Title

Diabetes in the Surgical patient- place for Prehab intervention?

Introduction

Around 8 million procedures are performed in the UK with 10-15% of patients having diabetes. These patients are subjected to greater numbers of complications and length of stays. Furthermore, as the population of the UK ages, the likelihood of patients presenting for major oncological surgery while also having either type 1 or type 2 diabetes (T2D) increases, implying an overall greater mortality when compared to those without diabetes.

We identified that a number of patients referred to our Surgical Prehabilitation Service suffering from T2D. We explored whether we could offer a multimodal, targeted intervention to make a significant impact on their T2D management. This is particularly relevant in patients presenting for expedited surgery which does not allow time for traditional interventions to have a clinical impact.

We hypothesised that supervised exercise and dietary changes in T2D oncology patients awaiting elective surgery would improve their diabetes management in a short period of time.

Methods

Oncological patients referred to our Surgical Prehabilitation Service for optimization before elective surgery who suffered from T2D were offered to enrol in our Prehabilitation Programme.

We measure glycosylated haemoglobin (HbA1c) before and after Prehabilitation to assess changes in diabetes management.

The dietary approach included our usual counselling; 1) cutting down on processed foods, 2) reaching a minimum daily protein intake of 1.5 g/kg of ideal body weight, and as a novelty we asked patients to consider 3) an *ad libitum* low-carbohydrate high-fat diet. To provide support for the later, we explained patients how to detect high-carbohydrate sources.

Patients also performed 2-3 30-minute interval training sessions per week on a cycle ergometer at our Surgical Prehabilitation Service. Patients were offered anxiety coping strategies at group sessions as part of the Prehabilitation Programme.

Results

Four oncology male patients with T2D referred to the our Surgical Prehabilitation Service for optimization before elective surgery accepted to adopt some dietary changes in form

of carbohydrate restriction. After an average span of 7 weeks, HbA1c (Figure 1) and BMI showed reductions (Table 1).

Conclusion

There was demonstrable HbA1c improvement in our 4 male oncological patients awaiting elective surgery. These improvements were observed in as short as 5 weeks and allowed patients to eat to satiety while only reducing high-carbohydrate foods intake. Currently, we continue recruiting eligible patients to further assess the reproducibility of our approach.
More focussed studies are required for establishing the efficacy of Prehabilitation interventions on T2D patients.

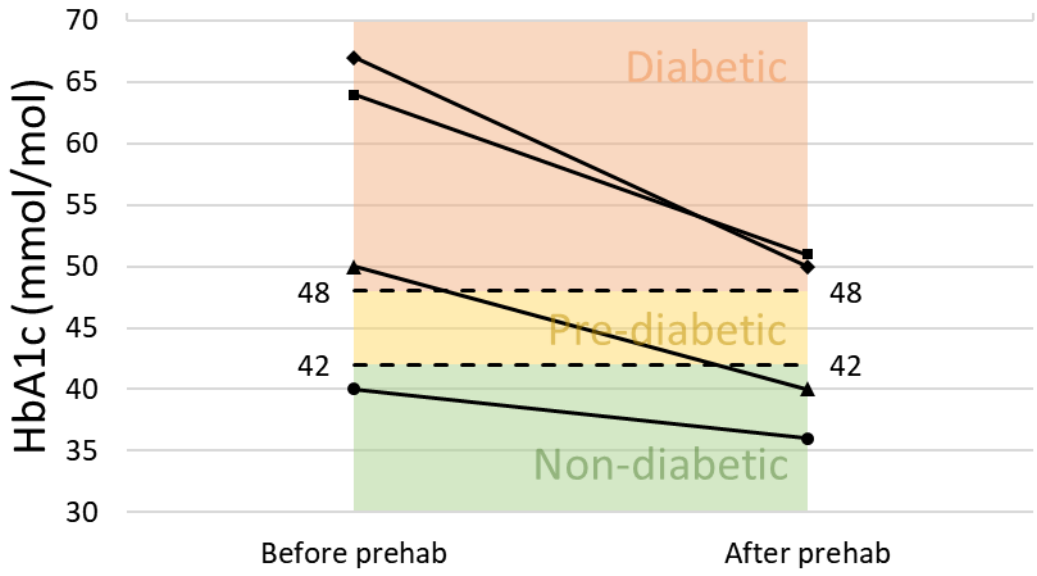

Figure 1. Individual changes in glycosylated haemoglobin (HbA1c) from pre- to post-prehabilitation

	Pre-prehabilitation			Post-prehabilitation		
	Mean	Range		Mean	Range	
		Min	Max		Min	Max
Age (years)	68	59	79	-	-	-
Weight (kg)	115.9	99.0	125.5	108.8	97.4	117.0
BMI (kg/m^2)	38.5	34.3	41.1	36.2	33.7	39.1
HbA1c (mmol/mol)	55	40	67	43	34	51
Prehab time (weeks)	-	-	-	7	5	8

Table 1. Pre- and post-prehabilitation data

Nutritional Prehabilitation at University Hospital Southampton

Introduction:
The National Institute of Clinical Excellence (NICE) acknowledge that malnourished patients have 3x risk of complications and 4x risk of death from surgery than well-nourished patients[1]. It is estimated that 24-65% of patients undergoing surgery are malnourished [2]. There are several randomised control trials and meta-analyses that demonstrate preoperative nutrition in malnourished patients can reduce postoperative morbidity by 20%[3]. With this in mind, University Hospital Southampton (UHS) have encompassed screening and treatment of malnutrition into Fit for Surgery School (F4SS). F4SS is an educational session which patients attend on average one month prior to surgery with the aim of improving modifiable risk factors and reducing surgical complications.

Methods:
Between August 2017 to 2018, patients who attended F4SS completed a modified Malnutrition Universal Screen Tool consisting of weight, BMI and percentage weight loss. All patients at high risk of malnutrition were assessed and treated by a dietitian. High risk was considered as >5% weight loss in the last 6-9 months, BMI <20 kg/m^2 or a reduced appetite.

Results:
27% of 266 patients screened were at high risk of malnutrition. 86% had lost significant weight and 61% had a reduced appetite. Figure 1 shows that Hepatopancreaticobiliary had the highest frequency of malnutrition. Only 15% of patients identified at high risk of malnutrition were already known to a Dietitian. Overall, 34% of patients received dietetic input. Of these, 26% received specialist dietetic advice, 31% required nutritional supplements and 40% were referred to the appropriate dietitian for ongoing nutritional support.

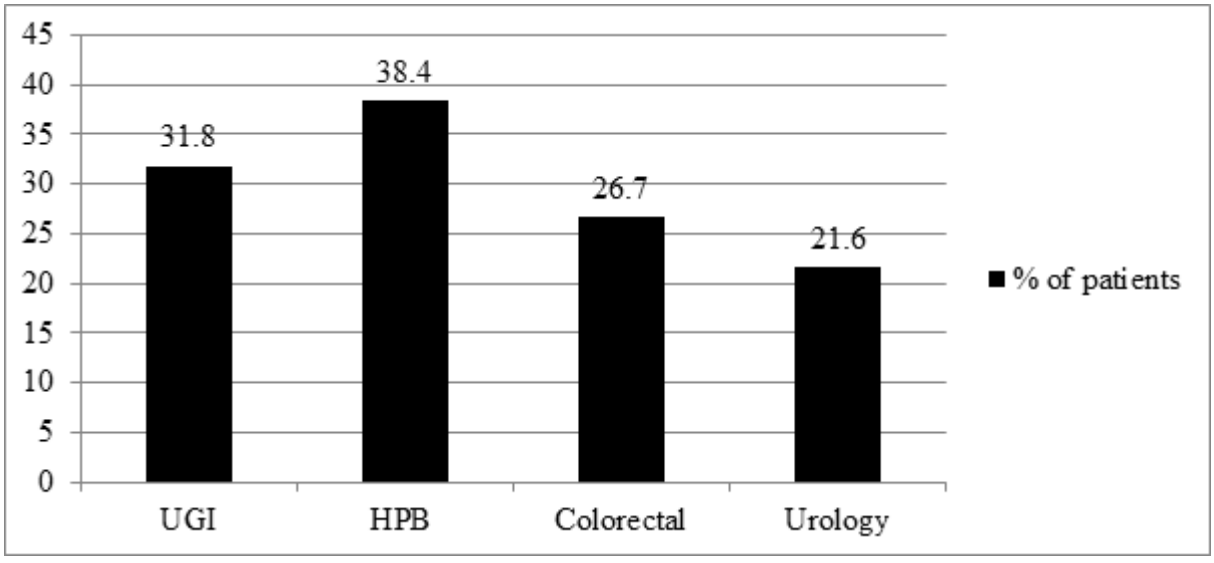

Figure 1: The percentage of patients identified at high risk of malnutrition according to surgical speciality.

