BMJ Open

Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: protocol for a randomised controlled trial

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2022-063583
Article Type:	Protocol
Date Submitted by the Author:	04-Apr-2022
Complete List of Authors:	Wong, Sami; The Chinese University of Hong Kong, Faculty of Medicine Cheung, Helen; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Ng, Floria; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Yau, King Wai; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Wong, Man Kin Henry; Prince of Wales Hospital, Anaesthesia and Intensive Care Lau, Vivian; Prince of Wales Hospital, Anaesthesia and Intensive Care Leung, Wing Wa; The Chinese University of Hong Kong, Division of Colorectal Surgery, Department of Surgery Mak, Tony W. C.; The Chinese University of Hong Kong, Division of Colorectal Surgery, Department of Surgery Lee, Anna; The Chinese University of Hong Kong, Anaesthesia and Intensive Care
Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Adult surgery < SURGERY, Adult anaesthesia < ANAESTHETICS

Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: protocol for a randomised controlled trial

Sami Sum Yu WONG[1], Helen Hoi Ting CHEUNG[2], Floria Fung NG[2], Derek King Wai YAU[2], Man Kin Henry WONG[3], Vivian Nga Man LAU[3], Wing Wa LEUNG[4], Tony Wing Chung MAK[4], Anna LEE[2]

[1] Faculty of Medicine, Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

[2] Department of Anaesthesia and Intensive Care, Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

[3] Department of Anaesthesia and Intensive Care, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

[4] Division of Colorectal Surgery, Department of Surgery, Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

Corresponding author: Professor Anna LEE, Department of Anaesthesia and Intensive Care, Office 21, 4/F Main Clinical Block and Trauma Centre, Prince of Wales Hospital, Shatin, N.T., Hong Kong Email: annalee@cuhk.edu.hk Telephone: +852 3505 2735

Category: Study Protocols

MESH terms: Patient Reported Outcome Measures; Patient Satisfaction; Patient Education; Preoperative Care

Word count: 256 (abstract), 2845 (text)

Abstract

Introduction: Multimodal prehabilitation, an emerging field within the Perioperative Medicine specialty, requires close multidisciplinary team coordination. The goal is to optimise the patient's health status in the 4 to 8 weeks before elective surgery to withstand surgical stress. Most patients are unfamiliar with the concept of prehabilitation but are interested in participating in such a program after explanation. The objective of this randomised controlled trial is to evaluate the effect of prehabilitation (patient education video and multimodal prehabilitation) on the preoperative patient-centred coordinated care experience.

Method and analysis: One hundred patients undergoing major elective surgery (cardiac, colorectal, hepatobiliary-pancreatic and urology) will be recruited into a two-group, parallel, superiority, single-blinded randomised controlled trial. Patients will be randomised to receive either preoperative patient education comprising of a video and prehabilitation program with standard care (intervention) or standard care (control). The primary outcome measure will be the quality of preoperative patient care experience using the 11-item Chinese version of the Person Centred Coordinated Care Experience Questionnaire (P3CEQ) before surgery. Secondary outcomes will include the change in Hospital Anxiety and Depression Scale (HADS) score from trial enrolment to before surgery, Quality of Recovery Score (QoR-15) on third day after surgery and Days Alive and At Home within 30 days after Surgery (DAH_{30}). Intention-to-treat and per-protocol analyses will be performed.

Ethics and dissemination: The Joint CUHK-NTEC Clinical Research Ethics Committee approved the study protocol (CREC Ref. No. 2021.518-T). The findings will be presented at scientific meetings, in peer-reviewed journals and to study participants.

Trial registration number: Chinese Clinical Trial Registry (ChiCTR2100053637)

Article Summary

Strength and limitations of this study

- The study will provide a structured education and multimodal prehabilitation package for 100 elective surgical patients to optimise their health status before undergoing surgery, allowing them to better withstand the surgical stress and improve their quality of recovery after surgery
- A two-group, parallel, superiority, single-blinded randomised controlled trial will allow for a direct comparison between the intervention and control groups, providing high quality assessment on the effect of patient education and prehabilitation on the quality of preoperative person-centred coordinated care experience
- The exclusion criteria of the study means that it may not be generalisable to other surgical specialities and settings with different structured multimodal prehabilitation programs
- As multimodal prehabilitation is a complex intervention, the exact attribution (%) of patient education video, exercise prehabilitation and nutritional prehabilitation to the overall effect on preoperative person-centred coordinated care experience may be difficult to estimate with the proposed sample size.

INTRODUCTION

Multimodal prehabilitation is an emerging field within the Perioperative Medicine specialty. It includes individualised structured exercises, nutrition counselling and supplementation, and psychological support through standardised multimedia patient education.[1] The goal of multimodal prehabilitation is to optimise the patient's health status in the 4 to 8 weeks before surgery to withstand surgical stress.[1]

Major surgery is associated with a 40% reduction in physiological reserve.[2] Many 'high risk' surgical patients have low physiological reserves from being older, malnourished or frail with multiple comorbidities.[3] These patients also have several modifiable lifestyle factors, such as physical inactivity, obesity, smoking, hazardous alcohol drinking, and poor nutrition.[3] When all these risk factors are combined, its association with the risk of postoperative complications is higher.[3] The interval between diagnosis and hospital admission is an ideal opportunity for promoting behavioural risk modifications for long-term health benefits that goes beyond surgery itself – offering an ideal "teachable moment". Thus, multimodal prehabilitation provides a unique opportunity to optimise the patient's physiological reserve to withstand the surgical stress response.[3]

Most patients (83%) were unfamiliar with the concept of prehabilitation but were interested in participating in such a program after explanation.[4] The primary motivation (62%) for patient participation in prehabilitation programs was to be physically prepared for surgery and most patients (81%) felt supported by the multidisciplinary healthcare team.[5] Our systematic review of 7 randomised controlled trials (726 cardiac surgical patients) showed that physical prehabilitation may improve postoperative functional capacity and slightly shorten the length of hospital stay (Mean Difference: -0.66 days, 95% CI -1.29 to -0.03; I^2 = 45%; low-certainty

evidence).[6] However, none of these studies examined the level of patient-centred coordinated care experience associated with multimodal prehabilitation.

Our systematic review (34 trials, 3742 surgical patients) on patient education formats for reducing perioperative anxiety showed that multimedia formats was associated with increased knowledge more than text, which in turn increased knowledge more than verbal formats.[7] As a component of a cardiac surgical prehabilitation program, our multifaceted patient education program (video and intensive care unit tour for patients and their family members) was associated with higher overall patient and family satisfaction scores, and lower patient anxiety scores.[8]

Significance of the present study

Despite previous studies focusing on the effect of prehabilitation education, there are no local 'prehabilitation videos' available for current patients receiving physical and nutritional prehabilitation before elective surgery. Prehabilitation programs are not widely used in Hong Kong and patient education is usually not standardised across different surgical patients.

Given that multimodal prehabilitation is a complex intervention requiring a high level of coordination between anaesthetists, surgeons, nurses, physiotherapists and dieticians with patients, measurement of the quality of patient-centred coordinated care is essential for quality improvements in Perioperative Medicine. Conceptually, person-centred (patient-centred) coordinated care is when care and support have been guided by and organised effectively around the needs and preferences of individuals.[9] The five domains of person-centred coordinated care include (1) information and communication processes, (2) care planning, (3) transitions (continuity of care), (4) goals and outcomes, and (5) decision-making.[10]

Study Objectives and hypotheses

The primary objective of this randomised controlled trial (RCT) is to evaluate the effect of prehabilitation (patient education video and multimodal prehabilitation) on the preoperative patient-centred coordinated care experience. The secondary objective is to assess the effect of prehabilitation on preoperative anxiety and depression levels, quality of recovery and days alive and at home within 30 days after surgery (DAH_{30}).

The primary hypothesis is that prehabilitation (patient education video and multimodal prehabilitation) is associated with a better patient-centred coordinated care experience than standard care. The secondary hypothesis is that prehabilitation is associated with lower preoperative anxiety and depression levels, higher quality of recovery and higher number of days alive and at home within 30 days after surgery.

METHOD AND ANALYSIS

Study design

The study design is a two-group, parallel, superiority, single-blinded randomised controlled RCT. Patients will be randomised to receive either preoperative patient education comprising of a video and prehabilitation program with standard care (intervention) or standard care (control). Block randomisation with 1:1 allocation will be carried out according to a computer-generated sequence to be performed by one of the authors (AL) not involved in the screening, patient recruitment, clinical care or data collection, using 2019 Power Analysis and Sample Size (PASS) Software (NCSS, LLC. Kaysville, Utah, USA). Sequentially numbered, opaque, sealed envelopes will be used to conceal the sequence until the interventions are assigned at an outpatient preoperative clinic. The study has been designed with reference to the CONsolidated Standards Of Reporting Trials (CONSORT) statement,[11]

and reported according to the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) statement.[12] The trial has been registered on the Chinese Clinical Trials Registry (ChiCTR2100053637). An overview of the study design is provided in Figure 1.

INSERT FIGURE 1 HERE

Study setting and population

The study will be conducted at the Prince of Wales Hospital in Hong Kong, a 1807-bed teaching hospital. Currently, there are approximately 500 adults undergoing major to ultra-major elective surgical procedures performed per month.

