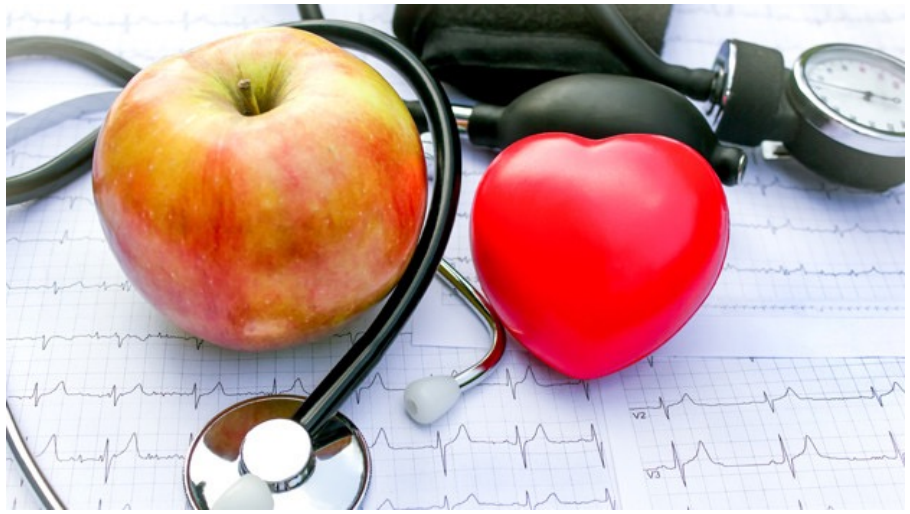
Prehabilitation for Surgery

Optimizing pre-operative health to improve post-operative outcomes

Mini Med School

1 June, 2021

Nicole Cameron



a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Medicine

University of Victoria

let's talk science

Territorial Acknowledgement

We acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day.

Introductions and Disclosures

- I am a first year medical student
- This talk is intended for your entertainment and education, and is not meant to replace advice from your family physician or another health care professional
- All pictures used are free stock photos or photos available under a Creative Commons license unless otherwise noted
- This talk will be recorded

- Thank you for joining us!

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- If you are interested in receiving a digital certificate for your participation/completion of Mini Med School, please enter your contact information into this link:
  - https://forms.gle/xNW4BGrsgMW1zstE9

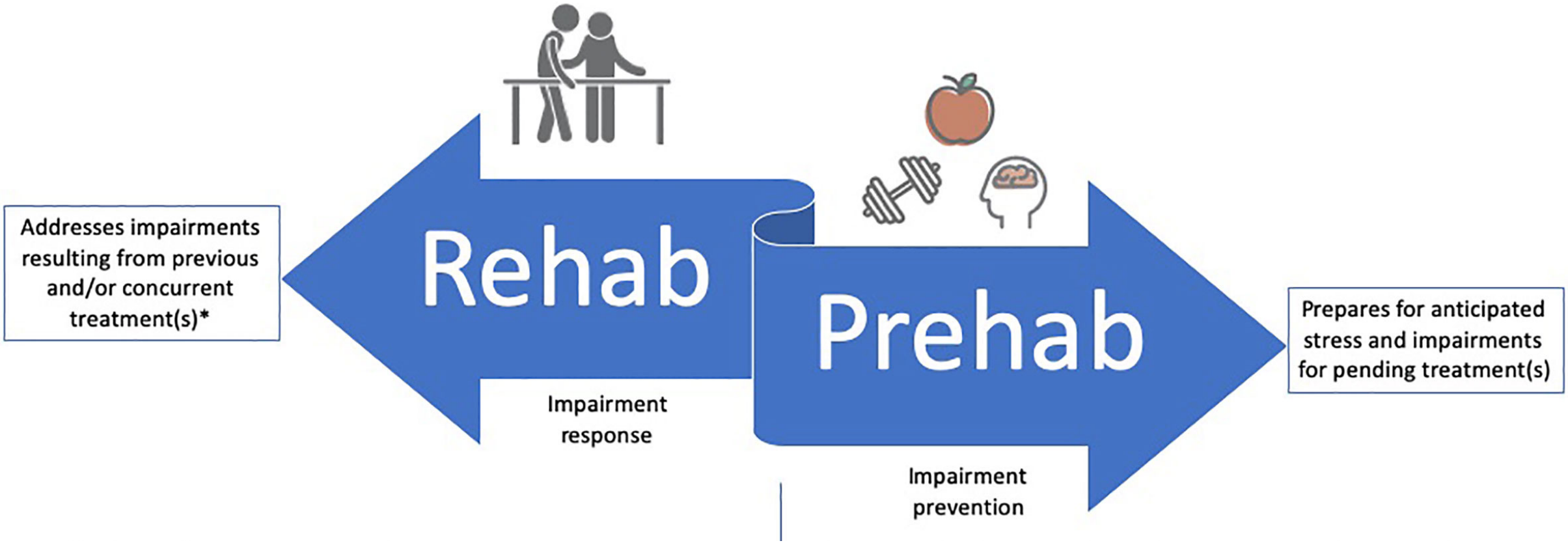
Agenda

- Prehabilitation
- Frailty
- *Intermission*
- *Q&A*
- Physical Strength/Flexibility
- Cardiovascular Health
- Nutrition
- Mental Health and Social Support
- Prehabilitation Programs
- Suggested Resources
- *Q&A*

Poll

- Have you had surgery in the past and/or do you have upcoming surgery in the near future?

Prehabilitation – What it is



Santa Mina D, van Rooijen SJ, Minnella EM, Alibhai SMH, P, Dalton SO, Gillis C, Grocott MPW, Howell D, Randall IM, Sabiston CM, Silver JK, Slooter G, West M, Jack S and Carli F (2021) Multiphasic Prehabilitation AcBrahmbhattross the Cancer Continuum: A Narrative Review and Conceptual Framework. *Front. Oncol.* 10:598425. doi: 10.3389/fonc.2020.598425

Poll

- If you have had surgery in the past, did you engage in rehabilitation?

