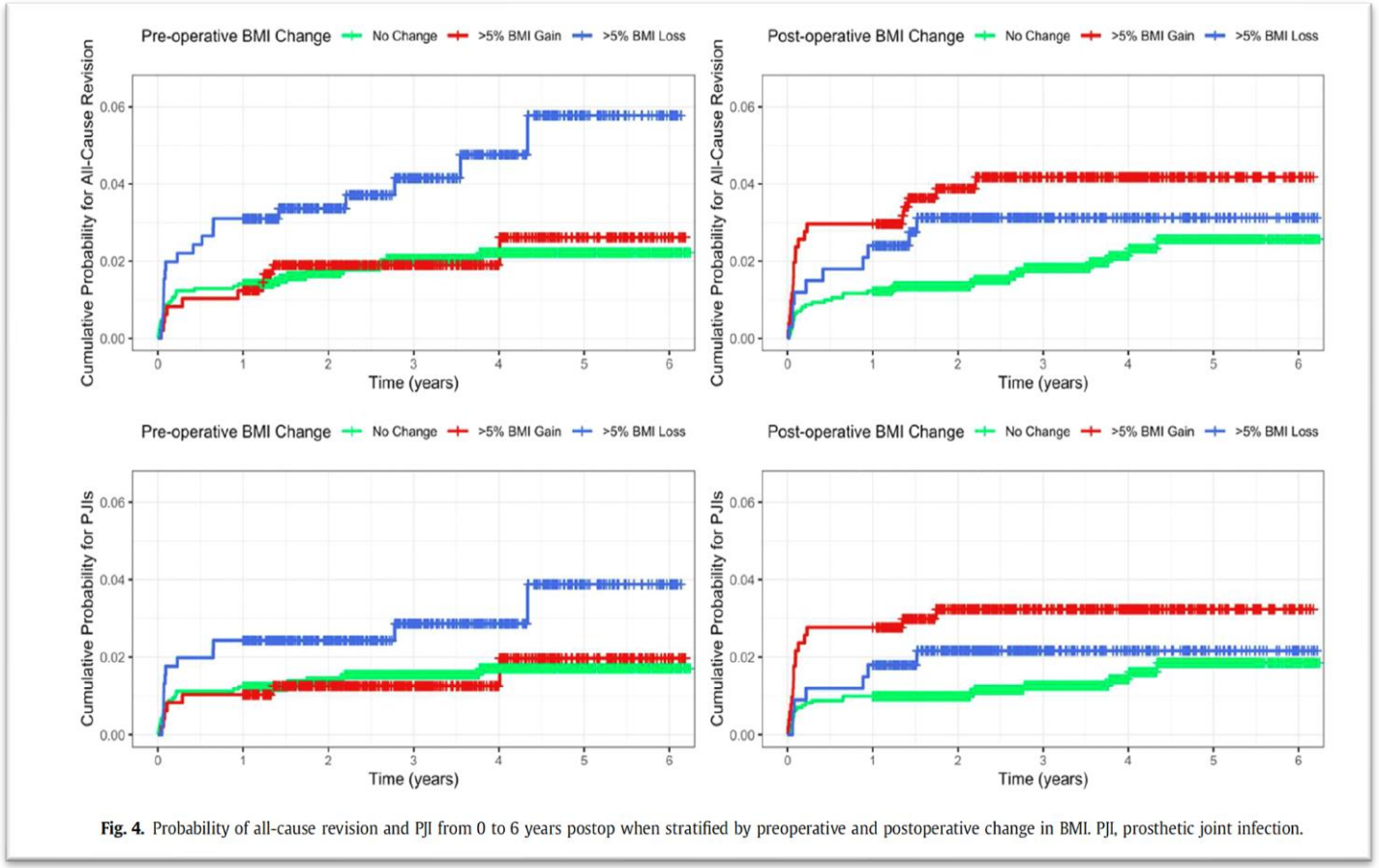
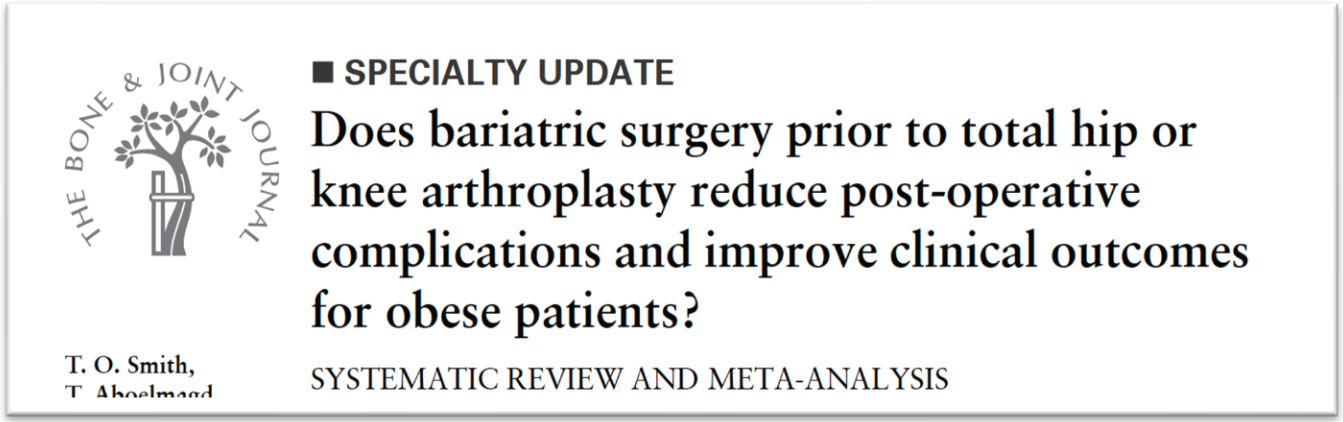