Eligibility

Inclusion criteria:

- Adults (>18y old) undergoing major to ultra-major elective surgery cardiac (CABG±valve/valve only) surgery
- Adults (≥50 years) undergoing major colorectal, hepatobiliary-pancreatic or urology surgery
- Primary language is either English or Cantonese
- Prefrail to moderately frail patients with a Clinical Frailty Scale (CFS)[13] of 4-6 at the time of accepting surgery at the outpatient surgical/nurse clinic
- Patients with estimated ≥4 weeks of surgical waiting list time

Exclusion criteria:

- Contraindications for prehabilitation, such as those with cognitive deficits who are unable to comply with study procedures, physical limitations that would preclude

prehabilitation and inability to regularly attend prehabilitation sessions, such as those who are severely frail (CSF 7-9).

Blinding

To minimise measurement bias, study research personnel collecting the outcome measures will not be aware (blinding) of the treatment allocation by another member of research staff. Due to the nature of the intervention and requirements of informed consent, trial participants will not be blinded to the treatment allocation.

Interventions

Control arm: standard care

Patients in the control group will receive the standard preoperative consultations by surgeons and anaesthesiologists. Unstructured information about life style modifications patients can undertake at home, such as exercise and enhanced nutrition, will be given to patients and family members at the discretion of healthcare staff in the usual manner, often on an ad hoc basis. All patients will receive standardised surgical processes and perioperative care under existing protocols. Anaesthesia techniques, postoperative pain management, early postoperative mobilisation and physiotherapy, and postoperative nutrition will follow existing Early Recovery After Surgery (ERAS) protocols where appropriate.

Intervention arm: video and prehabilitation (+ standard care)

Patients randomly allocated to the intervention group will receive the same standard care provided in the control group. They will also view a 10-minute patient education video about prehabilitation before receiving physical prehabilitation with a registered physiotherapist. Participants undergoing major colorectal, hepatobiliary-pancreatic or urology surgery will

also receive nutritional assessment/counselling with a registered dietician. Participants undergoing cardiac surgery will also receive nutritional advice from the physiotherapist during their physical prehabilitation.[14] The prehabilitation will be conducted in the 4 to 8 weeks before elective surgery following existing prehabilitation protocols.

The video will describe the concept and benefits of prehabilitation, the flow of current prehabilitation exercise programs, and basic nutritional information. The patient education video will be in Cantonese, the predominant language used in Hong Kong, but with subtitles in English.

The information covered in the 10-minute video include the following:

1. Introduction to prehabilitation
    - Aims of prehabilitation
    - Benefits of prehabilitation
    - Possible complications and conditions after surgery
2. Exercise in prehabilitation
    - Aims and benefits of exercise in prehabilitation
    - Tests of physical fitness (e.g. six-minute walk test)
    - Structure, contents and methods of prehabilitation
    - Safety measures during training
    - Importance of home exercise
3. Diet in prehabilitation
    - Importance of a healthy diet
    - Components of a healthy diet
    - Strategies to eating well

Components of the physical prehabilitation (1-3 times/week) include the following:

- Warm up activities (5-10 mins)
- Aerobic exercise in the form of walking/running, stepping, arm cycling and leg cycling (training intensity between 40% and 80% of oxygen uptake reserve for 20-30 mins)
- Resistance training for major muscle groups of upper and lower limbs
- Cool down activities (5-10 mins)
- Education on breathing techniques and daily activities
- Re-enforcement of advice on nutrition, smoking cessation and positive psychology support

Outcome measures

Primary outcome

The quality of preoperative healthcare experience from the patient's perspective will be assessed using the Person-Centred Coordinated Care Experience questionnaire (P3CEQ) in both treatment and control groups.[10] The P3CEQ is a valid and reliable measure of patient-centred coordinated care in primary healthcare services in the United Kingdom.[10] The English P3CEQ is a 10-item questionnaire that includes two domains of person-centred and care coordination factors, with a total score ranging from 0 to 30 where a higher score represents better experiences of person-centred care. One optional question about the involvement of family member/carer is not included in the final scoring system as the item exceeded the acceptable missing response threshold (>15%).[10] However, as Confucian family values are important in medical decision-making in the Chinese culture,[15] we will include this question in our scoring system. The English P3CEQ has been translated into Hong Kong Chinese for psychometric validation in another study. The Hong Kong Chinese version will be used on the day before surgery upon hospital admission, which is the

common timepoint shared between the control and intervention groups.

Secondary outcomes

1. Hospital Anxiety and Depression Scale (HADS)

The change in anxiety and depression levels will be measured using the Hong Kong Chinese version of the HADS questionnaire.[16] This is a valid and reliable tool, with seven questions relating to anxiety and seven questions relating to depression.[16] The subscales of anxiety and depression ranges from 0 to 21, with higher scores indicating higher severity of disorder. Patients will be asked to complete the HADS at the time of randomisation. The blinded outcome assessor will ask patients to complete the HADS on the day before surgery upon hospital admission.

2. Quality of Recovery (QoR-15)

The Chinese version of the 15-item Quality of Recovery (QoR-15)[17] will be used on postoperative Day 3. The QoR-15 includes the items measuring pain, physical comfort, physical independence, psychological support and emotional state.[17] The QoR-15 score ranges from 0 to 150 and takes about 3 minutes to complete.[17] The validity (convergent, construct, discriminant), reliability (internal consistency, split-half, test-retest), responsiveness, acceptability and feasibility properties have been well established.[17] A poor symptom state (recovery) after surgery has been defined at a cut-off of <118.[18] Depending on patient's postoperative status, QoR-15 assessment may be deferred if patient is unwell or unavailable when outcome assessor collects the data. QoR-15 assessment will be conducted at a later date after obtaining patient's agreement. The exact date of actual QoR-15 assessment will be recorded by the blinded outcome assessor.

3. Days (alive and) at home within 30 days after surgery (DAH_{30})

The DAH_{30} is a patient-centred, generic outcome measure that will be used to measure the patient's overall recovery profile at 30 days after surgery.[19] DAH_{30} is a composite measure that incorporates the details on postoperative hospital length of stay, discharge to rehabilitation centre or nursing home, hospital readmissions, and postoperative deaths.[19] Half a day difference is considered clinically meaningful.[19] We will extract data from the electronic patient medical record to estimate the DAH_{30}.

Other variables in data collection

Baseline demographic characteristics (age, sex, education level, living at home with family member status) will be recorded at the time of randomisation. From the patient's medical record, we will collect the following data: prehabilitation compliance rate and number of sessions attended in the intervention group, CFS at time of randomisation and before elective surgery, American Society of Anesthesiologists Physical Status Classification,[20] surgical and anaesthetic details, duration of intensive care unit admission, severity of illness using (APACHE II)[21] in critically ill patients requiring postoperative care, predicted mortality risk in cardiac surgical patients (logistic EuroScore),[22] duration of postoperative stay, hospital readmission, hospital discharge destination and vital status (dead/alive) at 30 days after surgery.

Sample size

Group sample sizes of 45 (intervention) and 45 (control) will achieve 80% power to reject the null hypothesis of zero effect size when the population effect size is 0.60 (medium to large effect size) and the significance level (alpha) is 0.050 using a two-sided two-sample equal-variance t-test. To allow for 10% loss to follow-up, we will recruit 50 patients in each arm; total sample of 100.

Statistical methods

Missing data will be checked and imputed using the most common category value for categorical variables or median for continuous variables if there is <10% missing data. Otherwise, multiple imputation techniques will be used. The Shapiro-Wilk's test will be used to check data for normality. Appropriate independent Student's t-test or Mann-Whitney U test will be used appropriately to compared group differences for P3CEQ, QoR-15 and DAH_{30}. The mean difference in HADS scores between groups over time (interaction group*time) will be assessed using the generalised estimating equation with a Gaussian distribution, identify-link function, exchangeable correlation with robust standard errors. Both intention-to-treat and per-protocol analyses will be performed. The two-sided level of significance will be set at P<0.05. SPSS version 27.0 (IBM, Armonk, NY) and Stata version 17.0 (StataCorp, College Station, TX) will be used to performed data analyses.

Monitoring and data management

Study data will be collected and managed using REDCap electronic data capture tools hosted at The Chinese University of Hong Kong.[23,24] REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources.

No interim analysis has been planned. There will be no formal data monitoring committee. However, the study progress and any unanticipated serious adverse events will be reported as part of an annual renewal application for local research ethics committee approval. Anonymised data set will be available after the publication of the completed study, following

the deposition of the dataset into The Chinese University Research Data Repository (https://researchdata.cuhk.edu.hk/).

Patient and public involvement

Patients and the public were not involved in the development of the research question, the design of the study nor did they contribute to the editing of this document for readability or accuracy. Study participants will receive a one-page plain language summary of the results on completion of the study as part of the knowledge translation approach.

Ethics and dissemination

Before obtaining written informed consent, the purpose of the study, procedures, risks and benefits of participation, and the time commitment involved will be explained to eligible patients by study research staff. Patients allocated to the intervention group will be reimbursed for the number of prehabilitation sessions attended to encourage high compliance with the program.

Patients may withdraw from the study without prejudice at any time during the study. Data will be kept confidential on password protected files and computer, and in secure offices of the Department of Anaesthesia and Intensive, with access limited to study research staff. Only group data will be published in a peer-reviewed journal publication. Approval for the project (protocol version 2.0, 21/09/2021) was obtained from The Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee (CREC Ref. No. 2021.518-T). Any protocol modifications will be communicated to the local research ethics committee and clinical trials registry in a timely manner. The study will adhere to local laws, Declaration of Helsinki and institutional policies.