Poll

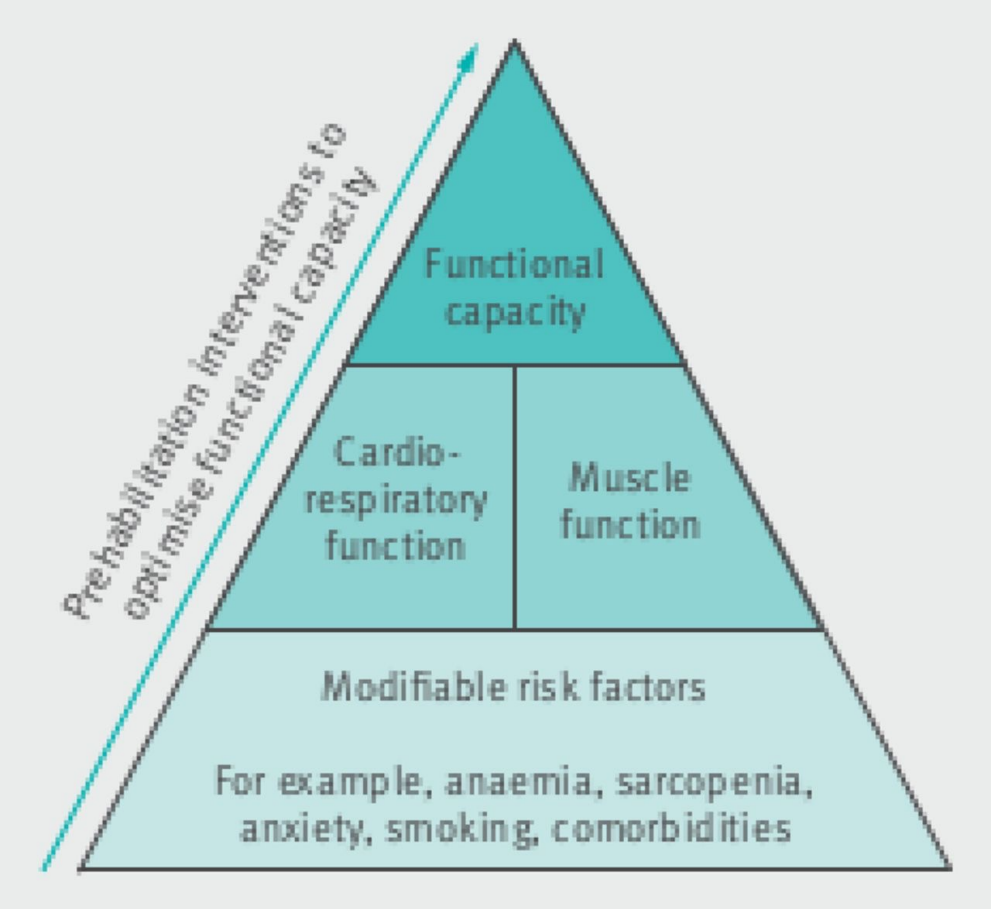
- If you have had surgery or have upcoming surgery, did your doctor or healthcare provider ever talk to you about prehabilitation or improving your health prior to surgery?

Prehabilitation – What it is

- **Functional Capacity:** The ability of someone to perform tasks and activities that are necessary or desirable in their lives.
  - Tightly associated with health status and quality of life