Conclusion:
Preoperative malnutrition at UHS is significant and few patients would have received nutritional support if they had not been screened at F4SS. Preoperative treatment of

malnutrition is known to improve post-operative outcomes, however the exact affects in this study were not measured. It's currently not mandatory for patients to attend F4SS and cannot be relied on as the only nutritional screen prior to surgery. It is recommended that all patients due to undergo surgery are screened for malnutrition at the earliest opportunity in order to improve compliance with the NICE Clinical Guidance 32[1].

References:

1. National Institute of Clinical Excellence. Clinical Guidance 32. 2006
2. Bozzetti et al. Clinical Nutrition. 26: 698-709. 2007.
3. Benoist S, Brouquet A. Journal of Vascular Surgery. 152 (1): S3–S7. 2015.

Success rates for smoking cessation referrals from a Pre-Assessment Clinic (PAC)

Background and Goal of Study:

Smoking is a risk factor for surgical morbidity and mortality (1). It is the largest cause of preventable disease and premature death in the UK (2), and the Perioperative Clinic (PC) affords the opportunity to encourage smoking cessation and refer to an NHS Smoking Cessation Service (SCS).

Project aims:

1) Establish quit rates in patients referred from PC to SCS
2) Investigate patient satisfaction with SCS
3) Inform the development of improvements to the current service

Materials and Methods:

40 patients referred to SCS, identified at random from referral paperwork, were contacted by telephone and a questionnaire completed. Patients were contacted during working hours using the contact details given on the referral form.

2 patients were excluded from the analysis; one deceased, one still awaiting surgery. Data from 38 patients was analysed.

Results and Discussion:

17 patients (45%) were contacted successfully after =< two attempts. No contact was made in 55%. SCS usually only contact patients twice, so it is likely these patients did not attend smoking cessation.

Of the 17 patients questioned, 7 (41%) were contacted by the SCS, whereas 10 (59%) were not contacted at all preoperatively.

Of the 7 patients who were contacted by SCS, 5 (71%) were satisfied with the SCS. 2 people were not satisfied as the support offered did not fit in with their lifestyle.

Only 1 patient (6%) stopped smoking pre-operatively. They had received support from the SCS. However, 9 patients (53%) did stop smoking post-operatively. Of these, 4 had received support from the SCS, but 5 were not contacted and did so independently.

Conclusion(s):

There is some evidence from this small sample that patients are motivated to stop smoking at the time of surgery, however current methods to refer and engage these patients are inadequate. There is a need to improve access to SCS for patients awaiting surgery, and further resource invested into PC to provide direct access would resolve the issue of failure to contact.

References

[1] Joint briefing on smoking and surgery. ASH, in partnership with the RCSEd, RCOA and FPH; 2016.

[2] ASH factsheet no.1: Smoking statistics. ASH; Nov 2018.

Title: Post-operative pulmonary (PPC) complications audit and implementation of the ICOUGH programme in a District General Hospital.

Introduction: Pulmonary complications are some of the most frequent complications seen after surgery. The ICOUGH pulmonary care programme was designed with a view to reducing these complications, and has been to shown to do so[1,2], leading to uptake in hospitals including Boston General and The Manchester Royal Infirmary.
The acronym stands for:

- I – incentive spirometry
- C – cough and deep breathe
- O – oral care
- U – understanding patient education
- G – get out of bed
- H – head of bed elevated

This audit was to look at high risk patients and the incidence of PPC within our high risk population to ascertain whether the implementation of ICOUGH was likely to be beneficial. Given the nature of our patient population and lack of funding, we felt that we had to stratify our patients to provide a focused approach to maximize the benefits of the post-op pulmonary prehabilitation programme. We aimed the audit at the high risk anaesthetist led pre-operative clinic and liaised closely with the physiotherapy department.

Methods: 6 weeks of retrospective data from anaesthetic –led pre-operative clinic was used from February to March 2018. A total of 63 patients were used, with a mean age of 70. Their ARISCAT[3] score was calculated, and classified into low, intermediate or high. PPC complications were recorded. The average length of stay with PPC vs length of stay without PPC was calculated.

Results: ARISCAT scores: 24 low risk (1.6% of PPC), 27 intermediate risk (13.3% of PPC), 7 high risk (42.1%). 2 out of 44 patients had PPC (4.5%). 1 patient died from PPC pre-operatively. Average length of stay: 3.25 days. Average length of stay with PPC: 114 days

Conclusion:
It is a small study but the 4.5% rate of PPC and the significantly increased length of stay associated with PPC promote the implementation of a programme such as ICOUGH with the possibility of significant reduction in morbidity and length of stay. In addition, the rate of PPC may be underestimated as there may be missed cases due to the retrospective nature of the study. Using this data, we are implementing a physiotherapy-led ICOUGH service and expect to re-audit after it has been introduced to quantify any improvement. We believe that this audit demonstrates how a pulmonary prehabilitation programme can be implemented in a small DGH with limited resources.

References:

1. **Cassidy et al** "I COUGH: reducing postoperative pulmonary complications with a multidisciplinary patient care program." *JAMA surgery. 2013Aug: 148(8):740-5*

2. **J. A. Moore, D. H. Conway,N. Thomas, D. Cummings, D. Atkinson**. Impact of a peri-operative quality improvement programme on postoperative pulmonary complications. Anaesthesia. Mar 2017. 72(3): 317-327
3. **Mazo et al "**Prospective External Validation of a Predictive Score for Postoperative Pulmonary Complications." *Anaesthesiology 08 2014; 121, 219-231*

Protocol for the Walking to Live study. Multimodal Prehabilitation for patients with intermittent claudication awaiting endovascular revascularization.

Background & Hypothesis:

Individuals with Peripheral Artery Disease (PAD) are often sedentary, suffer from decreased functional capacity, severe disability, poor quality of life and increased risk of premature mortality[1]. There is no data regarding how a Multimodal Prehabilitation program, might impact outcomes in PAD patients. This approach might potentially improve patient quality of life to a greater extent than just giving walking advice alone and may spare surgery for some patients.

Methods:

This is a prospective multi-institutional randomized controlled trial approved by the the McGill University Health Centre Research Ethics Board (MP-37-2018-4116). Ninety patients that meet inclusion criteria will undergo a baseline assessment and will be randomized to either 12 weeks of regular care (walking advice) or to a 12-week supervised Multimodal Prehabilitation program prior to endovascular revascularization. Patients will be reassessed after a 12-week period and depending on the results, surgery will be proposed. Functional capacity, nutritional status and disease-specific quality of life measurements will be collected in every assessment (table 1). Those patients who do not proceed with surgery after the 12 weeks will be followed as a third and fourth arm in the study (figure 1). All patients will receive follow-up appointments after the 12-week program at 1, 3, 6, 12 and 18 months to reassess their quality of life and the need for surgery in those patients who were opted out from surgery. The primary outcome will be changes in quality of life measured by disease-specific quality of life and impairment questionnaires.