DISCUSSION

With Hong Kong's aging population, the demand for prehabilitation before complex high risk surgical procedures is expected to increase. As far as we are aware, no studies have measured the quality of patient-centred coordinated care associated with prehabilitation programs. The results of this two-group, parallel, superiority, single-blinded randomised controlled trial will enable us to quantify the incremental level of preoperative patient-centred coordinated care with prehabilitation over standard care in adults undergoing a range of major to ultra-major elective surgery. If favourable results are associated with prehabilitation, the video can be distributed to other public hospitals in Hong Kong with prehabilitation programs for wider patient education dissemination. However, a limitation of the study is that it may not be generalisable to other surgical specialities outside our inclusion criteria and in settings with vastly different structured multimodal prehabilitation programs outside Hong Kong. As multimodal prehabilitation is a complex intervention, the exact attribution (%) of patient education video, exercise prehabilitation and nutritional prehabilitation to the overall effect on preoperative person-centred coordinated care experience may be difficult to estimate with the proposed sample size of 100 participants. Nonetheless, the findings will be presented at scientific meetings, in a peer-reviewed journal and to study participants to address the paucity of preoperative patient-centred coordinated care experience studies.

Trial status

The patient recruitment will started in later half of 2022 when the Chinese version of the P3CEQ tool has undergone sufficient psychometrical validations in another study we are currently conducting. We expect patient recruitment and one month of follow-up to be completed by the end of 2023.

Author contributors

The protocol was jointly written by SSYW and AL and was critically reviewed by HHTC, FN, DKWY, MKHW, VNML, WWL, TWCM. All authors were involved in the study concept and design of the study and approved the final version of the manuscript.

ORCID ID

SSY Wong (0000-0002-0071-1721), HHT Cheung (0000-0001-7942-9392), FF Ng (0000-0002-3946-9274), DKW Yau (0000-0003-1314-3679), MKH Wong (0000-0001-9937-0586), VNM Lau (0000-0003-1612-4780), WW Leung (0000-0003-3405-3736), TWC Mak (0000-0002-4516-3124), A Lee (0000-0003-2864-0045)

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Competing Interests

None declared.

References

1. Banugo P, Amoako D. Prehabilitation. *BJA Education* 2017;**17**:401-405.
2. Scheede-Bergdahl C, Minnella EM, Carli F. Multi-modal prehabilitation: addressing the why, when, what, how, who and where next? *Anaesthesia* 2019;**74 Suppl 1**:20-26. doi: 10.1111/anae.14505.
3. Durrand J, Singh SJ, Danjoux G. Prehabilitation. *Clin Med (Lond)* 2019;**19**:458-464. doi: 10.7861/clinmed.2019-0257.
4. Waterland JL, Ismail H, Amin B, *et* al. Patient acceptance of prehabilitation for major surgery: an exploratory survey. *Support Care Cancer* 2021;**29**:779-785. doi: 10.1007/s00520-020-05547-1.
5. Ferreira V, Agnihotram RV, Bergdahl A, *et al.* Maximizing patient adherence to prehabilitation: what do the patients say? *Support Care Cancer* 2018;**26**:2717-2723. doi: 10.1007/s00520-018-4109-1.
6. Yau DKW, Underwood MJ, Joynt GM, *et al*. Effect of preparative rehabilitation on recovery after cardiac surgery: a systematic review. *Ann Phys Rehabil Med* 2021;**64**:101391. doi: 10.1016/j.rehab.2020.03.014.
7. Hounsome J, Lee A, Greenhalgh J, *et al*. A systematic review of information format and timing before scheduled adult surgery for peri-operative anxiety. *Anaesthesia* 2017;**72**:1265-1272. doi: 10.1111/anae.14018.
8. Lai VKW, Ho KM, Wong WT, *et al*. Effect of preoperative education and ICU tour on patient and family satisfaction and anxiety in the intensive care unit after elective cardiac surgery: a randomised controlled trial. *BMJ Qual Saf* 2021;**30**:228-235. doi: 10.1111/anae.14018.
9. Horrell J, Lloyd H, Sugavanam T, *et al*. Creating and facilitating change for Person-Centred Coordinated Care (P3C): The development of the Organisational Change Tool (P3C-OCT). *Health Expect* 2018;**21**:448-456. doi: 10.1111/hex.12631.

10. Lloyd H, Fosh B, Whalley B, *et al*. Validation of the person-centred coordinated care experience questionnaire (P3CEQ). *Int J Qual Health Care* 2019;**31**:506-512. doi: 10.1093/intqhc/mzy212.

11. Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. *BMJ* 2010;**340**:c332–702. doi:10.1136/bmj.c332.

12. Chan AW, Tetzlaff JM, Altman DG, *et al*. SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Ann Intern Med* 2013;**158**:200–7. doi:10.7326/0003-4819-158-3-201302050-00583.

13. Rockwood K, Song X, MacKnight C, *et al*. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;**173**:489-95. doi: 10.1503/cmaj.050051.

14. Yau DKW, Wong MKH, Wong WT, *et al*. PREhabilitation for improving QUality of recovery after ELective cardiac surgery (PREQUEL) study: protocol of a randomised controlled trial. *BMJ Open* 2019;**9**:e027974. doi: 10.1136/bmjopen-2018-027974.

15. Cong Y. Doctor-family-patient relationship: the Chinese paradigm of informed consent. *J Med Philos* 2004;**29**:149-78. doi: 10.1076/jmep.29.2.149.31506.

16. Leung CM, Wing YK, Kwong PK, *et al*. Validation of the Chinese-Cantonese version of the hospital anxiety and depression scale and comparison with the Hamilton Rating Scale of Depression. *Acta Psychiatr Scand* 1999;**100**:456-61. doi: 10.1111/j.1600-0447.1999.tb10897.x.

17. Stark PA, Myles PS, Burke JA. Development and psychometric evaluation of a postoperative quality of recovery score: the QoR-15. *Anesthesiology* 2013;**118**:1332-40. doi: 10.1097/ALN.0b013e318289b84b.

18. Myles PS, Myles DB, Galagher W, *et al*. Minimal clinically important difference for three Quality of Recovery scales. *Anesthesiology* 2016;**125**:39-45. doi: 10.1097/ALN.0000000000001158.

19. Myles PS, Shulman MA, Heritier S, *et al*. Validation of days at home as an outcome measure after surgery: a prospective cohort study in Australia. *BMJ Open* 2017;**7**:e015828. doi: 10.1136/bmjopen-2017-015828.

20. Dripps RD, Lamont A, Eckenhoff JE. The role of anesthesia in surgical mortality. *JAMA* 1961;**178**:261-6. doi: 10.1001/jama.1961.03040420001001.

21. Knaus WA, Draper EA, Wagner DP, *et al.* APACHE II: a severity of disease classification system. *Crit Care Med* 1985;**13**:818–29. doi:10.1097/00003246-198510000-00009.

22. Michel P, Roques F, Nashef SA. Logistic or additive EuroSCORE for high-risk patients? *Eur J Cardiothorac Surg* 2003;**23**:684–7. doi:10.1016/S1010-7940(03)00074-5.

23. Harris PA, Taylor R, Thielke R, *et al*. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;**42**:377-81. doi: 10.1016/j.jbi.2008.08.010.

24. Harris PA, Taylor R, Minor BL, *et al.* The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform* 2019;**95**:103208. doi: 10.1016/j.jbi.2019.103208.

Figure Legends

Figure 1. Patient flow

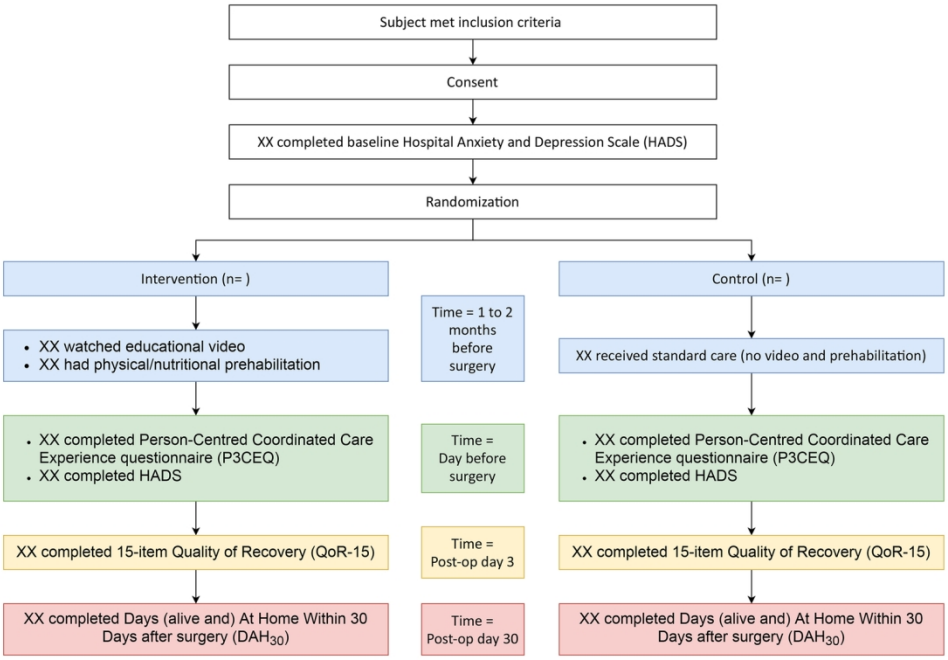

Figure 1. Patient flow

74x52mm (600 x 600 DPI)

SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	Item No	Description	Page
Administrative information			
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry	2,7
	2b	All items from the World Health Organization Trial Registration Data Set	yes
Protocol version	3	Date and version identifier	14
Funding	4	Sources and types of financial, material, and other support	16
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors	16
	5b	Name and contact information for the trial sponsor	n/a
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	n/a
	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	13
Introduction			
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	4-5
	6b	Explanation for choice of comparators	5
Objectives	7	Specific objectives or hypotheses	6
Trial design	8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, noninferiority, exploratory)	6

Methods: Participants, interventions, and outcomes			
Study setting	9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	7
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	7-8
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	8-10
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving/worsening disease)	7
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return, laboratory tests)	14
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	8
Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	10-12
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	Fig 1
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	12
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size	12
Methods: Assignment of interventions (for controlled trials)			
Allocation:			
Sequence generation	16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	6

Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	6
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	6, 8
Blinding (masking)	17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	8
	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	8
Methods: Data collection, management, and analysis			
Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	10-12
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	13
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	13
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	13
	20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	13
	20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation)	13
Methods: Monitoring			
Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	13

	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	13
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	13
Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	13
Ethics and dissemination			
Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval	14
Protocol amendments	25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC/IRBs, trial participants, trial registries, journals, regulators)	14
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	14
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	n/a
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	13-14
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site	16
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	13-14
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	n/a
Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	14
	31b	Authorship eligibility guidelines and any intended use of professional writers	16
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	14
Appendices			

Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates	n/a
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	n/a

*It is strongly recommended that this checklist be read in conjunction with the SPIRIT 2013 Explanation & Elaboration for important clarification on the items. Amendments to the protocol should be tracked and dated. The SPIRIT checklist is copyrighted by the SPIRIT Group under the Creative Commons "Attribution-NonCommercial-NoDerivs 3.0 Unported" license.