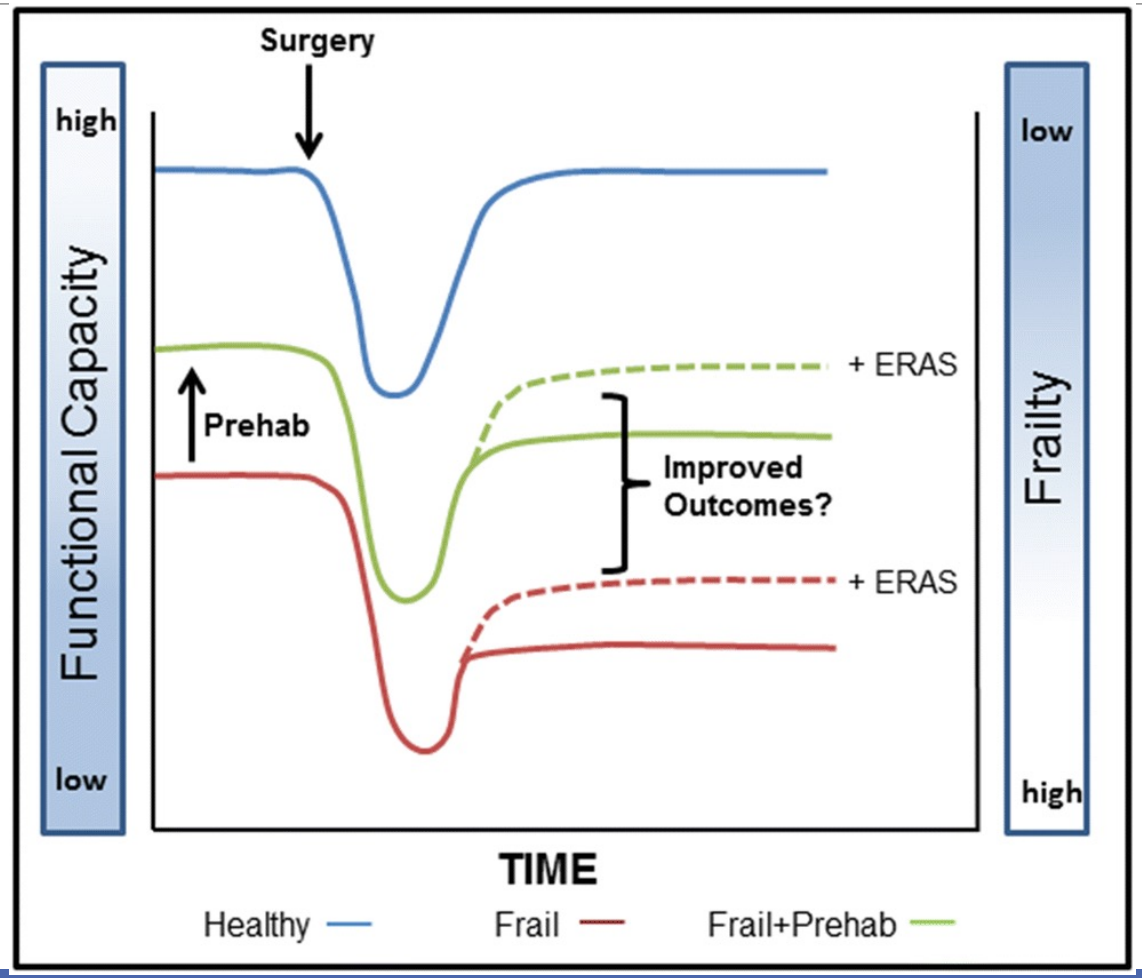
Prehabilitation – What it is

The goal of prehabilitation is to optimize functional capacity



Prehabilitation – Why it matters

The goal of prehabilitation is to optimize functional capacity



ERAS = enhanced recovery after surgery protocols

Durand, M.J., Beckert, A.K., Peterson, C.Y. *et al.* You Are Only as Frail as Your Arteries: Prehabilitation of Elderly Surgical Patients. *Curr Anesthesiol Rep* **9,** 380–386 (2019). https://doi.org/10.1007/s40140-019-00357-6

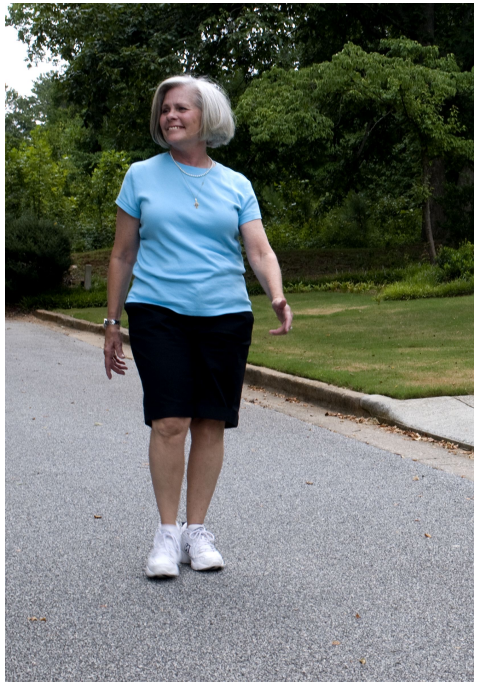
Frailty – What it is

- An aging-related syndrome of physiological decline, characterized by reduced functional reserve and marked vulnerability to adverse health outcomes

- The presence of at least 3/5 of the following:
  - Unintentional weight loss
  - Self-reported exhaustion
  - Weakness
  - Slow walking speed
  - Low physical activity

Frailty – Activities of Daily Living (ADLs)

- Dressing
- Eating
- Ambulating
- Toileting
- Hygiene (grooming)



Frailty – Instrumental Activities of Daily Living (IADLs)

- Shopping
- Housekeeping
- Accounting/finances
- Cooking
- Medications
- Transportation

Clinical Frailty Scale*

1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 Well – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 Managing Well – People whose **medical problems are well controlled,** but are **not regularly active** beyond routine walking.

4 Vulnerable – While **not dependent** on others for daily help, often **symptoms limit activities.** A common complaint is being "slowed up", and/or being tired during the day.

5 Mildly Frail – These people often have **more evident slowing,** and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 Moderately Frail – People need help with **all outside activities** and with **keeping house.** Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 Severely Frail – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 Very Severely Frail – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9 Terminally Ill - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