Potential impact of the study:

The vast majority of research until now has focused on the effects of optimizing PAD risk factors separately. The results of this study will shed light on the effects of a multimodal optimization approach in PAD patients, specifically on how this approach might impact patient's quality of life as well as the need for surgery. If the study results demonstrate its usefulness, Multimodal Prehabilitation for PAD patients might eventually become a standard of care.

References:

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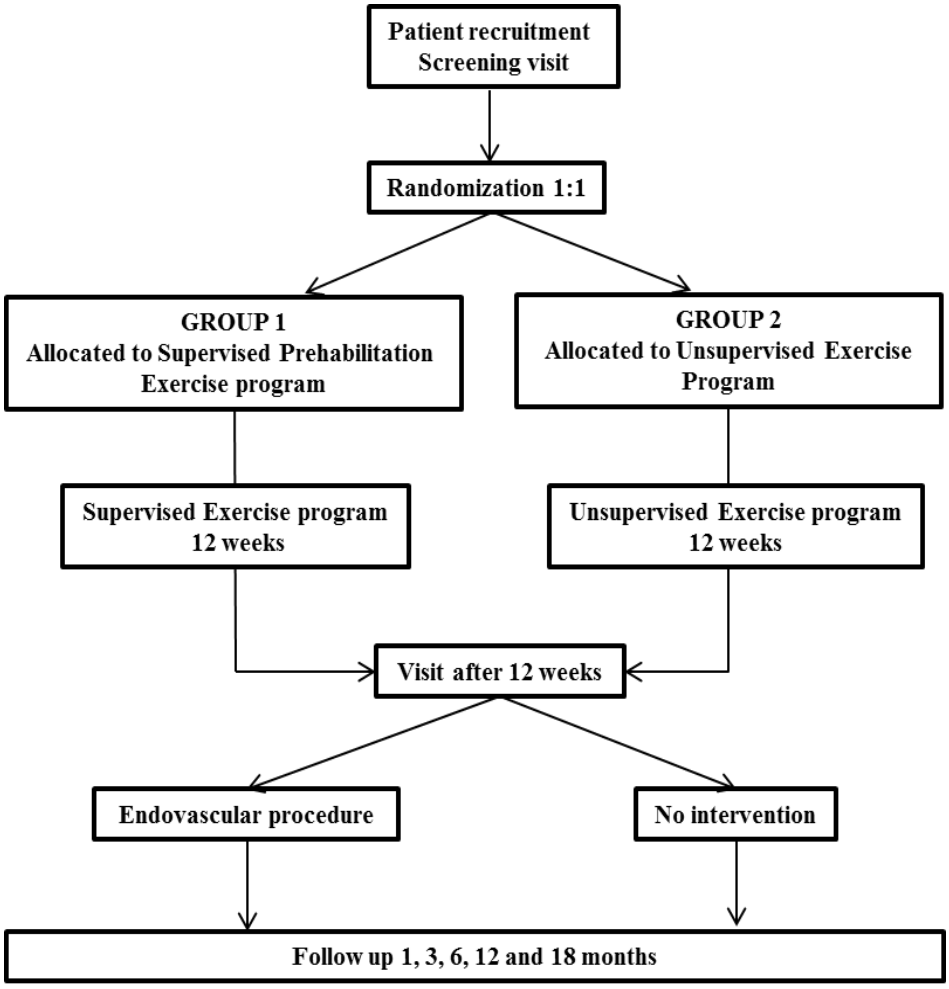
Table 1: Time points and measurements of the study

	All patients	Intervention	Control	All patients	
	Baseline Assessment	**Multimodal Prehabiliation program (12 weeks)**	**Walking advice (12 weeks)**	**12-Week Assessment**	**Follow-up: 1, 3, 6, 12 and 18 months**
Informed consent	X				
Medical history	X				
Physical exam	X			X	X
ABI, Toe Pressure	X			X	X
Disease-Related QOL questionnaires: • Vascu-Qol • WIQ	X			X	X
• WHODAS 2.0 • CHAMPS • HADS • SF-36	X			X	X
Funcional Capacity: • 6-MWT • Gardners test • Grip strength • TUG • Sit-to-Stand test	X			X	X
Nutritional Assessment	X				
Blood measurements: • HbA1c • Albumin • Hemoglobin • Prealbumin	X			X	
Compliance to Prehab Program		X			

ABI: Ankle-Brachial Index; QOL: Quality of Life; Vascu-Qol: Vascular Quality of life questionnaire; WIQ: Walking Impairment Questonnaire; WHODAS 2.0: World Health Organization Disability Assessment Schedule 2.0; CHAMPS: Community Healthy Activities Model Program for Seniors questionnaire; HADS: Hospital Anxiety and Depression Scale; SF-36: 36-Item Short Form Survey; 6-MWT: 6-Minute Walking Test; TUG: Timed Up and Go test.

Figure 1: Study design flow chart



Is a digital platform for surgical patients with low patient activation scores a feasible intervention?

Introduction

Individuals who have awareness and confidence of their own health (Patient Activation) tend to have more positive health related outcomes compared to those who take a more inactive approach. Patient activation is targeted through engagement and education.

The aim of this study was to;

1. Determine whether adult surgical patients have distinct levels of patient activation compared to other patient groups
2. Determine the association between low level of healthcare awareness and the use of internet in a deprived area of the UK.
3. To inform the development of an online platform enabling accessible healthcare interventions with the goal of improving patient activation.

Method

Data was collected from 354 patients undergoing pre-assessment before surgery between November 2018 and January 2019, using the Patient Activation Measure PAM. This is a standardised survey measuring patients knowledge, skills and confidence of their healthcare. Several factors including age, sex, surgery, internet use, smart phone, email address and simple lifestyle status (smoking and alcohol use) were also collected. The primary outcome was to examine whether PAM score was associated with internet access and smoking behaviour.

Results

A low PAM score was rated as PAM level of <=2 and a high PAM score includes those with a level of >=3. Surgical patients showed no difference in PAM scores compared to the UK average (low PAM score 20-40%). Higher PAM scores were associated with a younger age group and more likely to be female vs male. The low PAM score group still had extremely high smart phone use and internet access.

Patients with low PAM scores were significantly more likely to smoke than those with a high PAM score (25/108(23%) vs 13/246(5%), $p<0.01$). Individuals with a high PAM score were significantly more likely to drink alcohol than those with a low PAM score (57/108 vs 179/246, $p <0.01$).

Conclusions

An individual's activation and knowledge of their healthcare has an impact on their likelihood to smoke and hence their health related outcomes. As over 90% of individuals in both groups have access to a smart phone and the internet it is feasible to target individuals perioperatively and improve patient activation using an online platform.

	Low PAM score	High PAM score
N=	108 (30.5%)	246 (69.5%)
Age	57.2	53.1
Sex	43 Fm (39.8%) 65 M (60.2%)	122 Fm (49.6%) 124 M (50.4%)
Have Internet Access	98 (90.8%)	232 (94.4%)
Have a Smart Phone	87 (80.6%)	243 (87.0%)
Have Friend/family with a smart phone	103 (95.4%)	214 (98.8%)
Have Email Address	85 (78.8%)	218 (88.6%)

Resting hand grip strength is not predictive of basic Cardio-Pulmonary exercise test variables in preoperative surgical patients

Introduction

Cardio-pulmonary exercise testing (CPET) is considered to be the gold standard for objective, quantitative pre-operative risk stratification[1]. However, the procedure is resource consuming in terms of cost and time. The most commonly used variables for perioperative risk stratification are the anaerobic threshold (AT) and peak oxygen delivery (peak VO2) Hand grip strength (HGS) however is rapid, inexpensive and requires minimal training or equipment. Impaired HGS has been shown to be associated with increased length of post operative stay, post operative mortality and morbidity across various specialties[2], worse functional outcome after hip fracture surgery[3], impaired cardiac function in patients with COPD[4], chronic disease and multimorbidity[5], markers of frailty[6] and all cause mortality in healthy subjects[7].