BMJ Open

Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: protocol for a randomised controlled trial

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2022-063583.R1
Article Type:	Protocol
Date Submitted by the Author:	25-Aug-2022
Complete List of Authors:	Wong, Sami; The Chinese University of Hong Kong, Faculty of Medicine Cheung, Helen; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Ng, Floria; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Yau, King Wai; The Chinese University of Hong Kong, Anaesthesia and Intensive Care Wong, Man Kin Henry; Prince of Wales Hospital, Anaesthesia and Intensive Care Lau, Vivian; Prince of Wales Hospital, Anaesthesia and Intensive Care Leung, Wing Wa; The Chinese University of Hong Kong, Division of Colorectal Surgery, Department of Surgery Mak, Tony W. C.; The Chinese University of Hong Kong, Division of Colorectal Surgery, Department of Surgery Lee, Anna; The Chinese University of Hong Kong, Anaesthesia and Intensive Care
Primary Subject Heading:	Anaesthesia
Secondary Subject Heading:	Health services research, Patient-centred medicine, Surgery
Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Adult surgery < SURGERY, Adult anaesthesia < ANAESTHETICS

Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: protocol for a randomised controlled trial

Sami Sum Yu WONG[1], Helen Hoi Ting CHEUNG[2], Floria Fung NG[2], Derek King Wai YAU[2], Man Kin Henry WONG[3], Vivian Nga Man LAU[3], Wing Wa LEUNG[4], Tony Wing Chung MAK[4], Anna LEE[2]

[1] Faculty of Medicine, Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

[2] Department of Anaesthesia and Intensive Care, Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

[3] Department of Anaesthesia and Intensive Care, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

[4] Division of Colorectal Surgery, Department of Surgery, Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong SAR, China

Corresponding author: Professor Anna LEE, Department of Anaesthesia and Intensive Care, Office 21, 4/F Main Clinical Block and Trauma Centre, Prince of Wales Hospital, Shatin, N.T., Hong Kong Email: annalee@cuhk.edu.hk Telephone: +852 3505 2735

Category: Study Protocols

MESH terms: Patient Reported Outcome Measures; Patient Satisfaction; Patient Education; Preoperative Care

Word count: 256 (abstract), 2948 (text)

Abstract

Introduction: Multimodal prehabilitation, an emerging field within the Perioperative Medicine specialty, requires close multidisciplinary team coordination. The goal is to optimise the patient's health status in the 4 to 8 weeks before elective surgery to withstand surgical stress. Most patients are unfamiliar with the concept of prehabilitation but are interested in participating in such a program after explanation. The objective of this randomised controlled trial is to evaluate the effect of prehabilitation (patient education video and multimodal prehabilitation) on the preoperative patient-centred coordinated care experience.

Method and analysis: One hundred patients undergoing major elective surgery (cardiac, colorectal, hepatobiliary-pancreatic and urology) will be recruited into a two-group, parallel, superiority, single-blinded randomised controlled trial. Patients will be randomised to receive either preoperative patient education comprising of a video and prehabilitation program with standard care (intervention) or standard care (control). The primary outcome measure will be the quality of preoperative patient care experience using the 11-item Chinese version of the Person Centred Coordinated Care Experience Questionnaire (P3CEQ) before surgery. Secondary outcomes will include the change in Hospital Anxiety and Depression Scale (HADS) score from trial enrolment to before surgery, Quality of Recovery Score (QoR-15) on third day after surgery and Days Alive and At Home within 30 days after Surgery (DAH_{30}). Intention-to-treat and per-protocol analyses will be performed.

Ethics and dissemination: The Joint CUHK-NTEC Clinical Research Ethics Committee approved the study protocol (CREC Ref. No. 2021.518-T). The findings will be presented at scientific meetings, in peer-reviewed journals and to study participants.

Trial registration number: Chinese Clinical Trial Registry (ChiCTR2100053637)

Article Summary

Strength and limitations of this study

- This is a two-group, parallel, superiority, single-blinded randomised controlled trial to examine the effect of patient education and prehabilitation on the quality of preoperative person-centred coordinated care experience
- As patients are not blinded to treatment allocation, performance bias may occur
- Exact attribution (%) of patient education video, exercise prehabilitation and nutritional prehabilitation to the overall effect on preoperative person-centred coordinated care experience may be difficult to estimate with the proposed sample size.

INTRODUCTION

Multimodal prehabilitation is an emerging field within the Perioperative Medicine specialty. It includes individualised structured exercises, nutrition counselling and supplementation, and psychological support through standardised multimedia patient education.[1] The goal of multimodal prehabilitation is to optimise the patient's health status in the 4 to 8 weeks before surgery to withstand surgical stress.[1]

Major surgery is associated with a 40% reduction in physiological reserve.[2] Many 'high risk' surgical patients have low physiological reserves from being older, malnourished or frail with multiple comorbidities.[3] These patients also have several modifiable lifestyle factors, such as physical inactivity, obesity, smoking, hazardous alcohol drinking, and poor nutrition.[3] When all these risk factors are combined, its association with the risk of postoperative complications is higher.[3] The interval between diagnosis and hospital admission is an ideal opportunity for promoting behavioural risk modifications for long-term health benefits that goes beyond surgery itself – offering an ideal "teachable moment". Thus, multimodal prehabilitation provides a unique opportunity to optimise the patient's physiological reserve to withstand the surgical stress response.[3]

In one study, most patients (83%) were unfamiliar with the concept of prehabilitation but were interested in participating in such a program after explanation.[4] The primary motivation (62%) for patient participation in prehabilitation programs was to be physically prepared for surgery and most patients (81%) felt supported by the multidisciplinary healthcare team.[5] Our systematic review of 7 randomised controlled trials (726 cardiac surgical patients) showed that physical prehabilitation may improve postoperative functional capacity and slightly shorten the length of hospital stay (Mean Difference: -0.66 days, 95% CI -1.29 to -

0.03; I^2 = 45%; low-certainty evidence).[6] However, none of these studies examined the level of patient-centred coordinated care experience associated with multimodal prehabilitation.

Our systematic review (34 trials, 3742 surgical patients) on patient education formats for reducing perioperative anxiety showed that multimedia formats were associated with increased knowledge more than text, which in turn increased knowledge more than verbal formats.[7] As a component of a cardiac surgical prehabilitation program, our multifaceted patient education program (video and intensive care unit tour for patients and their family members) was associated with higher overall patient and family satisfaction scores, and lower patient anxiety scores.[8]

Significance of the present study

Despite previous studies focusing on the effect of prehabilitation education, there are no local 'prehabilitation videos' available for current patients receiving physical and nutritional prehabilitation before elective surgery. Prehabilitation programs are not widely used in Hong Kong and patient education is usually not standardised across different surgical patients.

Given that multimodal prehabilitation is a complex intervention requiring a high level of coordination between anaesthetists, surgeons, nurses, physiotherapists and dieticians with patients, measurement of the quality of patient-centred coordinated care is essential for quality improvements in Perioperative Medicine. Conceptually, person-centred (patient-centred) coordinated care is when care and support have been guided by and organised effectively around the needs and preferences of individuals.[9] The five domains of person-centred coordinated care include (1) information and communication processes, (2) care planning, (3) transitions (continuity of care), (4) goals and outcomes, and (5) decision-making.[10]

Study Objectives and hypotheses

The primary objective of this randomised controlled trial (RCT) is to evaluate the effect of prehabilitation (patient education video and multimodal prehabilitation) on the preoperative patient-centred coordinated care experience. The secondary objective is to assess the effect of prehabilitation on preoperative anxiety and depression levels, quality of recovery and days alive and at home within 30 days after surgery (DAH_{30}).

The primary hypothesis is that prehabilitation (patient education video and multimodal prehabilitation) is associated with a better patient-centred coordinated care experience than standard care. The secondary hypothesis is that prehabilitation is associated with lower preoperative anxiety and depression levels, higher quality of recovery and higher number of days alive and at home within 30 days after surgery.