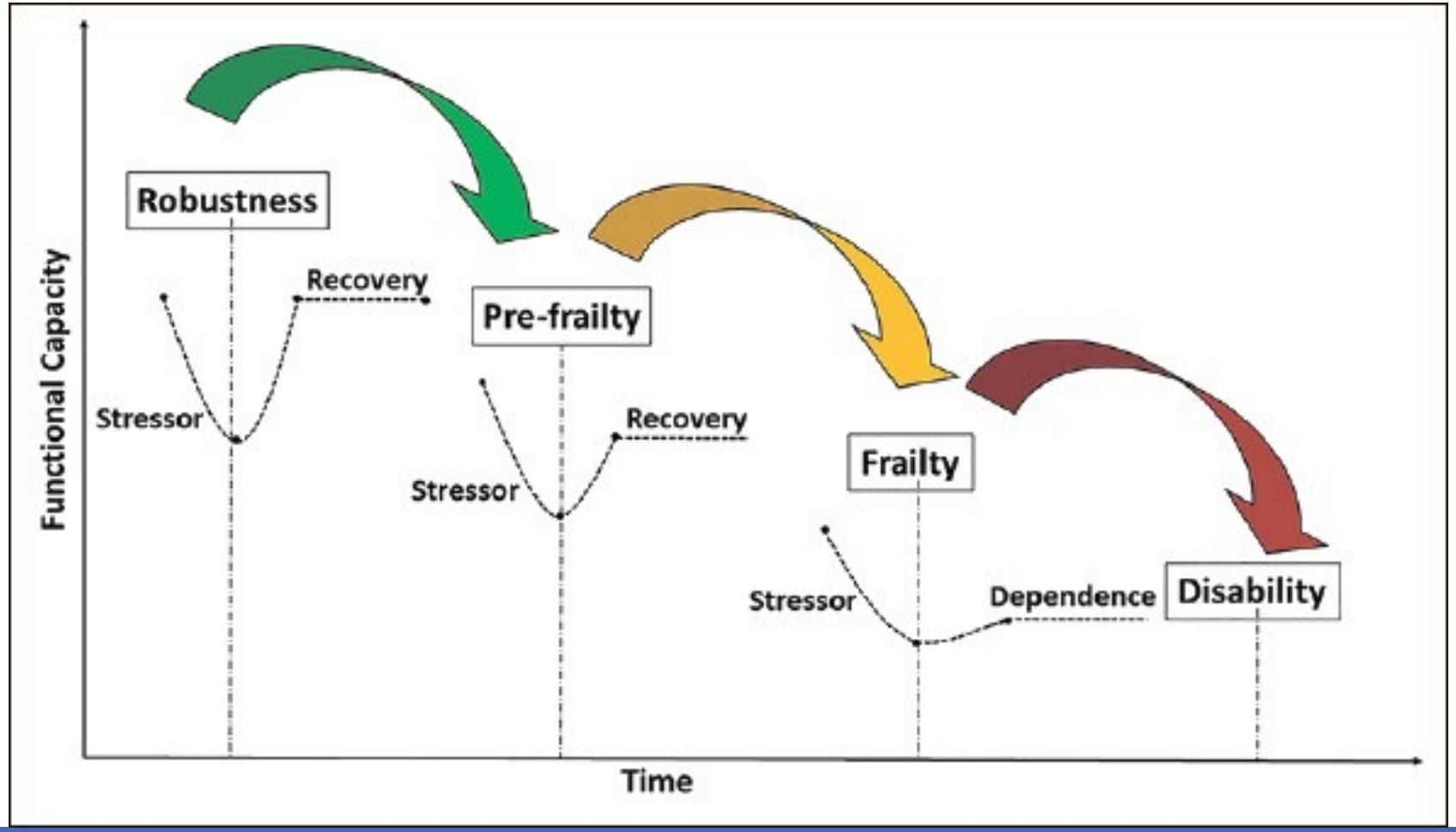
In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

Frailty – Why it matters

- Frailty predicts just about everything…
  - Decreased life expectancy
  - Decreased quality of life
  - Increased risk of adverse drug reactions
  - Decreased likelihood of benefit from treatments
  - Cognitive and physical decline
  - Increased frequency of falls
  - Increased risk of functional decline during hospitalization
  - *Increased risk of poor surgical outcomes (mortality, serious complications, functional decline)
  - Increased risk of hospital and care home admission

Frailty – Why it matters



Dent, E., Morley, J.E., Cruz-Jentoft, A.J. *et al.* Physical Frailty: ICFSR International Clinical Practice Guidelines for Identification and Management. *J Nutr Health Aging* **23,** 771–787 (2019). https://doi.org/10.1007/s12603-019-1273-z

Frailty – Risk Factors

- Age (but age ≠ frailty)
- Low levels of physical activity
- Poor nutrition
- Smoking
- Alcohol abuse
- Low socioeconomic status
- Mental illness

Frailty – Age

- A combination of age-related changes contribute to frailty:
  - Immune system decline
  - Muscle mass and strength decrease
  - Structural changes in aging brain
  - Vascular changes (endothelial dysfunction, arterial stiffening)
- BUT age ≠ frailty

Frailty – Low physical activity

- Less then 1/3 of adults aged 65+ participate in any leisure time physical activity (USA study)
  - “use it or lose it”
- Loss of muscle mass (sarcopenia) can reduce someone’s independence and when chronic can lead to frailty
- ↓muscle mass → ↓ muscle power and strength → ↑ frailty (loss of performance)

C.M. Nascimento, M. Ingles, A. Salvador-Pascual, M.R. Cominetti, M.C. Gomez-Cabrera, J. Viña. Sarcopenia, frailty and their prevention by exercise. Free Radical Biology and Medicine, Volume 132, 2019, Pages 42-49, ISSN 0891-5849, https://doi.org/10.1016/j.freeradbiomed.2018.08.035.

Frailty – Poor nutrition

- Malnutrition contributes to all 5 criteria for frailty
  - Directly leads to weight loss, weakness, fatigue
  - Contributes to slow walking speed and low physical activity

- Frailty is associated with low daily energy intake (< 21 kcal/kg)
  - If intake not enough, body fat and muscle are broken down to make energy our bodies need → weight loss

Bartali B, Frongillo EA, Bandinelli S, Lauretani F, Semba RD, Fried LP, Ferrucci L Low nutrient intake is an essential component of frailty in older persons. *J Gerontol A Biol Sci Med Sci.* 2006; 61:589–93.

Frailty – Poor nutrition

- Frailty is associated with low daily protein intake (<0.7 g/kg)
  - 10-33% of older adults do not meet their recommended daily intake of protein → loss of muscle mass and strength

- Inadequate intake of Vitamins D, E, C, and Folate is associated with higher risk of frailty

Bartali B, Frongillo EA, Bandinelli S, Lauretani F, Semba RD, Fried LP, Ferrucci L Low nutrient intake is an essential component of frailty in older persons. *J Gerontol A Biol Sci Med Sci.* 2006; 61:589–93.

Frailty – Smoking

- Smoking predicts the development and worsening of frailty
  - Cardiovascular disease
  - Respiratory disease
  - Cancer
  - Chronic inflammation → muscle wasting, weight loss, exhaustion, weakness, slow walking speed = frailty
- Dose-response relationship between smoking and frailty
  - Heavy smokers had the highest degree of frailty
  - Never smokers had the lowest degree of frailty

Kojima, G., Iliffe, S. & Walters, K. Smoking as a predictor of frailty: a systematic review. *BMC Geriatr* **15,** 131 (2015). https://doi.org/10.1186/s12877-015-0134-9

Hubbard RE, Searle SD, Mitnitski A, Rockwood K. Effect of smoking on the accumulation of deficits, frailty and survival in older adults: a secondary analysis from the Canadian Study of Health and Aging. J Nutr Health Aging. 2009;13(5):468–72.