This study seeks to establish whether HGS correlates with and is predictive of variables derived from CPET.

Methods

The study population consisted of a retrospective analysis of patients presenting to the Prehabilitation unit of a district general hospital in the UK undergoing CPET prior to major surgery between August and November 2018.

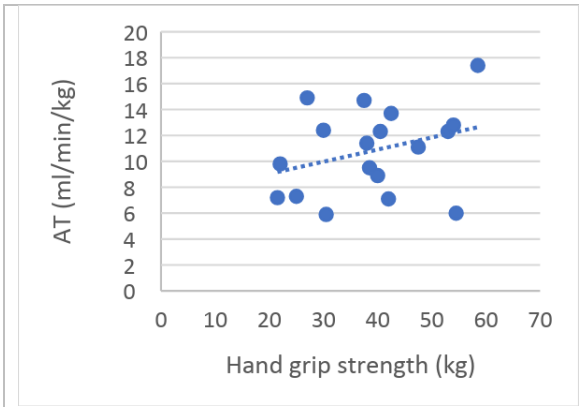
Resting maximum HGS achieved bilaterally was used for analysis. CPET was undertaken using a cycle ergometer.

Statistical analysis was performed using the Pearson correlation coefficient (r) and a 2-sided t-test, with level of significance defined as $p<0.05$.

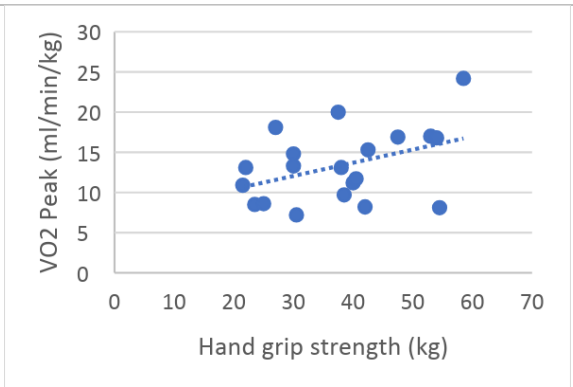
Results
Summary data for the group is shown in Table 1.

	Mean (range)	r value	P value
Maximum HGS (kg)	37.8 (21.5 - 58.5)	-	-
AT (ml/min/kg)	10.8 (5.9 - 17.4)	0.322	0.19
VO2 peak (ml/min/kg)	13.3 (7.2 - 24.2)	0.415	0.07
O2 pulse at AT (ml/beat)	8.4 (2.3 – 13.4)	0.562	0.015*
O2 pulse at peak (ml/beat)	8.7 (3.1 – 15.3)	0.551	0.014*

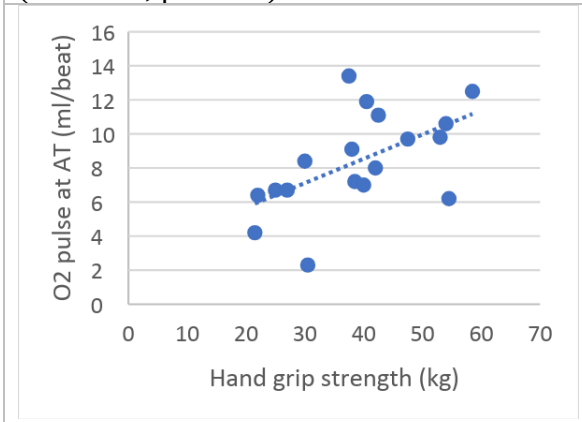
Table 1



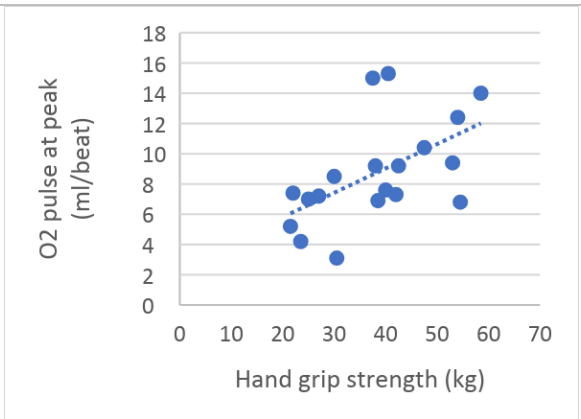
(r = 0.322, p = 0.19)



(r = 0.415, p = 0.07)



(r = 0.562, p = 0.015*)



(r = 0.551, p – 0.014*)

Figure 1

Conclusion
In this group of patients AT and peak VO2 were only very weakly associated with HGS, r value of 0.322 and 0.415 respectively. This is perhaps slightly surprising given previous results have suggested that HGS is associated with loss of physical function, and a correlation between VO2 peak and HGS.
As shown in previously published data, HGS was moderately associated with 02 pulse, a specific indicator of cardiac fitness. Taken with the negative finding of relationship between AT and peak VO2, an alternative explanation is that HGS is entirely independent of

respiratory function, and that as peak VO2 and AT are markers of overall cardio-respiratory fitness, rather than solely cardiac muscle function.

These data reinforce the point that there is unlikely to be any single reliable number for perioperative risk assessment, as concordance of different markers of 'fitness' is limited. Hand grip strength may, however, be useful in combination with other variables to help guide shared decision making.

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Perioperative Correlation between Timed Up and Go and 6-Minute Walking Test in patients undergoing elective oncologic surgery.

INTRODUCTION:

Timed Up and Go Test (TUG) and 6-Minute Walking Test (6MWT) are two instruments used to assess functional performance in surgical patients. Both of them have shown to predict postoperative morbidity and mortality across surgical specialties[1]. TUG is characterized by its simplicity, speed and its feasibility to be done in almost any clinical outpatient setting. On the other hand, the 6MWT requires more time to perform and a specific setting that might not be available to all clinicians. The objective of this study is to evaluate the correlation between TUG and 6MWT in patients undergoing elective oncologic surgery.

METHODS:

A retrospective analysis of eight RCTs done at the Perioperative Program of the Montreal General Hospital between the years 2013 – 2018 was performed. All RCTs were approved by the MUHC Research Ethics Board (REB). Patient characteristics were compiled as well as type of surgery, cancer stage and length of stay. Full functional assessment including 6MWT and TUG parameters were recorded at baseline, preoperative, 4 weeks and 8 weeks after surgery. Pearson correlation coefficient analysis was performed to determine the correlation between TUG and 6MWT.

RESULTS:

A total of 549 patients scheduled for elective oncologic surgery were included, with 1413 TUG and 6MWT pairs accounting for all the assessments. Patients characteristics were mean age±SD 68.8 ±11.1, Male 58%, BMI 27.5±5.6 kg/m^2, ASA classification I 4% / II 53% / III 42% / IV 1%, Abdominal surgery 68% / Thoracic surgery 20% / Esophageal 12%, Length of stay (days±SD) 6.7±8.4. There was a strong negative correlation between TUG and 6MWT that was maintained throughout the perioperative period (Figure 1 and Table 1). TUG points for the 400m and 300m of the 6MWT were identified using linear regression equation TUG= 8.42s, 10.33s respectively. Below 200m the correlation between 6MWT and TUG became weak ($r= -0.23$, $r^2= 0.05$, $p>0.05$). **CONCLUSIONS:**

There is a strong correlation between 6MWT and TUG in the perioperative setting in patients undergoing elective oncologic surgery. TUG might be a useful screening tool to

quickly assess functional capacity before performing the 6MWT, and it could potentially be used in settings where 6MWT is not feasible. Further research is needed to explore the potential application of TUG in risk stratification in the perioperative setting.