METHOD AND ANALYSIS

Study design

The study design is a single-centre, two-group, parallel, superiority, single-blinded randomised controlled RCT. Patients will be randomised to receive either preoperative patient education comprising of a video and prehabilitation program with standard care (intervention) or standard care (control). Block randomisation with 1:1 allocation will be carried out according to a computer-generated sequence to be performed by one of the authors (AL) not involved in the screening, patient recruitment, clinical care or data collection, using 2019 Power Analysis and Sample Size (PASS) Software (NCSS, LLC. Kaysville, Utah, USA). Sequentially numbered, opaque, sealed envelopes will be used to conceal the sequence until the interventions are assigned at an outpatient preoperative clinic. The study has been designed with reference to the CONsolidated Standards Of

Reporting Trials (CONSORT) statement,[11] and reported according to the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) statement.[12] The trial has been registered on the Chinese Clinical Trials Registry (ChiCTR2100053637). An overview of the study design is provided in Figure 1.

INSERT FIGURE 1 HERE

Study setting and population

The study will be conducted at the Prince of Wales Hospital in Hong Kong, a 1807-bed teaching hospital. Currently, there are approximately 500 adults undergoing major to ultra-major elective surgical procedures performed per month. Patients meeting the inclusion criteria will be recruited.

Eligibility

Inclusion criteria:

- Adults (>18y old) undergoing major to ultra-major elective surgery cardiac (CABG±valve/valve only) surgery
- Adults (≥50 years) undergoing major colorectal, hepatobiliary-pancreatic or urology surgery
- Primary language is either English or Cantonese
- Prefrail to moderately frail patients with a Clinical Frailty Scale (CFS)[13] of 4-6 at the time of being accepted for surgery at the outpatient surgical/nurse clinic
- Patients with estimated ≥4 weeks of surgical waiting list time

Exclusion criteria:

- Contraindications for prehabilitation, such as those with cognitive deficits who are unable to comply with study procedures, physical limitations that would preclude prehabilitation and inability to regularly attend prehabilitation sessions, such as those who are severely frail (CSF 7-9).

Blinding

To minimise measurement bias, study research personnel collecting the outcome measures will not be aware (blinding) of the treatment allocation performed by another member of research staff. Due to the nature of the intervention and requirements of informed consent, trial participants will not be blinded to the treatment allocation.

Interventions

Control arm: standard care

Patients in the control group will receive the standard preoperative consultations by surgeons and anaesthesiologists. Unstructured information about life style modifications patients can undertake at home, such as exercise and enhanced nutrition, will be given to patients and family members at the discretion of healthcare staff in the usual manner, often on an ad hoc basis. All patients will receive standardised surgical processes and perioperative care under existing protocols. Anaesthesia techniques, postoperative pain management, early postoperative mobilisation and physiotherapy, and postoperative nutrition will follow existing Early Recovery After Surgery (ERAS) protocols where appropriate.

Intervention arm: video and prehabilitation (+ standard care)

Patients randomly allocated to the intervention group will receive the same standard care provided in the control group. They will also view a 10-minute patient education video about

prehabilitation before receiving physical prehabilitation with a registered physiotherapist.[14] All participants undergoing major elective surgery will also receive nutritional assessment/counselling with a registered dietician. The prehabilitation will be conducted in the 4 to 8 weeks before elective surgery following existing prehabilitation protocols.

The video will describe the concept and benefits of prehabilitation, the flow of current prehabilitation exercise programs, and basic nutritional information. The patient education video will be in Cantonese, the predominant language used in Hong Kong, but with subtitles in English.

The information covered in the 10-minute video include the following:

1. Introduction to prehabilitation
    - Aims of prehabilitation
    - Benefits of prehabilitation
    - General 'generic' complications and conditions (eg. malnutrition) after surgery
2. Exercise in prehabilitation
    - Aims and benefits of exercise in prehabilitation
    - Tests of physical fitness (e.g. six-minute walk test)
    - Structure, contents and methods of prehabilitation
    - Safety measures during training
    - Importance of home exercise
3. Diet in prehabilitation
    - Importance of a healthy diet
    - Components of a healthy diet
    - Strategies to eating well

Components of the physical prehabilitation (1-3 times/week) include the following:

- Warm up activities (5-10 mins)
- Aerobic exercise in the form of walking/running, stepping, arm cycling and leg cycling (training intensity between 40% and 80% of oxygen uptake reserve for 20-30 mins)
- Resistance training for major muscle groups of upper and lower limbs
- Cool down activities (5-10 mins)
- Education on breathing techniques and daily activities
- Re-enforcement of advice on nutrition, smoking cessation and positive psychological support

Outcome measures

Primary outcome

The quality of preoperative healthcare experience from the patient's perspective will be assessed using the Person-Centred Coordinated Care Experience questionnaire (P3CEQ) in both treatment and control groups.[10] The P3CEQ is a valid and reliable measure of patient-centred coordinated care in primary healthcare services in the United Kingdom.[10] The English P3CEQ is a 10-item questionnaire that includes two domains of person-centred and care coordination factors, with a total score ranging from 0 to 30 where a higher score represents better experiences of person-centred care. One optional question about the involvement of family member/carer is not included in the final scoring system as the item exceeded the acceptable missing response threshold (>15%).[10] However, as Confucian family values are important in medical decision-making in the Chinese culture,[15] we will include this question in our scoring system. The English P3CEQ has been translated into Hong Kong Chinese for psychometric validation in another study (unpublished). The Hong Kong Chinese version will be used on the day before surgery upon hospital admission,

which is the common timepoint shared between the control and intervention groups.

Secondary outcomes

1. Hospital Anxiety and Depression Scale (HADS)

The change in anxiety and depression levels will be measured using the Hong Kong Chinese version of the HADS questionnaire.[16] This is a valid and reliable tool, with seven questions relating to anxiety and seven questions relating to depression.[16] The subscales of anxiety and depression ranges from 0 to 21, with higher scores indicating higher severity of disorder. Patients will be asked to complete the HADS at the time of randomisation. The blinded outcome assessor will ask patients to complete the HADS on the day before surgery upon hospital admission.

2. Quality of Recovery (QoR-15)

The Chinese version of the 15-item Quality of Recovery (QoR-15)[17] will be used on postoperative Day 3. The QoR-15 includes the items measuring pain, physical comfort, physical independence, psychological support and emotional state.[17] The QoR-15 score ranges from 0 to 150 and takes about 3 minutes to complete.[17] The validity (convergent, construct, discriminant), reliability (internal consistency, split-half, test-retest), responsiveness, acceptability and feasibility properties have been well established.[17] A poor symptom state (recovery) after surgery has been defined at a cut-off of <118.[18] Depending on patient's postoperative status, QoR-15 assessment may be deferred if patient is unwell or unavailable when outcome assessor collects the data. QoR-15 assessment will be conducted at a later date after obtaining patient's agreement. The exact date of actual QoR-15 assessment will be recorded by the blinded outcome assessor.

3. Days (alive and) at home within 30 days after surgery (DAH_{30})

The DAH_{30} is a patient-centred, generic outcome measure that will be used to measure the patient's overall recovery profile at 30 days after surgery.[19] DAH_{30} is a composite measure that incorporates the details on postoperative hospital length of stay, discharge to rehabilitation centre or nursing home, hospital readmissions, and postoperative deaths.[19] Half a day difference is considered clinically meaningful.[19] We will extract data from the electronic patient medical record to estimate the DAH_{30}.

Other variables in data collection

Baseline demographic characteristics (age, sex, education level, living at home with family member status) will be recorded at the time of randomisation. From the patient's medical record, we will collect the following data: prehabilitation compliance rate with various elements of prehabilitation and number of sessions attended in the intervention group, CFS at time of randomisation and before elective surgery, American Society of Anesthesiologists Physical Status Classification,[20] surgical and anaesthetic details, duration of intensive care unit admission, severity of illness using (APACHE II)[21] in critically ill patients requiring postoperative care, predicted mortality risk in cardiac surgical patients (logistic EuroScore),[22] duration of postoperative stay, hospital readmission, hospital discharge destination and vital status (dead/alive) at 30 days after surgery.

Sample size

Group sample sizes of 45 (intervention) and 45 (control) will achieve 80% power to reject the null hypothesis of zero effect size when the population effect size is 0.60 (medium to large effect size) and the significance level (alpha) is 0.050 using a two-sided two-sample equal-variance t-test. To allow for 10% loss to follow-up, we will recruit 50 patients in each arm; total sample of 100.

Statistical methods

Missing data will be checked and imputed using the most common category value for categorical variables or median for continuous variables if there is <10% missing data. Otherwise, multiple imputation techniques will be used. The Shapiro-Wilk's test will be used to check data for normality. Appropriate independent Student's t-test or Mann-Whitney U test will be used appropriately to compared group differences for P3CEQ, QoR-15 and DAH_{30}. The mean difference in HADS scores between groups over time (interaction group*time) will be assessed using the generalised estimating equation with a Gaussian distribution, identify-link function, exchangeable correlation with robust standard errors. Both intention-to-treat and per-protocol analyses will be performed. The two-sided level of significance will be set at P<0.05. SPSS version 27.0 (IBM, Armonk, NY) and Stata version 17.0 (StataCorp, College Station, TX) will be used to performed data analyses.

Monitoring and data management

Study data will be collected and managed using REDCap electronic data capture tools hosted at The Chinese University of Hong Kong.[23,24] REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources.

No interim analysis has been planned. There will be no formal data monitoring committee. However, the study progress and any unanticipated serious adverse events will be reported as part of an annual renewal application for local research ethics committee approval. Anonymised data set will be available after the publication of the completed study, following

the deposition of the dataset into The Chinese University Research Data Repository (https://researchdata.cuhk.edu.hk/).