Fig. 4. Probability of all-cause revision and PJI from 0 to 6 years postop when stratified by preoperative and postoperative change in BMI. PJI, prosthetic joint infection.

Billy I. Kim, Niall H. Cochrane, Jeffrey A. O'Donnell, Mark Wu, Samuel S. Wellman, Sean Ryan, Thorsten M. Seyler, Preoperative Weight Loss and Postoperative Weight Gain Independently Increase Risk for Revision After Primary Total Knee Arthroplasty, The Journal of Arthroplasty, Volume 37, Issue 4, 2022

What comes first



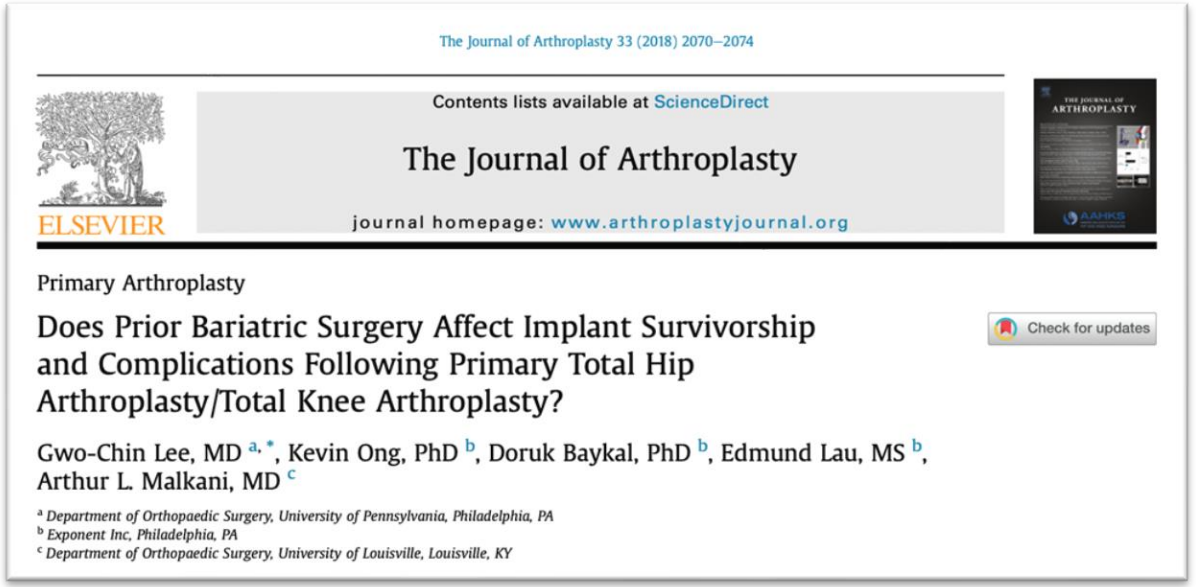
THE BONE & JOINT JOURNAL

■ SPECIALTY UPDATE

Does bariatric surgery prior to total hip or knee arthroplasty reduce post-operative complications and improve clinical outcomes for obese patients?