Frailty – Alcohol abuse

- High consumption of alcohol (> 14 drinks/week) in midlife predicts old-age frailty
- High alcohol consumption can cause malnutrition
  - Impairs nutrient digestion and absorption
  - Decreased protein synthesis
  - Decreased dietary caloric intake

Frailty – Low socioeconomic status

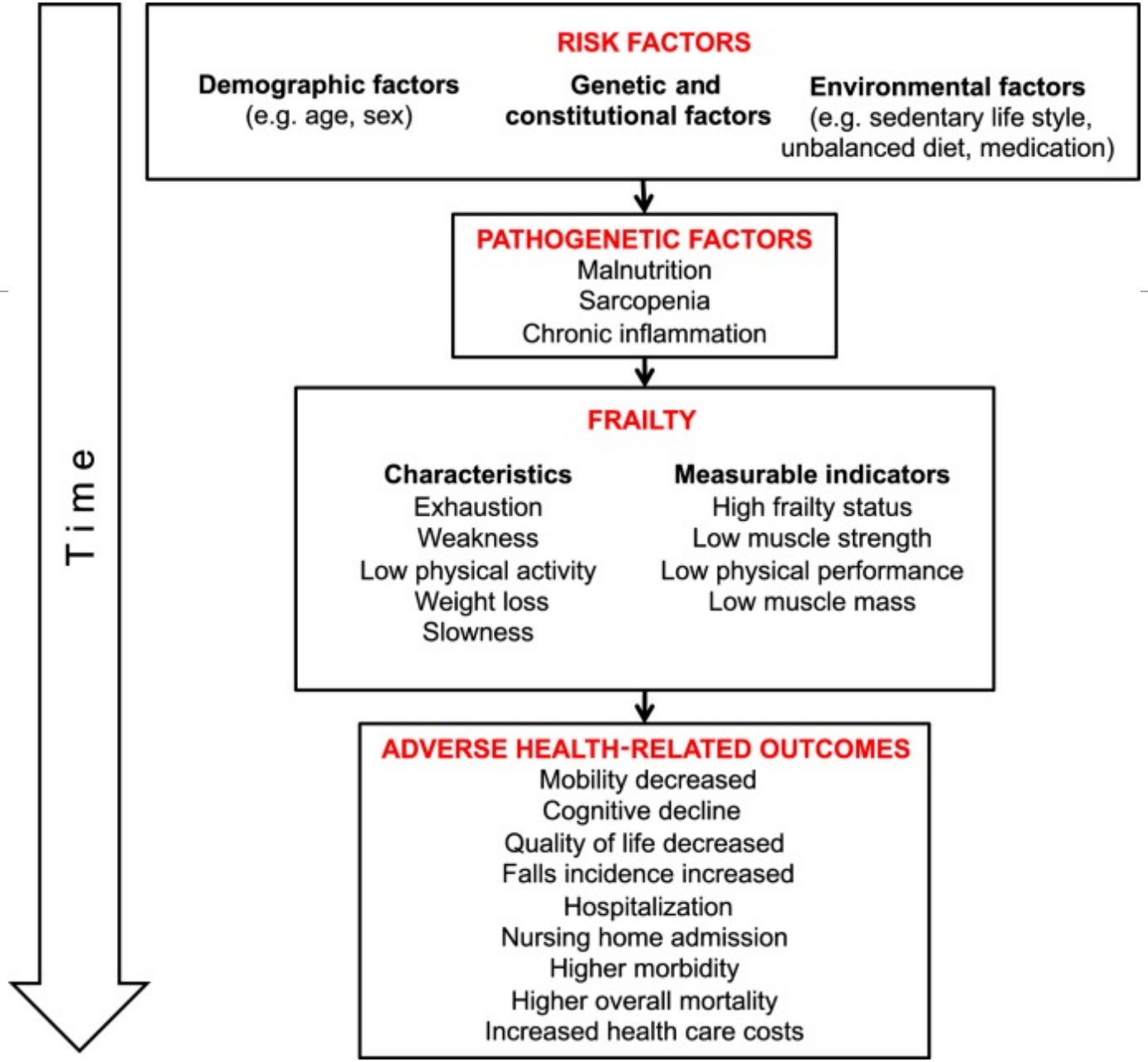
- Frailty more prevalent in people with low socioeconomic status:
  - Lower level of education
  - Lower income
  - Racial and ethnic minorities
  - Living in a high-density neighbourhood

Feng Z, Lugtenberg M, Franse C, Fang X, Hu S, et al. (2017) Risk factors and protective factors associated with incident or increase of frailty among community-dwelling older adults: A systematic review of longitudinal studies. PLOS ONE 12(6): e0178383. https://doi.org/10.1371/journal.pone.0178383

Frailty – Mental illness

- Depression can increase risk of frailty in older adults
  - Independent risk factor for hypertension, diabetes, stroke, heart disease, Alzheimer's disease, and cancer
  - Associated with higher levels of self-neglect
- Depression may share common underlying mechanisms with frailty
  - Immune, inflammatory, and metabolic processes
- Greater depressive symptoms predict greater frailty, and greater frailty predicts greater depressive symptoms