Patient and public involvement

Patients and the public were not involved in the development of the research question, the design of the study nor did they contribute to the editing of this document for readability or accuracy. Study participants will receive a one-page plain language summary of the results on completion of the study as part of the knowledge translation approach.

Ethics and dissemination

Before obtaining written informed consent (Supplementary Material), the purpose of the study, procedures, risks and benefits of participation, and the time commitment involved will be explained to eligible patients by study research staff. The same study research staff will obtain patient's written informed consent to participate at the outpatient preadmission clinics. Patients allocated to the intervention group will be reimbursed for the number of prehabilitation sessions attended to encourage high compliance with the program.

Patients may withdraw from the study without prejudice at any time during the study. Data will be kept confidential on password protected files and computer, and in secure offices of the Department of Anaesthesia and Intensive Care, with access limited to study research staff. Only group data will be published in a peer-reviewed journal publication. Approval for the project (protocol version 2.0, 21/09/2021) was obtained from The Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee (CREC Ref. No. 2021.518-T). Any protocol modifications will be communicated to the local research ethics committee and clinical trials registry in a timely manner. The study will adhere to local laws, Declaration of Helsinki and institutional policies.

DISCUSSION

With Hong Kong's aging population, the demand for prehabilitation before complex high risk surgical procedures is expected to increase. Our development of a prehabilitation video was based upon our previous positive experience with a multifaceted preoperative patient education program[8] and recent findings from qualitative studies measuring patients' and caregivers' perspectives of important elements in prehabilitation.[25,26] Videos taken in real environment with clear explanations about the prehabilitation and expected postoperative recovery processes were common priorities identified in both studies.[25, 26] Prehabilitation could improve patient satisfaction through enhanced and continuous engagement with and support from healthcare providers during the presurgical period.[25] As far as we are aware, no studies have measured the quality of patient-centred coordinated care associated with prehabilitation programs.

The results of this two-group, parallel, superiority, single-blinded randomised controlled trial will enable us to quantify the incremental level of preoperative patient-centred coordinated care with prehabilitation over standard care in adults undergoing a range of major to ultra-major elective surgery. If favourable results are associated with prehabilitation, the video can be distributed to other public hospitals in Hong Kong with prehabilitation programs for wider patient education dissemination. However, a limitation of the study is that it may not be generalisable to other surgical specialities outside our inclusion criteria and in settings with vastly different structured multimodal prehabilitation programs outside Hong Kong. As multimodal prehabilitation is a complex intervention, the exact attribution (%) of patient education video, exercise prehabilitation and nutritional prehabilitation to the overall effect on preoperative person-centred coordinated care experience may be difficult to estimate with the proposed sample size of 100 participants. Nonetheless, the findings will be presented at

scientific meetings, in a peer-reviewed journal and to study participants to address the paucity of preoperative patient-centred coordinated care experience studies.

Trial status

Patient recruitment will started in mid-2023 after the Chinese version of the P3CEQ tool has undergone sufficient psychometrical validations in another study we are currently conducting. We expect patient recruitment and one month of follow-up to be completed by the end of 2024.

Author contributions

The prehabilitation video described in this manuscript was developed and produced by SSYW, HHTC, DKWY, MKHW, VNML, WWL and AL. The protocol was jointly written by SSYW and AL and was critically reviewed by HHTC, FN, DKWY, MKHW, VNML, WWL, TWCM. All authors were involved in the study concept and design of the study and approved the final version of the manuscript.

ORCID ID

SSY Wong (0000-0002-0071-1721), HHT Cheung (0000-0001-7942-9392), FF Ng (0000-0002-3946-9274), DKW Yau (0000-0003-1314-3679), MKH Wong (0000-0001-9937-0586), VNM Lau (0000-0003-1612-4780), WW Leung (0000-0003-3405-3736), TWC Mak (0000-0002-4516-3124), A Lee (0000-0003-2864-0045)

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Competing Interests

None declared.

References

1. Banugo P, Amoako D. Prehabilitation. *BJA Education* 2017;**17**:401-405.
2. Scheede-Bergdahl C, Minnella EM, Carli F. Multi-modal prehabilitation: addressing the why, when, what, how, who and where next? *Anaesthesia* 2019;**74 Suppl 1**:20-26. doi: 10.1111/anae.14505.
3. Durrand J, Singh SJ, Danjoux G. Prehabilitation. *Clin Med (Lond)* 2019;**19**:458-464. doi: 10.7861/clinmed.2019-0257.
4. Waterland JL, Ismail H, Amin B, *et* al. Patient acceptance of prehabilitation for major surgery: an exploratory survey. *Support Care Cancer* 2021;**29**:779-785. doi: 10.1007/s00520-020-05547-1.
5. Ferreira V, Agnihotram RV, Bergdahl A, *et al.* Maximizing patient adherence to prehabilitation: what do the patients say? *Support Care Cancer* 2018;**26**:2717-2723. doi: 10.1007/s00520-018-4109-1.
6. Yau DKW, Underwood MJ, Joynt GM, *et al*. Effect of preparative rehabilitation on recovery after cardiac surgery: a systematic review. *Ann Phys Rehabil Med* 2021;**64**:101391. doi: 10.1016/j.rehab.2020.03.014.
7. Hounsome J, Lee A, Greenhalgh J, *et al*. A systematic review of information format and timing before scheduled adult surgery for peri-operative anxiety. *Anaesthesia* 2017;**72**:1265-1272. doi: 10.1111/anae.14018.
8. Lai VKW, Ho KM, Wong WT, *et al*. Effect of preoperative education and ICU tour on patient and family satisfaction and anxiety in the intensive care unit after elective cardiac surgery: a randomised controlled trial. *BMJ Qual Saf* 2021;**30**:228-235. doi: 10.1111/anae.14018.
9. Horrell J, Lloyd H, Sugavanam T, *et al*. Creating and facilitating change for Person-Centred Coordinated Care (P3C): The development of the Organisational Change Tool (P3C-OCT). *Health Expect* 2018;**21**:448-456. doi: 10.1111/hex.12631.

10. Lloyd H, Fosh B, Whalley B, *et al*. Validation of the person-centred coordinated care experience questionnaire (P3CEQ). *Int J Qual Health Care* 2019;**31**:506-512. doi: 10.1093/intqhc/mzy212.

11. Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 Statement: updated guidelines for reporting parallel group randomised trials. *BMJ* 2010;**340**:c332–702. doi:10.1136/bmj.c332.

12. Chan AW, Tetzlaff JM, Altman DG, *et al*. SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Ann Intern Med* 2013;**158**:200–7. doi:10.7326/0003-4819-158-3-201302050-00583.

13. Rockwood K, Song X, MacKnight C, *et al*. A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;**173**:489-95. doi: 10.1503/cmaj.050051.

14. Yau DKW, Wong MKH, Wong WT, *et al*. PREhabilitation for improving QUality of recovery after ELective cardiac surgery (PREQUEL) study: protocol of a randomised controlled trial. *BMJ Open* 2019;**9**:e027974. doi: 10.1136/bmjopen-2018-027974.

15. Cong Y. Doctor-family-patient relationship: the Chinese paradigm of informed consent. *J Med Philos* 2004;**29**:149-78. doi: 10.1076/jmep.29.2.149.31506.

16. Leung CM, Wing YK, Kwong PK, *et al*. Validation of the Chinese-Cantonese version of the hospital anxiety and depression scale and comparison with the Hamilton Rating Scale of Depression. *Acta Psychiatr Scand* 1999;**100**:456-61. doi: 10.1111/j.1600-0447.1999.tb10897.x.

17. Stark PA, Myles PS, Burke JA. Development and psychometric evaluation of a postoperative quality of recovery score: the QoR-15. *Anesthesiology* 2013;**118**:1332-40. doi: 10.1097/ALN.0b013e318289b84b.

18. Myles PS, Myles DB, Galagher W, *et al*. Minimal clinically important difference for three Quality of Recovery scales. *Anesthesiology* 2016;**125**:39-45. doi: 10.1097/ALN.0000000000001158.

19. Myles PS, Shulman MA, Heritier S, *et al*. Validation of days at home as an outcome measure after surgery: a prospective cohort study in Australia. *BMJ Open* 2017;**7**:e015828. doi: 10.1136/bmjopen-2017-015828.

20. Dripps RD, Lamont A, Eckenhoff JE. The role of anesthesia in surgical mortality. *JAMA* 1961;**178**:261-6. doi: 10.1001/jama.1961.03040420001001.

21. Knaus WA, Draper EA, Wagner DP, *et al.* APACHE II: a severity of disease classification system. *Crit Care Med* 1985;**13**:818–29. doi:10.1097/00003246-198510000-00009.

22. Michel P, Roques F, Nashef SA. Logistic or additive EuroSCORE for high-risk patients? *Eur J Cardiothorac Surg* 2003;**23**:684–7. doi:10.1016/S1010-7940(03)00074-5.

23. Harris PA, Taylor R, Thielke R, *et al*. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;**42**:377-81. doi: 10.1016/j.jbi.2008.08.010.

24. Harris PA, Taylor R, Minor BL, *et al.* The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform* 2019;**95**:103208. doi: 10.1016/j.jbi.2019.103208.

25. Gillis C, Gill M, Gramlich L, *et al*. Patients' perspectives of prehabilitation as an extension of Enhanced Recovery After Surgery protocols. *Can J Surg* 2021;**64**:E578-E587. doi: 10.1503/cjs.014420.

26. Reid H, Mohammadi S, Watson W, *et al*. Patient and caregiver perspectives on an eHealth tool: a qualitative investigation of preferred formats, features and characteristics of a presurgical eHealth education module. *Rehabil Process Outcome* 2021;**10**:11795727211010501. doi: 10.1177/11795727211010501.