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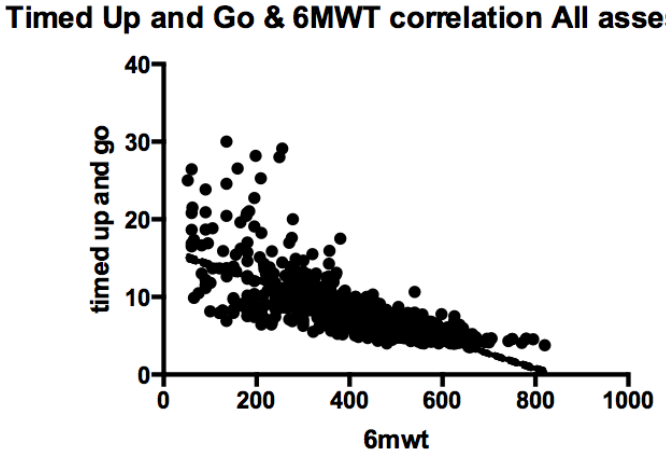
Table 1: Timed Up and Go vs 6MWT

	Baseline	Preop	4Weeks	8Weeks	All assessments
Functional capacity(mean±SD)					
6MWT, m	435±124	461±123	436±127	489±105	450±124
Timed Up and Go, s	7.82±3.36	7.34±3.18	7.64±3.30	6.59±1.94	7.46±3.14
TUG & 6MWT Correlation					
Number of pairs	514	377	302	220	1413
Pearson correlation (r)	-0.77	-0.75	-0.75	-0.78	-0.76
CI 95%	-0.80 – -0.73	-0.79 – -0.70	-0.80 – -0.70	-0.83 – -0.72	-0-78 – -0.74
R squared	0.59	0.56	0.56	0.60	0.58
P	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

6MWT: 6-Minute Walking Test, TUG: Timed Up and Go Test.

Figure 1: 6MWT and TUG Correlation



Prehabilitation for port films: pelvic exercises may reduce sacral slope variability during radiation therapy

Introduction:

Prehabilitation for radiation therapy is not well studied. Retrospective data shows variability in set-up positioning of patients during daily pelvic RT. We hypothesize that a brief structured daily exercise regimen is feasible for subjects to perform before RT and may minimize variability in positioning as measured by sacral slope angles (SSA) on lateral views. Determining feasibility and effectiveness of these exercises in decreasing set-up variability has clinical implications, both for targeting treatment sites and preventing adverse effects.

Methods:

Subjects in the exercise intervention condition (n=8, 8 F) performed a structured daily hip exercise regimen throughout the duration of RT, and subjects in the historical control condition (n=20, 17 F, 3 M) had usual care. For each patient, SSA measurements were compared to SSA measurements from the simulation CT for 5 weeks during RT. The extent of variability of measurements between two conditions was studied using a linear mixed model. For all patients in both conditions, the same two readers independently measured SSA to compare angles on day of simulation against the angles measured from each day of RT.

Results:

The average variation in SSA for intervention condition was 0.913° (±0.582°), with range among patients 0.57°-1.3°. The average variation for control condition was 2.27° (±1.43°), with range among patients 1.22° - 5.09°. The difference between two conditions was statistically significant (p=0.0019). Comparison of SSA variation between conditions demonstrated a statistically significant difference at each week (wk 1: p = 0.0071, wk 2: p = 0.0077, wk 3: p = 0.011, wk 4: p = 0.005, wk 5: p = 0.0079). The exercise intervention condition had no significant variation between week 1 and later weeks (wk 2: p = 0.876, wk 3: p = 0.741, wk 4: p = 0.971, wk 5: p = 0.397). The control condition showed greater SSA variation between week 1 and later weeks (wk 2: p = 0.868, wk 3: p = 0.915, wk 4: p = 0.015, wk 5: p = 0.224), with significant variation between weeks 1 and 4. No subject reported any adverse effects.

Conclusion:

We observed a significant decrease in sacral slope variability in our exercise cohort as compared to historical controls. SSA variation for control condition increased over the course of treatment with significant difference noted between week 1 and 4. A larger clinical trial is required to evaluate the potential clinical benefits of a structured daily exercise regimen during pelvic RT.

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Evaluation of the effectiveness of an exercise prehabilitation intervention in autologous stem cell transplant candidates

PR1910

Background:
Autologous Stem Cell Transplant (AuSCT) is a chemotherapy treatment of advanced hematology cancers in which patients require a high level of functional reserve due to the significant physical demands and toxicities of the high dose therapy. Prehabiliatation is a novel intervention which includes exercise prior to cancer therapy that aims to improve physiological reserve to optimise peri and post-transplant outcomes(1). However, to date little research has been undertaken regarding the effectiveness of exercise prehabilitation interventions in AuSCT candidiates.

Aim:
To evaluate the functional outcomes of a prehabilitation exercise intervention for lymphoma and multiple myeloma patients awaiting AuSCT.

Methods:
A retrospective data analysis of patients who completed an exercise program prior to AuSCT was conducted. An exercise physiologist completed assessments at baseline; immediately prior to AuSCT; and 30-days post AuSCT. Outcomes included: six-minute walk test (6MWT), 30 second sit to stand, and maximal grip strength. Patients were prescribed an individualised exercise program and performed either supervised group-based or unsupervised home exercise programs until AuSCT. Descriptive statistics were used to report demographic and clinical characteristics. Changes in physical function between baseline and follow-up time points were assessed with paired t-tests ($p<0.05$ indicating statistically significant differences).

Results:
Thirty-eight participants completed baseline physical function testing. Demographic and clinical characteristics included: median (IQR) age 65 (59-69) years; mean (SD) BMI 27.7 (5.9); sex % (n) male 63% (24/38) and 66% (25/38) had a diagnosis of lymphoma. The median (IQR) length of exercise prehabilitation was 31 (16.8-77.8) days. Participants attended an average of 4.0 (2.9) supervised outpatient classes, with those completing a home program receiving 1.3 (1.3) reviews of their program prior to AuSCT. Pre and post physical function measures (n=20) showed significant improvements following prehabilitation (mean difference (95% CI) in 6MWT (75.9m (48.7-103.1), $p<0.005$), sit to stand (5.0 repetitions (4.0-6.0, $p<0.005$) and grip strength (1.9kg (0.6-3.1, $p=0.005$). Physical function measures completed 30 days post-transplant (n=14 6MWT) had returned to near baseline values.

Conclusion:
Prehabilitation exercise is an effective intervention to improve functional capacity prior to AuSCT. Future studies should analyse intervention impact on quality of life and recovery, and compare outcomes to usual care.

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Prioritizing Health Literacy (HL) to Increase Patient Engagement in Prehabilitation: Our Experience.

Introduction

Health literacy (HL), has been defined by the Institute of Medicine as the "the degree to which individuals have the capacity to obtain, process, and understand basic information and services needed to make appropriate decisions regarding their health". Firstly, patients must get the information they need, secondly, they must understand, and thirdly they must decide to act.

Low or limited HL is prevalent throughout the world. The European Health Literacy Project showed that 46% of the population had problematic or inadequate health literacy levels. In the United States, nearly half of the adult population has low health literacy and in Canada, 60% has low health literacy.

The McGill Experience

ERAS

For the past 10 years, the McGill University Health Centre (MUHC) Enhanced Recovery After Surgery (ERAS) program has focused on the significance and vital role that HL plays in patient engagement. Providing educational sessions about HL to all health care professionals has sensitised staff on how to speak in plain language and use strategies to help patients understand better. Material written at a grade 6 level with meaningful images added throughout to help has been provided to all our patients to facilitate health information.

Prehabilitation programme

The nature of prehabilitiation programme is personalized medicine in which each intervention is adapted to the patient's needs. We recently started to implement HL strategies to the prehabilitation team. The programme is explained and demonstrated at baseline visit by a team of health care professionals and then followed and practiced at each patient's visit. The prehabilitation team applies health literacy guidelines, when speaking about dealing with lifestyle changes, compliance to treatments such as smoking cessation, exercise, and nutrition. This has great value since over 80% of our patients in the prehabilitation program are elderly.