SYSTEMATIC REVIEW AND META-ANALYSIS

T. O. Smith,
T. Aboelmagd



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ELSEVIER

Primary Arthroplasty

Does Prior Bariatric Surgery Affect Implant Survivorship and Complications Following Primary Total Hip Arthroplasty/Total Knee Arthroplasty?

Check for updates

Gwo-Chin Lee, MD [a,*], Kevin Ong, PhD [b], Doruk Baykal, PhD [b], Edmund Lau, MS [b], Arthur L. Malkani, MD [c]

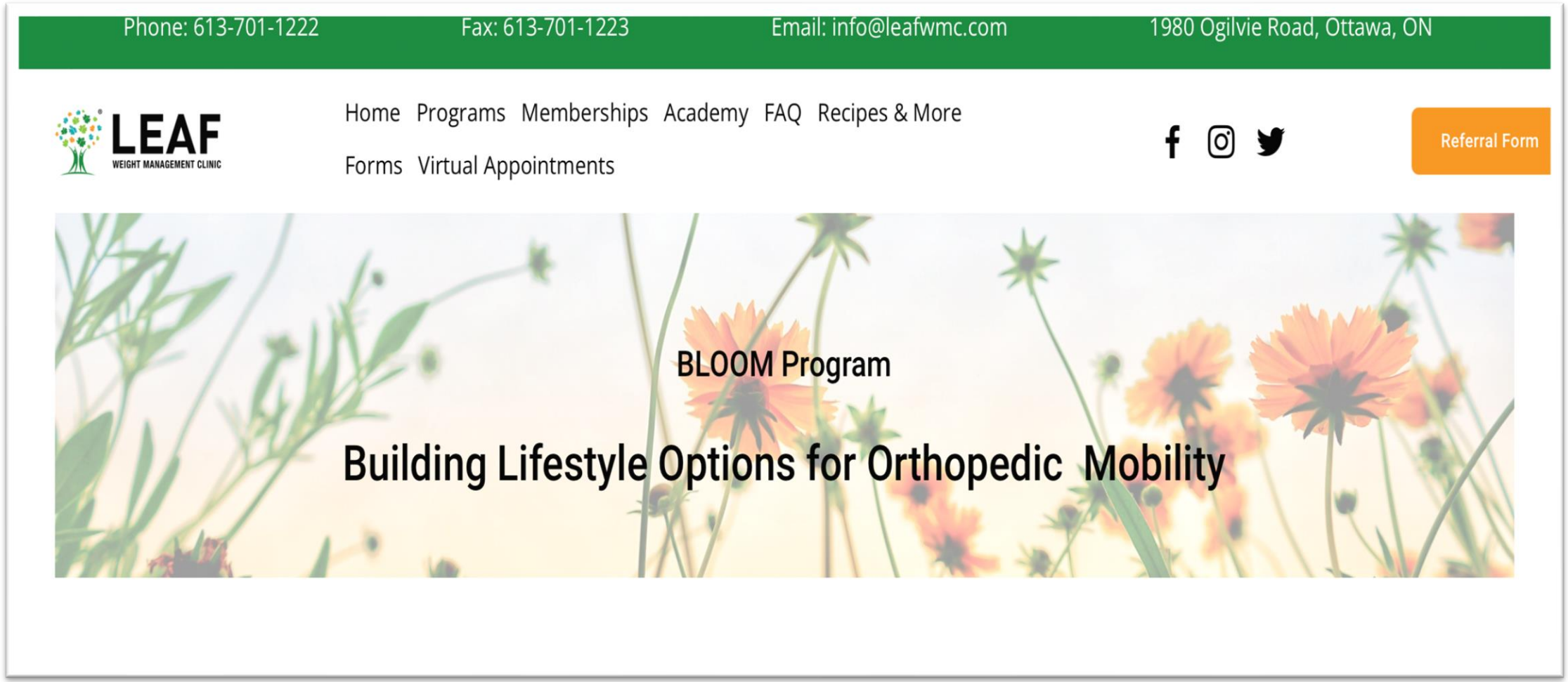
[a] Department of Orthopaedic Surgery, University of Pennsylvania, Philadelphia, PA
[b] Exponent Inc, Philadelphia, PA
[c] Department of Orthopaedic Surgery, University of Louisville, Louisville, KY

Toby O Smith, Tariq Aboelmagd, Caroline Hing AM. Does bariatric surgery prior to total hip or knee replacement reduce post-operative complications and improve clinical outcomes for obese patients? Systematic review and metaanalysis. Bone Joint J [Internet]. 2016;98-B(9):1160–6.