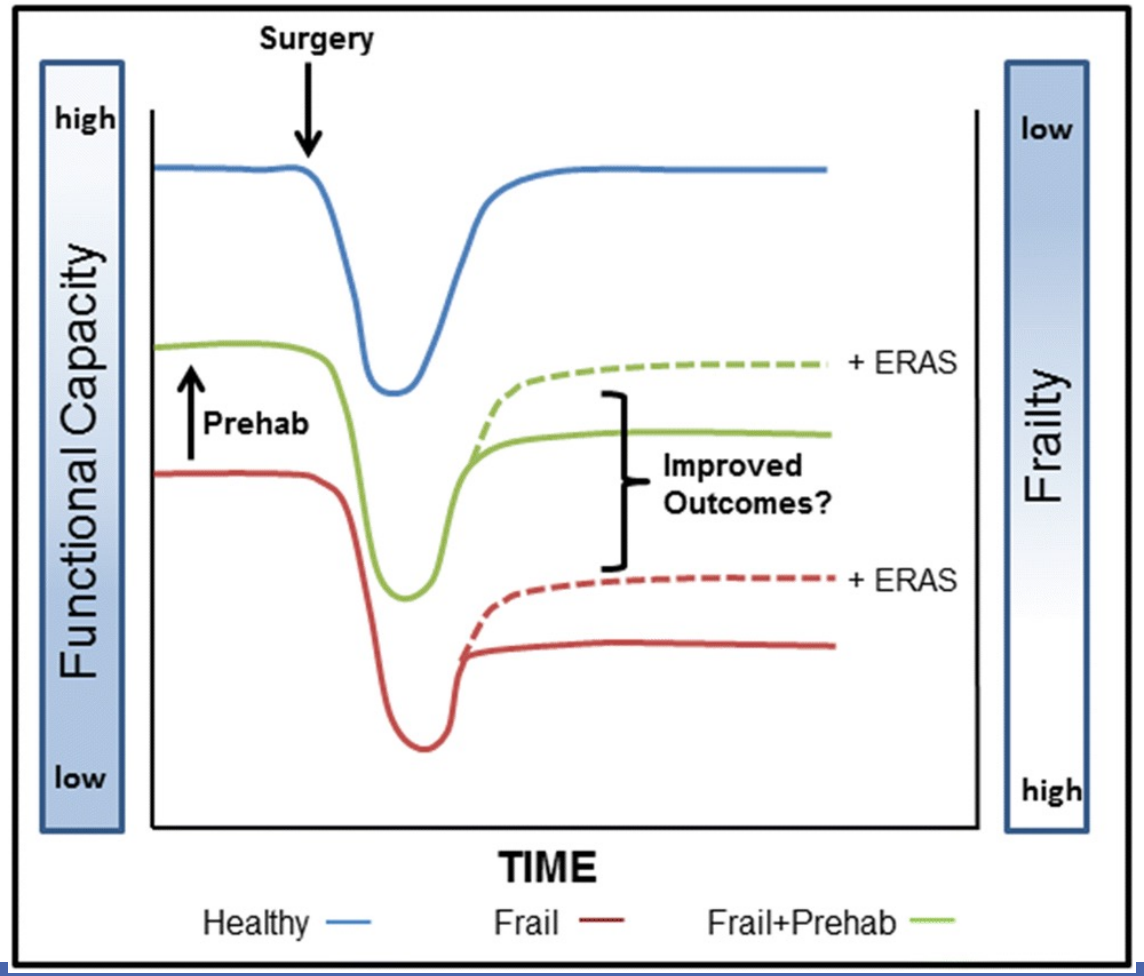
Aprahamian, I., Mamoni, R.L., Cervigne, N.K. *et al.* Design and protocol of the multimorbidity and mental health cohort study in frailty and aging (MiMiCS-FRAIL): unraveling the clinical and molecular associations between frailty, somatic disease burden and late life depression. *BMC Psychiatry* **20,** 573 (2020). https://doi.org/10.1186/s12888-020-02963-9



Haider, S., Grabovac, I. & Dorner, T.E. Effects of physical activity interventions in frail and prefrail community-dwelling people on frailty status, muscle strength, physical performance and muscle mass—a narrative review. *Wien Klin Wochenschr* **131,** 244–254 (2019). https://doi.org/10.1007/s00508-019-1484-7

Frailty – Benefits of Prehabilitation

↑ functional capacity = ↓ frailty



Durand, M.J., Beckert, A.K., Peterson, C.Y. *et al.* You Are Only as Frail as Your Arteries: Prehabilitation of Elderly Surgical Patients. *Curr Anesthesiol Rep* **9,** 380–386 (2019). https://doi.org/10.1007/s40140-019-00357-6

Prehabilitation - Benefits

- Prehabilitation programs involving exercise, nutrition, and psychological preparation before surgery have been shown to promote a better surgical outcome
  - Improved physical fitness and functional capacity
  - Shortened hospital stay
  - Lower post-operative complication rates
  - Earlier return to baseline function

- Frail patients gain the greatest benefits from prehabilitation treatments

Gillis, C. and Wischmeyer, P.E. (2019), Pre-operative nutrition and the elective surgical patient: why, how and what?. Anaesthesia, 74: 27-35. https://doi.org/10.1111/anae.14506

Barberan-Garcia A, Ubre M, Roca J, et al. Personalised prehabilitation in high-risk patients undergoing elective major abdominal surgery: a randomized blinded controlled trial. *Annals of Surgery* 2018; **267**: 50–6.

Prehabilitation - Benefits

- Prehabilitation programs often focus on a few key areas of health:
  - Physical strength and flexibility
  - Cardiovascular health
  - Nutrition
  - Mental health and social support

Intermission

- 10-minute break

Q&A

- Questions or comments about the talk so far?