Eliminating distractions, speaking slowly, repeating the information and using the teachback method are various strategies used to help patients understand better.

Using plain language is essential for all patients. For examples, words such as consume are replaced with *eat or drink* and accelerate with *speed up.*

Next step

Assessment of our programme will include an evaluation of our printed material to ensure that our content is easy to understand and our images are meaningful. Modifications are done according to patient's feedback.

Patient satisfaction survey will be included in our written prehabilitation guide and patients will be able to complete and return it anonymously in a drop off box.

Title: Exploring the feasibility of incorporating a structured one-on-one psychological intervention within a Prehabilitation program

Authors:

Background: Psychological distress is frequently present in individuals awaiting cancer surgery, and can lead to many unfavourable outcomes (e.g., surgical complications, diminished quality of life).[1-5] While there is growing interest in the use of Prehabilitation to optimize/enhance patients' health before cancer surgery, psychological health is rarely addressed in these programs. As a result, there is little published literature to guide interventions aimed at reducing distress in Prehabilitation programs. This pilot cohort study examined the feasibility of incorporating a preoperative psychological intervention within a multimodal Prehabilitation program in colorectal cancer (CRC) patients.

Methods: Adults awaiting curative resection for CRC were invited to participate in a tri-modal prehabilitation program before surgery. In addition to standard prehabilitation (i.e., nutritional counselling, in-hospital supervised exercise sessions), participants received a structured psychological intervention aimed at managing and reducing cancer-related distress and facilitating adherence to the Prehabilitation intervention. The psychological component consisted of one 90-minute baseline interview, and in-person follow-ups once weekly for 4-weeks. Additionally, participants completed four assessments (two pre- and two postoperatively) consisting of questionnaires, anthropometric measurements, and functional capacity tests. Feasibility was assessed by recruitment and enrollment rates into the program, and attrition, retention, and adherence to the program and psychological intervention. Data were analyzed using descriptive statistics.

Results: Forty-three adults were contacted over one year. Twenty-seven (63%) met eligibility criteria and enrollment rate into the program was 74% (n=20). Participants (M_{age}: 67.6±7.2) received the intervention on average 4.2±3.4 weeks before surgery. Attrition rate was 15% with retention rates of 89.5% for preoperative assessments and 76.5% combined (pre- and postoperative assessments). The psychological intervention was delivered to 95% (n=19) of participants enrolled at baseline, of which 100% completed the intervention. On average 2.1±1.0 psychological follow-up sessions were attended with an adherence rate of 85%. Reasons reported for missing psychological follow-ups were: bad weather, on vacation, and no interest/need for psychological follow-up.

Conclusions: These findings suggest that incorporating a psychological intervention within a multimodal prehabilitation program is feasible. The addition of psychological counselling in the preoperative period could lead to improvements in the management of preoperative distress, and as a result, reduce adverse surgical outcomes. Reasons for missing psychological follow-ups suggest that it may be beneficial to: (1) deliver follow-up sessions over the phone, and (2) conduct follow-up sessions only with those participants who need/want it. Based on the results of this study, further testing of patient acceptability and efficacy of such interventions is warranted.

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Prehabilitation: The fitness programme for Sheffield what it needs to deliver.

PR1913

Introduction

In 2018 Anaesthesia published a clinical guideline and recommendations on pre-operative exercise training in patients awaiting major non-cardiac surgery[1]. The guideline advised that 'if resources are limited, priority of referral to pre-operative exercise training should go to patients who are at increased risk of peri-operative complications, such as those with low cardiorespiratory fitness'.

The aims of this study were four fold; first to report the baseline cardiorespiratory fitness (CRF) of the patients being referred to Sheffield Teaching Hospitals for major non-cardiopulmonary surgery. Secondly to calculate the fitness gains required to lift the CRF of the patients referred to Sheffield above a 14ml.kg^{-1}min^{-1} threshold that delineated the 'unfit' from the 'fit'. Thirdly to ascertain if the unfit population belong to any one particular surgical speciality and finally if Sheffield Teaching Hospitals were to focus on improving the fitness of this unfit group how many individuals would require enrolment in a prehabilitation exercise programme.

Methods

A retrospective analysis of the cardiopulmonary exercise testing fitness database sanctioned by the Sheffield Teaching Hospitals Clinical Effectiveness Unit ref: 8810. Between 25/11/2005 and 18/09/2018 3333 sets of fitness data were entered upon this database. After excluding those datasets not meeting the inclusion criteria 2492 sets of data remained for analysis.

Results

The baseline CRF of the non-cardiac surgery population undergoing CPET in Sheffield is 16.46 ml.kg^{-1}min^{-1} ± 3.93. This population is 73% male with a mean age of 72 ± 9.5yr, Table 1.

If the attainment of an MVO_2 of 14 ml.kg^{-1}min^{-1} (4 METs) and greater indicates a patient with the desired minimal level of CRF then 656 patients (26%) did not pass the 14 ml.kg^{-1}min^{-1} threshold for CRF and are 'unfit'.

The mean age of this unfit group is 74; the mean gain required to rise beyond the 14 ml.kg^{-1}min^{-1} threshold is 1.99 ± 1.70 ml.kg^{-1}min^{-1}.

Analysing the data using one-way ANOVA to ascertain if the magnitude of the gains required to reach the 14 ml.kg^{-1}min^{-1} threshold for each of the surgical specialities reveals the gains to be similar in magnitude even after adjusting for age ($P>0.05$).

Conclusion

Sheffield's non-cardiopulmonary surgical population have low levels of CRF, any prehabilitation programme should aim for gains in ml.kg^{-1}min^{-1} in excess of 3.7. This prehabilitation programme needs to annually accommodate at least 200 individuals and should not be targeted at any one particular surgical speciality.

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Table 1 Cardiopulmonary exercise test derived cardiopulmonary fitness characteristics for the whole sample *n=2492.* Values are mean, (SD) and [IQR] and are displayed for each of the surgical specialities.

	Colorectal N=588	General Surgery N=56	Hepatic-pancreatic and biliary N=216	Transplant N=52	Urology N=69	Upper Gastrointestinal N=122	Vascular N=1389
Age	70 (10) [64-77]	63 (12) [54-72]	70 (9) [66-77]	54 (13) [43-65]	73 (9) [68-80]	70 (9) [66-76]	74 (8) [69-80]
Height (cm)	168.47 (9.84) [161.00-176.00	165.49 (10.49) [158.00-172.75]	169.33 (8.48) [164.00-175.00]	170.55 (10.73) [162.38-178.50]	169.73 (9.64) [161.50-177.00]	169.33 (9.99) [161.00-176.00]	170.32 (8.81) [164.40-176.00]
Weight (kg)	79.58 (18.54) [67.00-90.15]	86.40 (18.16) [75.25-96.90]	79.51 (17.07) [67.70-91.00]	79.23 (18.67) [63.05-95.00]	77.25 (16.54) [68.00-86.50]	82.88 (19.48) [68.75-95.70]	79.49 (17.170 [68.00-90.00]
Peak Power [$] (W)	94.43 (41.17) [66.00-119.00]	99.38 (39.71) [74.50-122.25]	94.23 (38.11) [68.25-115.50]	87.52 (31.43) [64.25-108.00]	82.10 (31.15) [60.50-104.50]	92.36 (37.33) [63.25-116.00]	89.51 (36.04) [64.00-114.00]
AT* ($ml.kg^{-1}min^{-1}$)	11.29 (3.03) [9.60-13.00]	10.10 (2.76) [8.90-11.58]	11.04 (2.71) [9.40-12.60]	9.99 (1.79) [8.93-11.40]	10.85 (2.55) [9.95-12.45]	10.93 (2.65) [9.28-11.93]	10.68 (3.09) [9.20-12.30
MVO_2 [~] indexed ($ml.kg^{-1}min^{-1}$)	17.00 (4.22) [14.33-19.40]	15.62 (3.02) [13.76-17.20]	16.79 (3.86) [14.20-18.50]	14.58 (3.07) [12.20-16.40]	16.37 (3.28) [14.05-18.25]	16.11 (4.08) [13.18-18.23]	16.32 (3.86) [13.65-18.40]
MVO_2 [~] absolute ($ml.min^{-1}$)	1341.7 (426.3) [1078.5-1613.8]	1373.6 (440.8) [1080.3-1532.8]	1324.0 (378.2) [1050.8-1532.8]	1154.1 (365.1) [854.0-1430.3]	1265.3 (320.5) [1005.5-1535.5]	1327.7 (443.2) [987.3-1554.0]	1296.2 (400.1) [998.0-1557.5]
VE/VCO_2 [#]	33 (7) [29-36]	31 (6) [27-35]	33 (6) [29-36]	31 (6) [28-34]	36 (8) [31-40]	34 (6) [30-37]	36 (7) [31-39]
Peak Heart Rate [^] ($beats.min^{-1}$)	133 (25) [117-151]	134 (25) [119-148]	134 (23) [116-150]	112 (23) [98-128]	127 (24) [106-147]	135 (25) [120-149]	120 (24) [103-134]