Other non-scale predictors of perioperative risks

- Percent body fat
- Nutritional status
- Presence of comorbidities

Middleton AH, Kleven AD, Creager AE, Hanson R, Tarima SS, Edelstein AI. Association Between Nonsurgical Weight Loss From Body Mass Index >40 to Body Mass Index <40 and Complications and Readmissions Following Total Hip Arthroplasty. J Arthroplasty. 2022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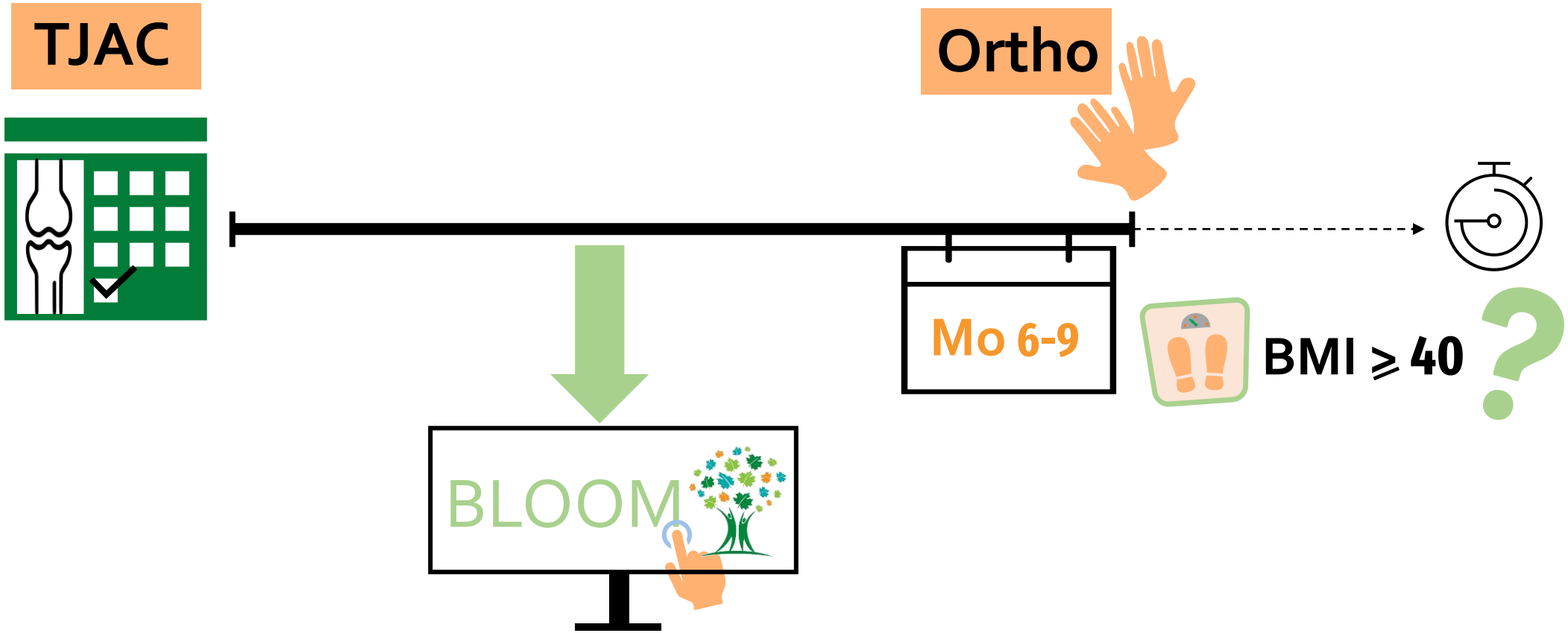