Agenda

- Physical Strength/Flexibility
- Cardiovascular Health
- Nutrition
- Mental Health and Social Support
- Prehabilitation Programs
- Suggested Resources
- *Q&A*

Prehabilitation – Physical strength/flexibility

- Frailty is not a contraindication for physical activity – it may be one of the most important reasons to prescribe exercise
  - Exercise has been shown to improve mobility, balance, walking speed, and ability to perform Activities of Daily Living in frail older adults
  - Frail older adults who completed a 10-week hip flexor stretching routine had increases in walking speed, stride length, and steps/min
  - Resistance training can improve muscle strength in frail older adults by 110%

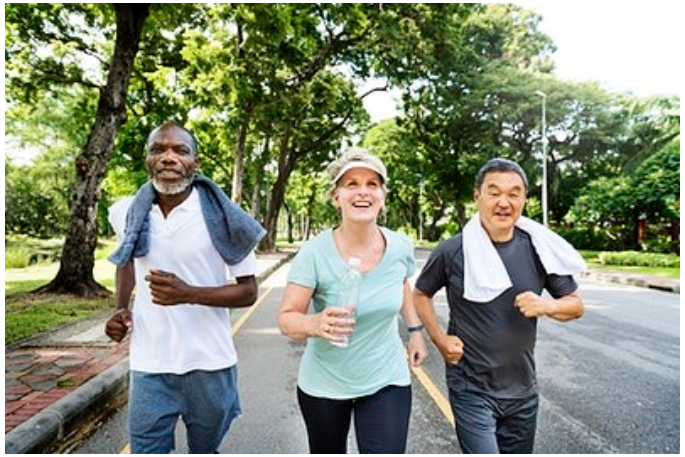
Chou CH, Hwang CL, Wu YT. Effect of exercise on physical function, daily living activities, and quality of life in the frail older adults: a meta-analysis. Arch Phys Med Rehabil. 2012 Feb;93(2):237-44. doi: 10.1016/j.apmr.2011.08.042. PMID: 22289232

Aguirre LE, Villareal DT. Physical Exercise as Therapy for Frailty. Nestle Nutr Inst Workshop Ser. 2015;83:83-92. doi: 10.1159/000382065. Epub 2015 Nov 2. PMID: 26524568; PMCID: PMC4712448

Watt J.R., Jackson K., Franz J.R., Dicharry J., Evans J., and Kerrigan D.C. 2011. Effect of a supervised hip flexor stretching program on gait in frail elderly patients. PM&R. **3**(4): 330–335.

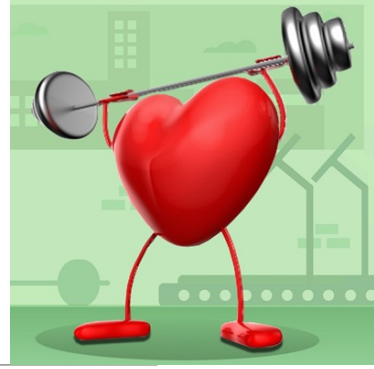
Prehabilitation – Physical strength/flexibility

- Patients who engaged in 4 weeks of aerobic and resistance exercise pre-operatively had improved post-operative mobility and were more likely to recover to or above their baseline capacity



Gillis C, Li C, Lee L, Awasthi R, Augustin B, Gamsa A, et al. Prehabilitation versus rehabilitation: a randomized control trial in patients undergoing colorectal resection for cancer. Anesthesiology. 2014;121(5):937–47. https://doi.org/10.1097/ALN.0000000000000393

Prehabilitation – Cardiovascular health



- Poor cardiorespiratory fitness is associated with post-operative morbidity, mortality, and longer hospital stay
  - Pre-operative training to improve fitness improves outcomes – the higher the cardiorespiratory fitness, the better the surgical outcomes
- 12 weeks of moderate exercise performed 3 times/week improved vascular function and health in older sedentary adults
  - Better prepares the vasculature for surgery
- Regular exercise has been shown to protect the heart against certain injury that can occur with surgery

Black MA, Cable NT, Thijssen DH, Green DJ. Impact of age, sex, and exercise on brachial artery flow-mediated dilatation. Am J Physiol Heart Circ Physiol. 2009;297(3):H1109–16. https://doi.org/10.1152/ajpheart.00226.2009

Myers, Jonathan N. PhD, FACSM[1,2]; Fonda, Holly MS[2] The Impact of Fitness on Surgical Outcomes: The Case for Prehabilitation, Current Sports Medicine Reports: 7/8 2016 - Volume 15 - Issue 4 - p 282-289 doi: 10.1249/JSR.0000000000000274

Prehabilitation - Nutrition

- High protein intake may preserve from frailty and protein-energy supplementation may reduce the progression of functional decline in those already frail
  - A 20% increase in protein intake was associated with a 12% lower risk of frailty over 3 years
- Following a Mediterranean-style diet is associated with lower risk of frailty
  - Slower decline of mobility in older adults
  - Associated with higher intakes of antioxidants including Vitamins C and E

Cruz-Jentoft, A. J., Kiesswetter, E., Drey, M., & Sieber, C. C. (2017). Nutrition, frailty, and sarcopenia. *Aging Clinical and Experimental Research, 29*(1), 43-48. https://doi.org/10.1007/s40520-016-070

Beasley JM, LaCroix AZ, Neuhouser ML, Huang Y, Tinker L, Woods N, Michael Y, Curb JD, Prentice RL. Protein intake and incident frailty in the Women's Health Initiative observational study. J Am Geriatr Soc. 2010 Jun;58(6):1063-71. doi: 10.1111/j.1532-5415.2010.02866.x.)

Prehabilitation – Mental health

- Perceived stress/worry about the operation has been associated with delayed recovery, postoperative complications, and impaired wound healing
  - Psychological preparation for surgery may improve these outcomes
- Patients with high levels of social support had less anxiety, received lower doses of narcotics, and has shorter hospital stay than patients with low support
- Pre-operatively improving depression scores in patients with depression has been shown to improve post-operative pain and physical function

https://www.mcgill.ca//patient-information/what-involved/brief-overview

Krohne HW, Slangen KE. Influence of social support on adaptation to surgery. Health Psychol. 2005 Jan;24(1):101-5. doi: 10.1037/0278-6133.24.1.101. PMID: 15631568.