[$]Peak Power; the workload reported for the bike test at the time of maximal oxygen consumption

*AT; anaerobic threshold

~MVO_2; peak oxygen consumption

[#]VE/VCO_2; ventilator equivalents at AT

^Peak Heart Rate; the heart rate recorded at MVO_2

PR1914

Sarcopenia in lung cancer: could chest imaging help?

Introduction: Fifteen to seventy percent of cancer patients demonstrate sarcopenia.[1-6,i,ii,iii,iv,v,vi,vii,viii,ix,x,xi,xii,xiii] Analysis of iliopsoas cross-sectional area, a non-invasive surrogate measure for sarcopenia in patients with cancer has been associated with survival.[xiv,xv,xvi,xvii] The pectoralis muscle may be a more accessible target for measuring sarcopenia in lung cancer patients,[xviii] but it is not known if it this correlates with iliopsoas cross-sectional area. Since measurements vary, it is most accurate to use internal controls. We attempted to examine the cross-sectional area of the two muscles and any change over the treatment period.

Methods: Charts were reviewed in 44 subjects who underwent surgical treatment of lung cancer. Available imaging at pre-treatment, 6 months, and 12 months was reviewed for the cross-sectional area of the pectoralis and the iliopsoas. The cross-sectional area of the pectoralis and the iliopsoas were measured manually at diagnosis by two different researchers, and the pectoralis was measured at 6 months and 12 months in subjects who were treated for lung cancer. Follow-up iliopsoas data was not available.

Results: Of the 44 subjects, 13 had a complete set of imaging. The mean age was 66 years old and the mean BMI was 28.72. There were 8 females and 5 males. 12 out of 13 were Caucasian. 12 out of 13 were stage T1 or T2. 12 out of 13 had undergone lobectomy. 10 out of the 13 were at ECOG performance status grade 0 at diagnosis. 4 out of 13 had postoperative events. The mean iliopsoas area at diagnosis was 8.17cm^2. The mean pectoralis area at diagnosis was 14.5 cm^2. The mean pectoralis area at 6 months was 13.9 cm^2. The mean pectoralis area at 12 months was 14.5cm^2. 8 out of 13 subjects had a decrease in mean pectoralis area at 6 months and 6 subjects had a decrease at 12 months.

Conclusion: There was no significant decrease in cross-sectional area of the pectoralis over the lung cancer treatment period. This could be because of the initial high performance status of our sample, the small size, or sarcopenia occurs comorbidly with presentation.

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A collaborative project to co-design a prehabilitation program for people with gastrointestinal cancer receiving chemotherapy

Introduction:

Prehabilitation originates in surgery where its use can reduce morbidity and improve health outcomes. It is now evolving as an intervention to minimise the deconditioning experienced during chemotherapy. Personalisation and patient experience are key factors to adherence to interventions and its success. Improving experience through co-design may be the key to designing an optimal service.

Objective: To use experience-based co-design (EBCD) to understand and improve patient and staff experience and co-design a prehabilitation programme for gastrointestinal cancer patients.

3. Methods:

A single-site service evaluation was undertaken using an EBCD approach.

Eligible participants:

- Adults with gastrointestinal cancer who received chemotherapy, along with their carers, if they had seen one more therapists (dietitian, occupational therapist, physiotherapist, psychological support) between 01.04.16-31.03.17.
- Staff with three months experience working in the service.

Objectives:

1. Explore staff and patient experiences of the current ad-hoc service and their recommendations for improvement.
2. Re-design the therapy services to improve experience and offer a tailored intervention to patients starting chemotherapy.

Results:

Eleven patient interviews were filmed and twelve staff interviews were transcribed. Thematic analysis was undertaken and a patient film and staff presentation were shared at a joint patient-staff event.

Patient experience: patients valued staffs' specialist knowledge, friendliness and compassion. It was important to have time and space to ask questions. They wanted an opportunity to interact and share their experience with patients in a similar position. They wanted seamless care; they struggled to remember the roles of professions.

Staff experience: Supporting patients to self-manage was a key priority. They wanted to offer holistic care and address service inequalities, particularly access. Therapists felt their roles were poorly understood.

Patients, staff and carers prioritised the work together and formed nutrition, physical activity and emotional well-being co-design groups.

Co-design recommendations for new prehabiltation service

- People need to understand its importance
- Use as non-medical environment as possible
- Offer groups for peer support and reciprocal learning
- A personalised plan is needed
- Critical points for support, especially emotionally, are diagnosis and discharge
- Incorporate digital technology, videos, apps, telehealth etc.
- Minimise hospital visits

Conclusion:
Co-design is an innovative framework that produces an intervention that meets the needs of people with cancer and staff; improving quality and sustainability. This prehabilitation model has been used for business planning and the novel ideas, e.g. app use, for research for patient benefit applications.

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Abstract submitted to Prehabilitation World Congress, 2019.

Corresponding Author

Title

Effect of progressive resistance training on persistent pain after axillary dissection in breast cancer– a randomized controlled trial

Introduction

Persistent pain is a known challenge, affecting up to 1 in 5 breast cancer survivors. In secondary analyses of a randomized controlled trial, we examined the effect of progressive resistance training on persistent pain in the first post-operative year in women treated for breast cancer with axillary lymph node dissection.

Methods and materials

Eligible women were aged 18 – 75 years, diagnosed with primary unilateral breast cancer, and treated with surgery including axillary lymph node dissection and radiotherapy. Participants were randomized (1:1) to usual care control or exercise intervention. The intervention included progressive resistance training three times weekly throughout the first post-operative year; supervised in groups in the first 20 weeks, and self-administered in the following 30 weeks. The individual exercise load was decided from baseline maximum strength tests, and progressed from low to moderate load. The control group received usual care, which included non-standardized community based physiotherapy. Pain was assessed at baseline, 20 weeks and 12 months by a questionnaire covering intensity and frequency of pain, neuropathic pain, and the influence of pain on aspects of daily life. The effect of the intervention on pain indicators was analyzed using linear mixed models and multinomial logistic regression models.

Results

Out of the 158 women participating in the trial, 76 were randomized to control and 82 to intervention. The proportion of women experiencing pain and neuropathic pain declined and did not significantly differ between groups during follow-up. However, in terms of intensity of pain, a consistent tendency favored the exercise group, with the intervention group scoring

significantly lower for neuropathic pain (p=0.049), and having significantly lower odds for moderate/severe pain at 20 weeks (p=0.02) and affected sleep at 12 months (p=0.03).

Conclusions

We found favourable effects of progressive resistance training on pain, in particular neuropathic pain, and on the influence of pain on sleep. These results affirm that the health benefits of progressive resistance training should be made available to women in post-surgery breast cancer rehabilitation, without increasing the risk of pain.