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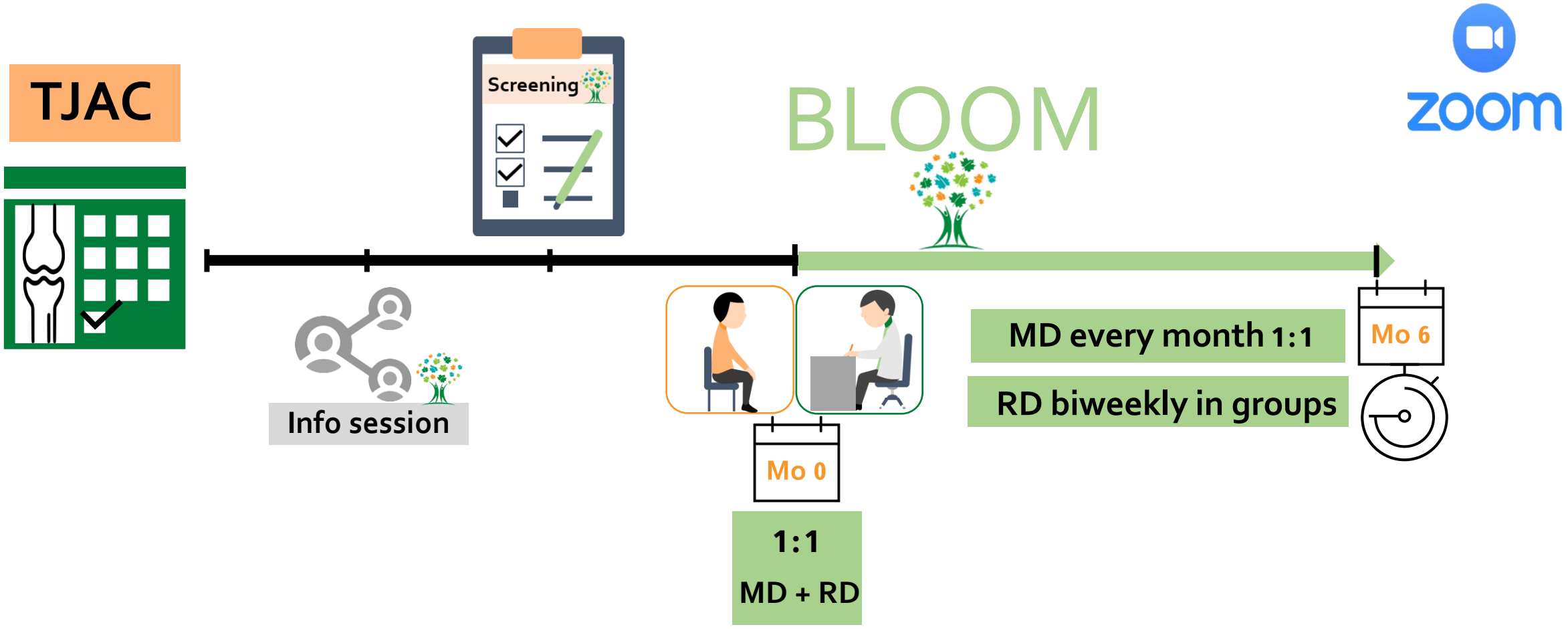
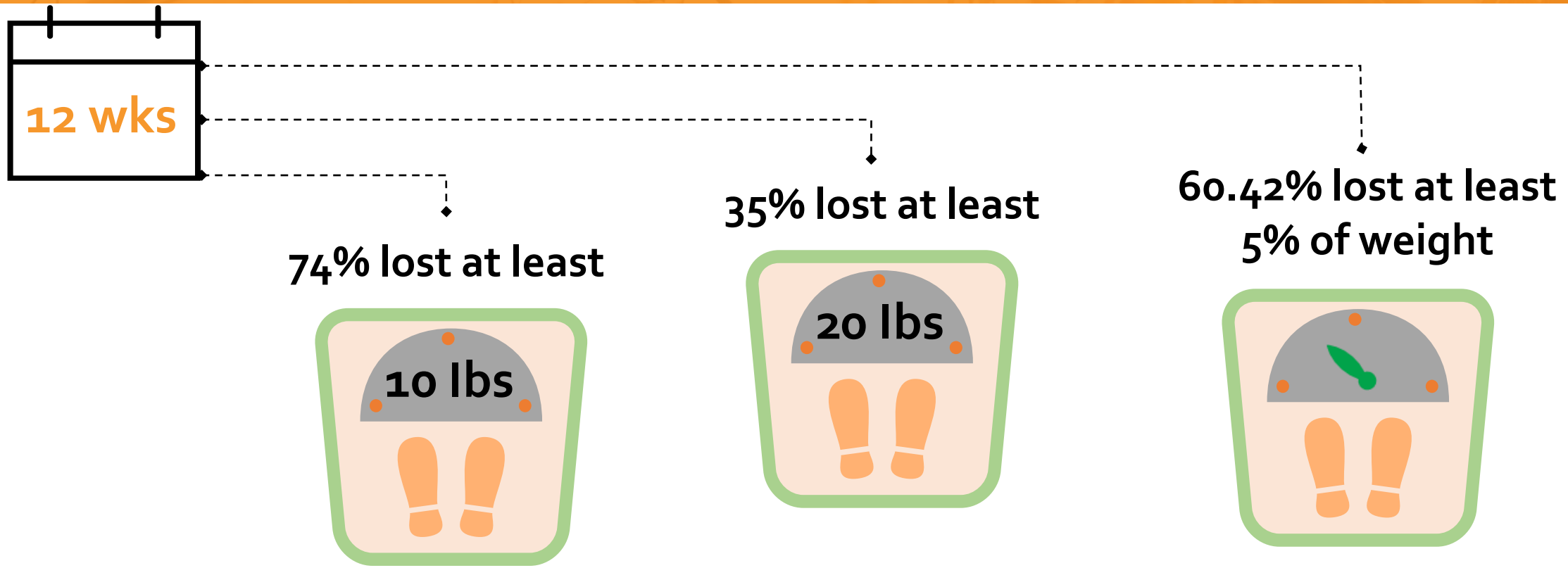