Figure Legends

Figure 1. Patient flow

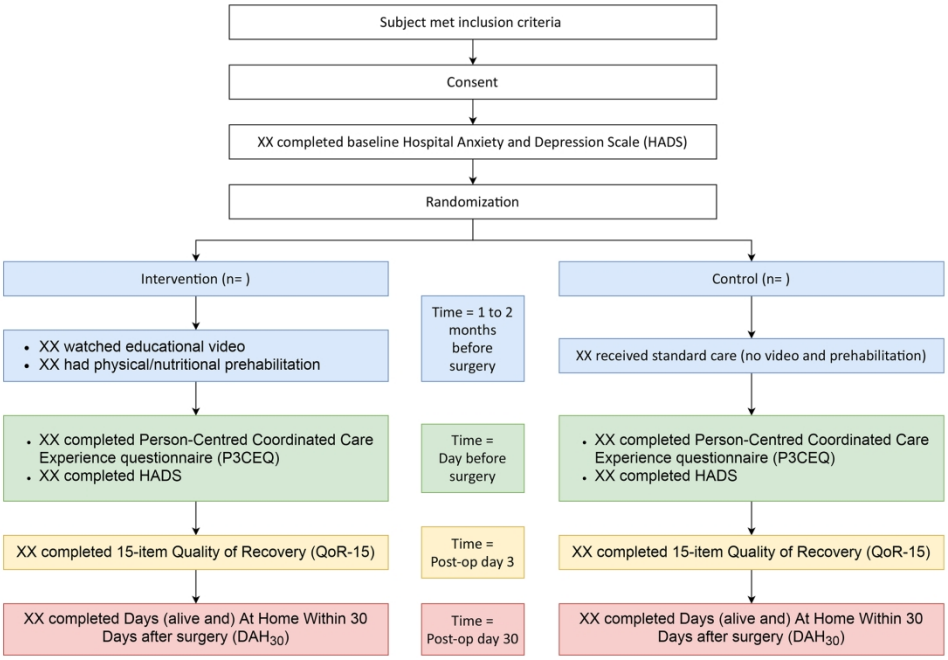

Figure 1. Patient flow

Version 3 (12.10.2021)
Patient version Participant No.:_____

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Department of Anaesthesia and Intensive Care
The Chinese University of Hong Kong

Title of Study

Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: a randomized controlled trial

Background

Multimodal prehabilitation includes individualized structured exercises, nutrition counselling and supplementation, and psychological support through standardized multimedia patient education. The goal of multimodal prehabilitation is to optimize your health status in the 4 to 8 weeks before surgery to better cope with the stress of your upcoming surgery. However, there are no local 'prehabilitation videos' available for patients like yourself to help you understand the benefits of and process of prehabilitation as part of the psychological component of prehabilitation.

Multimodal prehabilitation requires a high level of coordination between anaesthetists, surgeons, nurses, physiotherapists and dieticians with patients to provide quality care while you wait for your surgery. Therefore, you are invited to participate in this study to help assess whether the level of patient-centred coordinated prehabilitation care is higher than standard care (no prehabilitation) before surgery.

The objective of this study

1. To evaluate the effect of prehabilitation (patient education video and multimodal prehabilitation) on the preoperative patient-centred coordinated care experience
2. To assess the effect of prehabilitation on preoperative anxiety and depression levels, quality of recovery and DAH_{30} (days alive and at home within 30 days after surgery)

Procedures

The research assistants/research investigators/nurse will explain the risks and benefits of the study to you before surgery. Written informed consent will be obtained from you.

If you agree to participate, you will be randomized (this means you will have an equal chance of being in one or other of the groups) to either:

- Group 1 (patient education by a 10-minute video and prehabilitation program) or
- Group 2 (the current standard of care).

This means that you will have a 1 in 2 chance of receiving formal patient education by video and joining the prehabilitation program. If you are assigned to Group 1, the video education will take place (you will be watching the video while waiting on your pre-operative assessment clinic at the Day Surgery Center) before the prehabilitation program that will take place during the 4-8 weeks before your surgery. The prehabilitation program will take place 4-8 weeks before your surgery, depending on your availabilities, current clinical schedule and needs assessment made by physiotherapists and dieticians. The research staff will also collect information already entered into your medical record.

Before being allocated to either Group 1 or Group 2, you will be asked to complete a valid and reliable questionnaire "Hospital Anxiety and Depression Score" (HADS) to assess your baseline anxiety and depression levels. This will take about 5 to 10 minutes to do.

On the day before surgery, you will be asked to complete an 11-item validated and reliable questionnaire "Person-Centred Coordinated Care Experience questionnaire (P3CEQ)" to assess the quality of your preoperative healthcare experience. You will also be asked to repeat the HADS questionnaire so that we can measure a change, if any, of your anxiety and depression levels. In total, this will take about 15 to 20 minutes to do.

On the third day after surgery, you will be invited to complete a 15-item valid and reliable questionnaire "Quality of Recovery" (QoR-15) to measure your pain, physical comfort, physical independence, psychological support and emotional state. This assessment can be deferred if you are unwell or unavailable. This will take about 10 minutes to do.

Benefits

There will be no direct benefits to you from participating in the study. The results of this study may highlight aspects of multimodal prehabilitation that may be deficient, for targeting quality health services improvement in future patients undergoing major elective surgery.

Risks

There is no additional risk if you participate in the study.

Ethical Approval

This study has been approved by the Joint Chinese University of Hong Kong – New Territories East Cluster Clinical Research Ethics Committee (NTEC-CUHK Cluster REC/IRB) (phone: 3505-3935).

Confidentiality

All information obtained in this study will be considered confidential and used only for research purposes. Your identity will be kept confidential in so far as the law allows. NTEC-CUHK Cluster REC/IRB is one of the authorized parties to access your records related to the study for ethics review purpose. All electronic data will be deleted 7 years after publication of research papers.

Questions

The researcher has discussed with you and offered to answer your questions. If you have further questions, you can contact research nurse Ms Floria NG (project co-coordinator) or Professor Anna LEE (principle investigator) on 3505 2735.

Right to refuse or withdraw

You understand that to participate or not in the study is voluntary, and will not affect the medical management you will receive. You also understand you have the right to withdraw from the study anytime, if you wish to do so.

Version 3 (12.10.2021)
Patient version Participant No.:_____

香港中文大學
麻醉及深切治療學系

病人參與研究同意書

研究主題

一項隨機對照以病人教育短片及手術前復健計劃對術前以人為中心的協調護理體驗質量影響的試驗

研究背景

手術前多模式復健計劃是提供標準多元化的病人教育，項目包括個人化的鍛煉計劃、營養輔導、營養補充和心理支援。手術前多模式復健的目標是利用手術前 4 至 8 週的時間改善您的健康狀況，以應付未來手術的壓力。但是，手術前復健的心理因素部份上，現時仍未有本地的“復健短片”提供給您這類手術的病人，讓你們理解手術前復健的好處及過程。

在您等待手術期間，能提供優質護理服務的多模式復健計劃需要麻醉科醫生、外科醫生、護士、物理治療師和營養師與患者之間的高度協調。因此，我們邀請您參與本研究，以幫助評估以病人為中心的協調護理復健計劃水平是否高於沒有復健訓練的標準護理。

研究目標

1. 評估復健訓練（病人教育短片和多模式復健訓練）對術前以病人為中心的協調護理體驗的影響
2. 評估復健訓練對術前焦慮和抑鬱水平、恢復質量以及 DAH30（術後 30 天內在家存活日數）的影響

程序

研究人員/研究助理/護士將在手術前向您解釋研究的風險和益處並將獲得您的書面知情同意書。

如果您同意參與，您將被隨機分配（即您有同等機會）進入以下兩組中的其中一組：

- 第 1 組（一個 10 分鐘的病人教育短片和術前復健計劃）或
- 第 2 組（一般的標準護理服務）。

這意味您將有二分之一的機會接受我們提供的病人教育，包括短片和參加術前復健計劃。如果您被分配到第 1 組，手術前的 4-8 週期間您首先會觀看教育短片（您將在日間手術中心等待術前評估時觀看短片）然後才進行術前復健計劃。術前復健計劃將於您手術前 4 至 8 週進行，具體取決於您的當前時間表以及物理治療師和營養師所做的需求評估。研究人員還會收集您的醫療記錄。

被分配到第 1 組或第 2 組之前，您需要完成一份“醫院焦慮和抑鬱評分”（HADS）問卷，以評估您的基線焦慮和抑鬱水平。這需要大約 5 到 10 分鐘完成。

手術前一天，您需要完成一份 "以人為中心的協調護理之體驗水平" （P3CEQ）問卷，以評估您的術前醫療體驗質量。您仍需要重複 HADS 問卷，以便我們可以衡量您的焦慮和抑鬱水平變化的可能。這總共需要大約 15 到 20 分鐘完成。

手術後第三天，您需要完成另一份"恢復質量"（QoR-15）問卷，以衡量您的疼痛、身體舒適度、身體獨立性、心理支持和情緒狀態。這需要約 10 分鐘完成。如果您身體不適或沒法填寫，此評估可以推遲。

利益
您不會因為參與這項研究而得到任何直接益處。這項研究的結果可能突顯現時手術前多模式復健過程中存在的不足，使我們可改善醫療服務的質量，讓將來接受擇期手術的病人受惠。

風險
上述的評估和問卷調查不會有任何額外的風險。

倫理審核
此項研究已獲得香港中文大學-新界東醫院聯網臨床研究倫理聯席委員會批准(電話: 3505-3935)。

保密
由此項研究獲取的所有資料將被視為機密，只作研究用途。我們會依據法律保障保密處理您的個人資料。 香港中文大學 - 新界東醫院聯網臨床倫理聯席委員會是其中一個部門有權以倫理審查為用途而接觸您有關這項研究的紀錄。所有電子數據將在研究論文發表 7 年後刪除。

問題
研究員已和您討論並回答您的問題。若有其它疑問，您可致電 3505-2735 聯絡 Ms. Floria Ng (研究協調員)或李煥坤教授(研究負責人)。您亦可以選擇致電 3505-3935 聯絡香港中文大學 - 新界東醫院聯網臨床研究倫理聯席委員會查詢您在這項研究的權利。

拒絕參加及退出的權利
參加與否純屬自願，任何決定也不會影響您將獲得的醫療服務。您有權隨時退出此研究。

Version 2 (21.9.2021)
Patient version Participant No.:_____

Department of Anaesthesia and Intensive Care
The Chinese University of Hong Kong
香港中文大學
麻醉及深切治療學系

Title of Study
Effect of a patient education video and prehabilitation on the quality of preoperative person-centred coordinated care experience: a randomized controlled trial

研究主題
一項隨機對照以病人教育短片及手術前復健計劃對術前以人為中心的協調護理體驗質量影響的試驗

Consent
I agree to participate in this study. I have read the information provided and understand the explanation that has been given to me.

