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# Preoperative optimization of diagnostic work-up and physical fitness with patients undergoing cancer surgery

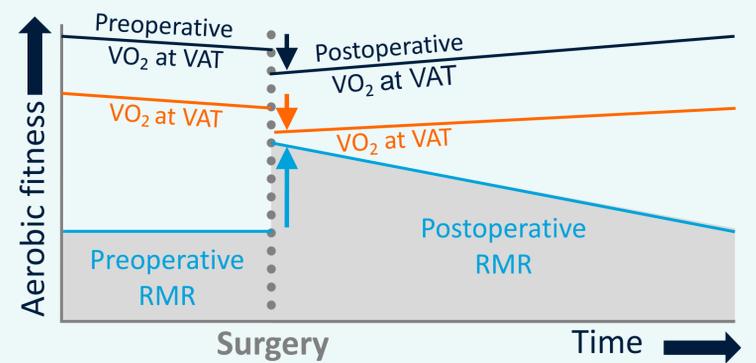
## Can we predict and improve outcome?

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### Introduction

- Relatively high percentage (**30-40%**) of postoperative complications in patients undergoing major (elective) cancer surgery
- Body has to cope with surgery-induced physiological stress response
- Patients with a **lower preoperative physical (aerobic) fitness** might have a **higher risk** for adverse postoperative outcomes
- Neoadjuvant therapy is known to preoperatively reduce physical (aerobic) fitness
- It remains to be demonstrated whether exercise prehabilitation in these **high-risk** patients increases **preoperative physical fitness** and **improves postoperative outcomes**



Abbreviations: RMR=resting metabolic rate; VAT=ventilatory anaerobic threshold; VO<sub>2</sub>=oxygen uptake.

**Aim** To evaluate the association of **preoperative physical fitness** with **postoperative outcomes** in patients preparing for major elective cancer surgery, as well as the **effect of exercise prehabilitation** on postoperative outcomes, especially in **patients characterized as high risk**

### Methods

#### Association between preoperative physical fitness and postoperative outcomes

- **Patient populations:** prospective and retrospective cohort studies and systematic reviews, in patients with colorectal (CRC), liver or pancreatic (HPB), or non-small cell lung cancer (NSCLC)
- **Preoperative exercise tests:** aerobic fitness (e.g., CPET, SRT, iSWT), muscle strength/endurance (e.g., HGS, FTSTST), functional mobility (e.g., TUG test, 2MWT)
- **Postoperative outcomes:** incidence and impact of complications, length of stay, time to recovery of physical functioning
- **Analyses:** univariate, logistic regression, and linear regression analyses

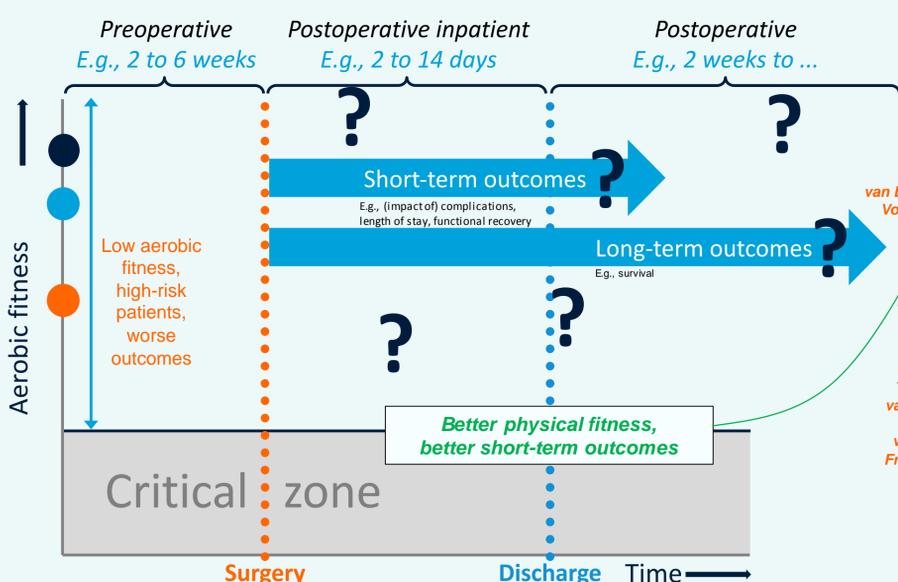
#### Effects of preoperative physical exercise training (prehabilitation)