TJAC
Screening
BLOOM
zoom
Info session
Mo 0
1:1
MD + RD
MD every month 1:1
RD biweekly in groups
Mo 6

BLOOM

Characteristic	Variable	
Patient Demographics	N	46
	Age, y	63.4
	Gender (F), n	35 (76%)
	Weight (lbs)	260
	BMI (kg/m2)	42
	Obesity related comorbidities, n	3 (1-7)
Anti-obesity Medications	N	17 (35%)
	Liraglutide, n	5
	Naltraxone-Bupropion, n	0
	Semaglutide 1mg or less, n	9
	Orlistat, n	1
	Metformin, n	2
Meal replacement	N	22 (48%)

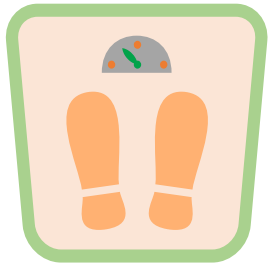
BLOOM


12 wks
74% lost at least
10 lbs
35% lost at least
20 lbs
60.42% lost at least
5% of weight

BLOOM

24 wks

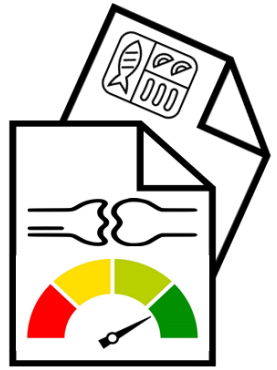
Change in weight and BMI



Non-scale wins

change in:

- Mediterranean diet score
- QoL
- The Oxford hip and knee scores



Stay Tuned!

Take home messages

- We do have significant body of evidence to say: obesity is associated with increased risk of perioperative complications in TJA

- Currently preoperative weight loss studies (mostly observational studies) are showing mixed results in terms of its effect on perioperative risks and functional outcomes of arthroplasty in both weight loss with bariatric surgeries and nonsurgical methods (mostly behavioral and dietary non- pharmacological approaches)

- There is paucity of evidence (and need for prospective controlled studies) to determine the type of weight loss interventions, duration, timing, and amount of the preoperative weight loss. These are important to develop optimization programs

Take home messages

- The current BMI cut off is center/surgeon dependent (but most common one is BMI of 40) for eligibility of TJA

- For medical preoperative weight management, at this time until we have better clearer answers, we suggest a comprehensive professional guided programs focusing on optimizing nutrition, physical activity and medical comorbidities with careful monitoring for risk of malnutrition and postoperative follow up to help maintain this state throughout the perioperative high-risk period

- Can elective surgery present an opportunity for starting a weight management effort for the purpose of long-term chronic weight management beyond the perioperative period?

Thank you!

- Any questions?

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