同意書
我已閱讀所提供資料，並瞭解一切向我所說明的解釋，我同意參加這項研究。

……	……
Name of participant 參加者姓名	Name of research assistant/investigator/nurse 研究助理/研究員/護士 姓名
……	……
參加者簽署 signature of participant	研究助理/研究員/護士 簽署 signature of research assistant/investigator/nurse
……	……
Date 日期	Date 日期

Patient Details (Gum Label)

SPIRIT 2013 Checklist: Recommended items to address in a clinical trial protocol and related documents*

Section/item	Item No	Description	Page
Administrative information			
Title	1	Descriptive title identifying the study design, population, interventions, and, if applicable, trial acronym	1
Trial registration	2a	Trial identifier and registry name. If not yet registered, name of intended registry	2,7
	2b	All items from the World Health Organization Trial Registration Data Set	yes
Protocol version	3	Date and version identifier	14
Funding	4	Sources and types of financial, material, and other support	17
Roles and responsibilities	5a	Names, affiliations, and roles of protocol contributors	16
	5b	Name and contact information for the trial sponsor	n/a
	5c	Role of study sponsor and funders, if any, in study design; collection, management, analysis, and interpretation of data; writing of the report; and the decision to submit the report for publication, including whether they will have ultimate authority over any of these activities	n/a
	5d	Composition, roles, and responsibilities of the coordinating centre, steering committee, endpoint adjudication committee, data management team, and other individuals or groups overseeing the trial, if applicable (see Item 21a for data monitoring committee)	13
Introduction			
Background and rationale	6a	Description of research question and justification for undertaking the trial, including summary of relevant studies (published and unpublished) examining benefits and harms for each intervention	4-5
	6b	Explanation for choice of comparators	5
Objectives	7	Specific objectives or hypotheses	6
Trial design	8	Description of trial design including type of trial (eg, parallel group, crossover, factorial, single group), allocation ratio, and framework (eg, superiority, equivalence, noninferiority, exploratory)	6

Methods: Participants, interventions, and outcomes			
Study setting	9	Description of study settings (eg, community clinic, academic hospital) and list of countries where data will be collected. Reference to where list of study sites can be obtained	7
Eligibility criteria	10	Inclusion and exclusion criteria for participants. If applicable, eligibility criteria for study centres and individuals who will perform the interventions (eg, surgeons, psychotherapists)	7-8
Interventions	11a	Interventions for each group with sufficient detail to allow replication, including how and when they will be administered	8-10
	11b	Criteria for discontinuing or modifying allocated interventions for a given trial participant (eg, drug dose change in response to harms, participant request, or improving/worsening disease)	7-8
	11c	Strategies to improve adherence to intervention protocols, and any procedures for monitoring adherence (eg, drug tablet return, laboratory tests)	14
	11d	Relevant concomitant care and interventions that are permitted or prohibited during the trial	8
Outcomes	12	Primary, secondary, and other outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome. Explanation of the clinical relevance of chosen efficacy and harm outcomes is strongly recommended	10-12
Participant timeline	13	Time schedule of enrolment, interventions (including any run-ins and washouts), assessments, and visits for participants. A schematic diagram is highly recommended (see Figure)	Fig 1
Sample size	14	Estimated number of participants needed to achieve study objectives and how it was determined, including clinical and statistical assumptions supporting any sample size calculations	12
Recruitment	15	Strategies for achieving adequate participant enrolment to reach target sample size	12
Methods: Assignment of interventions (for controlled trials)			
Allocation:			
Sequence generation	16a	Method of generating the allocation sequence (eg, computer-generated random numbers), and list of any factors for stratification. To reduce predictability of a random sequence, details of any planned restriction (eg, blocking) should be provided in a separate document that is unavailable to those who enrol participants or assign interventions	6

Allocation concealment mechanism	16b	Mechanism of implementing the allocation sequence (eg, central telephone; sequentially numbered, opaque, sealed envelopes), describing any steps to conceal the sequence until interventions are assigned	6
Implementation	16c	Who will generate the allocation sequence, who will enrol participants, and who will assign participants to interventions	6, 8
Blinding (masking)	17a	Who will be blinded after assignment to interventions (eg, trial participants, care providers, outcome assessors, data analysts), and how	8
	17b	If blinded, circumstances under which unblinding is permissible, and procedure for revealing a participant's allocated intervention during the trial	8
Methods: Data collection, management, and analysis			
Data collection methods	18a	Plans for assessment and collection of outcome, baseline, and other trial data, including any related processes to promote data quality (eg, duplicate measurements, training of assessors) and a description of study instruments (eg, questionnaires, laboratory tests) along with their reliability and validity, if known. Reference to where data collection forms can be found, if not in the protocol	10-12
	18b	Plans to promote participant retention and complete follow-up, including list of any outcome data to be collected for participants who discontinue or deviate from intervention protocols	13
Data management	19	Plans for data entry, coding, security, and storage, including any related processes to promote data quality (eg, double data entry; range checks for data values). Reference to where details of data management procedures can be found, if not in the protocol	13
Statistical methods	20a	Statistical methods for analysing primary and secondary outcomes. Reference to where other details of the statistical analysis plan can be found, if not in the protocol	13
	20b	Methods for any additional analyses (eg, subgroup and adjusted analyses)	13
	20c	Definition of analysis population relating to protocol non-adherence (eg, as randomised analysis), and any statistical methods to handle missing data (eg, multiple imputation)	13
Methods: Monitoring			
Data monitoring	21a	Composition of data monitoring committee (DMC); summary of its role and reporting structure; statement of whether it is independent from the sponsor and competing interests; and reference to where further details about its charter can be found, if not in the protocol. Alternatively, an explanation of why a DMC is not needed	13

	21b	Description of any interim analyses and stopping guidelines, including who will have access to these interim results and make the final decision to terminate the trial	13
Harms	22	Plans for collecting, assessing, reporting, and managing solicited and spontaneously reported adverse events and other unintended effects of trial interventions or trial conduct	13
Auditing	23	Frequency and procedures for auditing trial conduct, if any, and whether the process will be independent from investigators and the sponsor	13
Ethics and dissemination			
Research ethics approval	24	Plans for seeking research ethics committee/institutional review board (REC/IRB) approval	14
Protocol amendments	25	Plans for communicating important protocol modifications (eg, changes to eligibility criteria, outcomes, analyses) to relevant parties (eg, investigators, REC/IRBs, trial participants, trial registries, journals, regulators)	14
Consent or assent	26a	Who will obtain informed consent or assent from potential trial participants or authorised surrogates, and how (see Item 32)	14
	26b	Additional consent provisions for collection and use of participant data and biological specimens in ancillary studies, if applicable	n/a
Confidentiality	27	How personal information about potential and enrolled participants will be collected, shared, and maintained in order to protect confidentiality before, during, and after the trial	13-14
Declaration of interests	28	Financial and other competing interests for principal investigators for the overall trial and each study site	17
Access to data	29	Statement of who will have access to the final trial dataset, and disclosure of contractual agreements that limit such access for investigators	13-14
Ancillary and post-trial care	30	Provisions, if any, for ancillary and post-trial care, and for compensation to those who suffer harm from trial participation	n/a
Dissemination policy	31a	Plans for investigators and sponsor to communicate trial results to participants, healthcare professionals, the public, and other relevant groups (eg, via publication, reporting in results databases, or other data sharing arrangements), including any publication restrictions	14
	31b	Authorship eligibility guidelines and any intended use of professional writers	16
	31c	Plans, if any, for granting public access to the full protocol, participant-level dataset, and statistical code	14
Appendices			

Informed consent materials	32	Model consent form and other related documentation given to participants and authorised surrogates	Supp file
Biological specimens	33	Plans for collection, laboratory evaluation, and storage of biological specimens for genetic or molecular analysis in the current trial and for future use in ancillary studies, if applicable	n/a

*It is strongly recommended that this checklist be read in conjunction with the SPIRIT 2013 Explanation & Elaboration for important clarification on the items. Amendments to the protocol should be tracked and dated. The SPIRIT checklist is copyrighted by the SPIRIT Group under the Creative Commons "Attribution-NonCommercial-NoDerivs 3.0 Unported" license.