- **Study design and patient populations:** a randomized clinical trial, pre-post studies, and a case study in **high-risk** patients (low preoperative aerobic fitness) with colorectal (including patients **during** neoadjuvant therapy in rectal cancer), liver, or pancreatic cancer
- **Preoperative intervention:** **community- or home-based supervised** exercise prehabilitation (3-6 wks), **outpatient supervised** exercise prehabilitation during neoadjuvant therapy (9-17 wks)
- **Pre- and postoperative outcomes:** feasibility (CRC, HPB), change in physical fitness (CRC, HPB), and postoperative outcomes (CRC)

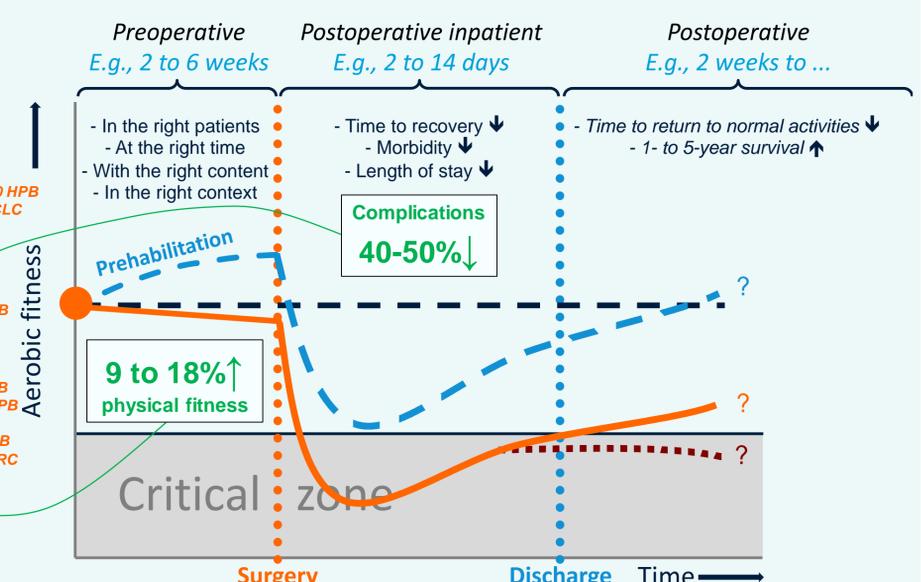
Abbreviations: CPET=cardiopulmonary exercise testing; CRC=colorectal cancer; FTSTST=five times sit-to-stand test; HGS=handgrip strength; HPB=hepatopancreatobiliary; iSWT=incremental shuttle walk test; NSCLC=non-small cell lung cancer; SRT=steep ramp test; TUG=timed up-and-go; 2MWT=two-minute walk test.

### Results

#### Association between preoperative physical fitness and postoperative outcomes



#### Effects of preoperative physical exercise training (prehabilitation)



Heldens et al. 2017 CRC  
Berkel et al. 2019 CRC  
van Beijsterveld et al. 2019; 2020 HPB  
Voorn et al. 2021a; 2021b NSCLC  
Cuijpers et al. 2021 CRC

Thomas et al. 2019 CRC HPB  
Berkel et al. 2021 CRC

Heldens et al. 2016 CRC  
Thomas et al. 2019 CRC HPB  
van Beijsterveld et al. 2020 HPB  
Berkel et al. 2021 CRC  
van Wijk et al. submitted HPB  
Franssen et al. in progress CRC

**Conclusion** **Better preoperative physical fitness** is associated with **better postoperative outcomes** in patients preparing for major elective cancer surgery. **Short-term exercise prehabilitation by unfit patients improves preoperative physical fitness and seems to reduce both the incidence and impact of postoperative complications.**