Rahman, R., Ibaseta, A., et al. (2020). Changes in patients' depression and anxiety associated with changes in patient-reported outcomes after spine surgery, *Journal of Neurosurgery: Spine SPI*, *32*(6), 871-890. Retrieved May 28, 2021, from https://thejns.org/spine/view/journals/j-neurosurg-spine/32/6/article-p871.xml

Prehabilitation Program - Sample

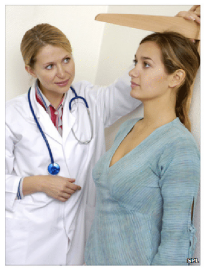
McGill University
Peri-Operative Program

Step 1

Once patients have seen their surgeon - and the surgery has been explained - they meet with a team physician who introduces the Peri-Operative Program.

Step 2

An appointment session is then set with a clinical coordinator who explains the various steps of the program and records anthropometric measurements (body weight, height, percentage of lean body mass and body fat).



https://www.mcgill.ca/peri-op-program/patient-information/what-involved

Prehabilitation Program - Sample

McGill University
Peri-Operative Program

Step 3

Visits are then scheduled with a physiotherapist/kinesiologist, a nutritionist and a psychologist who respectively assess body strength and flexibility, nutritional status, and mood.



Step 4

A home-based program is then proposed, which spans 4-5 weeks before your surgery and up to 8 weeks after surgery. The program may or may not include in-hospital exercise sessions.

Example of an Exercise Prescription

Mode	Frequency	Duration	Intensity	Progression
Aerobic	3-5 days/week	20-30 min	50%-85%	Increasing frequency, duration, and intensity
Strength (8-10 exercises)	2days/week	1 set-8-12 reps for each exercise	60%-80% of max	Increase resistance based on 2+2 method
Flexibility	Static following each session	Hold for 15-30 seconds	Stretch to tightness, not discomfort	ROM will increase over time
Warm up/cool down	Before and after each session	5-10 min	30-45%	Low intensity, large muscle group activity

https://www.mcgill.ca/peri-op-program/patient-information/what-involved

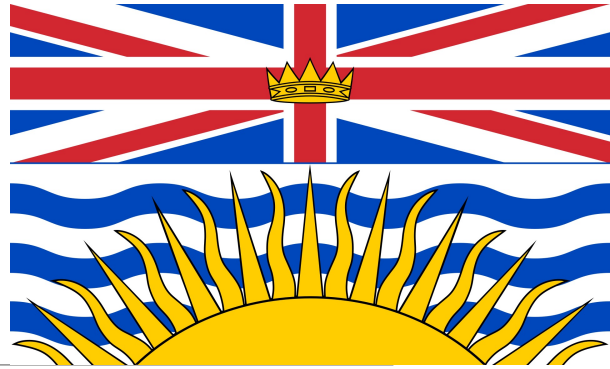
Prehabilitation Program - Sample

McGill Peri-Operative Program includes 4 components:

- Medical optimization
  - Adjust medications as needed, monitor vital signs, smoking cessation/reduction
- Physical activity program
  - Moderate intensity of aerobic and resistance exercises to be performed 3 days/week for 4-5 weeks before surgery
- Nutritional Plan
  - 3-day food diary and nutritional status assessment are used to provide counselling on dietary intake and nutritional supplementation (if necessary)
- Strategies to allay anxiety
  - Focus on relaxation, breathing exercises, and anxiety reduction techniques

https://www.mcgill.ca/peri-op-program/patient-information/what-involved/brief-overview

Prehabilitation Program – in BC?



- The Surgical Patient Optimization Collaborative (SPOC) is a trial prehabilitation program in coordination with Doctors of BC and the BC Government
  - Ran from May 2019-May 2021 followed by an evaluation period with the hopes of continuing the program into the future
- Components of optimization include:
  - Substance use
  - Frailty
  - Pain management
  - Physical activity
  - Social supports
  - Anemia
  - Mental health
  - Cardiac
  - Glycemic control
  - Nutrition
  - Smoking cessation
  - Venous thromboembolism prophylaxis
  - Sleep apnea

https://sscbc.ca/programs-and-initiatives/transform-care-delivery/surgical-patient-optimization-collaborative-spoc-0

Wait times for surgery - Silver lining?

- Long wait times for elective surgery is an ongoing concern, especially during the COVID-19 pandemic
- Could this be an opportunity for prehabilitation?
  - More time to improve functional capacity and optimize health of patients
  - Support the patient's functioning while waiting for surgery with the potential benefit of improved post-operative outcomes

Prehabilitation = Preventative care

- Components of prehabilitation are also components of a healthy lifestyle
- Optimizing physical, nutritional, and mental health is beneficial for all

Suggested Resources

- HealthLinkBC:
  - Physical activity: https://www.healthlinkbc.ca/physical-activity
  - Health eating: https://www.healthlinkbc.ca/healthy-eating
  - Mental health and substance use: https://www.healthlinkbc.ca/mental-health-substance-use
- Island Health:
  - Getting ready for surgery: https://www.islandhealth.ca/learn-about-health/surgery/getting-ready-surgery
- QuitNow (smoking cessation): https://quitnow.ca/
- Telephone 8-1-1 (7-1-1 for the hearing impaired)
  - Speak to a Registered Nurse, Registered Dietician, exercise professional, or Pharmacist

Poll

- After attending Mini Med School talks, will you implement any of the things we have talked about?
  - E.g. making changes to your diet/nutrition, exercise, sleep, substance use (smoking, alcohol, caffeine), time in nature, etc.

Poll

- If you are interested in attending Mini Med School talks in the future, which of the following topics would you be interested in? (select all that apply)
- If you have other topic suggestions, please type them into the chat

Q&A

- Questions or comments about the talk?

Closing Remarks

- Thank you to Dr. Jane Gair, our supervisor for this activity, and to my classmates, Julia De Pieri and Alexandra Jamieson, who delivered several of the talks in this series

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- Thank you for attending Mini Med School!