1. Title:

Pre-habilitation: text message-based coaching programme for pre-operative lifestyle management in patients with obesity.

2. Introduction:

The objective of this study was to identify whether a text-message based lifestyle intervention would enable patients with obesity to make positive changes to their health prior to elective surgery.

3. Methods:

Participants were identified for this study via theatre bookings at the Wollongong Hospital between July 2018 and April 2019.
Eligible participants needed to be: 18 years or older, awaiting an elective (Category C) procedure, Body Mass Index (BMI) > 30, owner of a personal mobile phone and able to consent to participation in the study.

Measures:
At the beginning of the study, BMI, weight and height, and smoking status were collected. Participants were required to provide information relating to their diet and exercise levels as well as current level of motivation to change their health eg daily fruit and vegetable intake, days per week of 30+ minutes of exercise and number of hours spent seated daily.

At 6 months from enrolment or date of surgery, the above measures were re-evaluated. Participants are also required to provide subjective assessment of the programme.

4. Results: Early results will be presented.

5. Conclusion: Feasibility as well as outcomes will be discussed.

6. References:

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Liu S, Willoughby JF. Do Fitness Apps Need Text Reminders? An Experiment Testing Goal-Setting Text Message Reminders to Promote Self-Monitoring Journal of Health Communication, 23: 379–386, 2018

Title: Development of a mobile application to improve fitness of patients with obesity before surgery

Authors and affiliations

Introduction

Every year, over half of the patients who undergo elective surgery in our local hospital are obese (BMI>30kg/m2). It is critical to improve the fitness of these patients before their surgery as research has shown that healthier patients experience fewer last minute cancellations and better postoperative outcomes (Cui et al. 2017; Gao et al. 2015). Despite the promising potential of mobile applications to assist these patients with weight loss and health improvement (Carter et al. 2013; Pagoto et al. 2013), the utilisation of this technology for surgical preparation is still in early development. This paper reports the process of developing a cloud-based, ontology-driven mobile application to improve the fitness of patients with obesity before surgery.

Methods

A multi-disciplinary research team was formed including a clinical anaesthetist and academic researchers in psychology, nutrition, exercise science, e-health development and information technology. Social cognitive theory was used to guide the design and development of the mobile application.

This mobile application will automatically send regular messages to the patients to encourage them in the areas of exercise, healthy body, healthy mind and healthy eating before their surgery. These messages have been developed by the research team and will be sent to the patients according to their risk level determined by the built-in assessment in the application. The assessment includes (1) EQ 5D 5L to assess the general quality of life of the patients, (2) Patient Activation Measure to assess patients' engagement with their health improvement, (3) International Physical Activity

Questionnaire to assess their physical activities and (4) Australian Health Survey Short Questions on nutrition to assess their food habit.

To enable intelligent reasoning of the assessment results and the automatic selection of messages, both the assessment items and the messages have been represented as an ontology which forms the logic layer of the mobile application. A secure authentication system and NoSQL database have also been deployed on Amazon cloud services. To ensure the success of this application, focus group discussions with the patients will be conducted to collect their requirements and test the acceptability, usability and feasibility of this application.

Results

By July 2019, the mobile application will be fully developed and tested.

Conclusion

Mobile applications have the potential to improve the fitness of patients with obesity before their surgery. Using a multi-disciplinary approach, a cloud-based, ontology-driven mobile application will be developed and tested.

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High Intensity Interval Training in the context of multimodal prehabilitation protects colorectal cancer patients from losing lean body mass after surgery

Introduction: Cancer-related muscle loss is associated with poor prognosis and postoperative complications, hence preserving muscle mass perioperatively is a key element of care. While Moderate Intensity Continuous Exercise (MICT), as part of multimodal prehabilitation for colorectal cancer, is known to attenuate lean body mass (LBM) decline,[1] the effect of High Intensity Interval Training (HIIT) has yet to be studied.

Methods: This retrospective analysis included a subgroup of elective colorectal cancer surgery patients from two RCTs which were approved by the MUHC Research Ethics Board (August 2015 to January 2019). Patients in the PREHAB group were compared to those receiving standard of care following ERAS pathway (CONTROL). Preoperative conditioning included supervised aerobic and resistance training, nutritional therapy (whey protein supplementation to achieve 1.5g/kg/day) and anxiety-coping strategies, as per multimodal prehabilitation. Aerobic exercise consisted of HIIT, where maximal and minimal intensities were individualized according to cardiopulmonary exercise test results. Body composition was assessed in all patients using bioelectrical impedance analysis at baseline, prior to- and four weeks after surgery. The primary outcome was change in LBM percentage (LBM%) using the ratio between LBM and weight, before and after surgery.

Results: The analysis involved 31 patients who completed all assessments. PREHAB included 15 patients (60% males) with a median age of 67 years [IQR, 61-69], while CONTROL included 16 patients (50% males) aged 60 years [IQR, 49-76]. No significant difference was observed in anthropometric measurements at baseline (weight of 84kg [IQR, 63-104] vs. 73kg [69-80]; mean absolute LBM 55kg ±15 vs. 52kg ±12; and LBM% 66 ±5 vs. 66 ±11, PREHAB and CONTROL, respectively), in disease or surgical characteristics. Compared to baseline, PREHAB patients significantly improved their LBM% by 2.10 ±2.24, p=0.010, at four weeks after surgery, while CONTROL patients did not (0.58 ±2.81). However, no significant changes were observed between groups, p=0.107, (Fig.1).

Conclusion: In comparison with our previous study using MICT, this preliminary result indicates that multimodal prehabilitation with HIIT provides sufficient LBM reserve to face surgical stress and the metabolic cost of recovery.

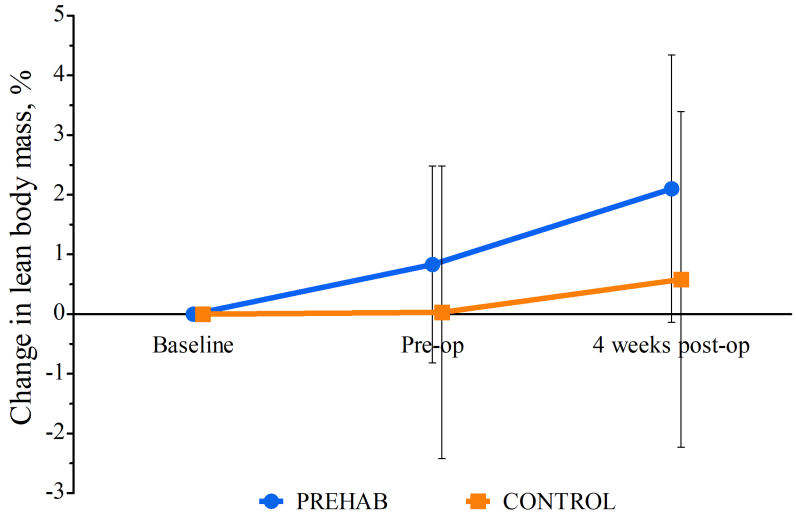

Fig. 1. *Mean change (SD) in lean body mass percent before and after surgery in the PREHAB and CONTROL groups.*

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PR 1920

In-hospital resistance training: the next step in the prehabilitation process

Introduction: Despite advances in surgical enhanced recovery programs such as ERAS, there remains an important decline in patient functional capacity following surgery[1]. Although prehabilitation has been shown to improve this post-surgical decrement[2], in-hospital bed rest and sedentarism impairs recovery[3]. Assisted walking has been shown to provide no additional benefit over current ERAS mobilization guidelines[4], suggesting the physical stimulus of basic ambulation is insufficient to mitigate the physical decline associated with surgery.

Resistance exercise is an effective means of preserving muscle mass, increasing muscle power, maintaining activities of daily living, enhancing energy expenditure and body composition, and promoting participation in spontaneous physical activity[5]. Additionally, it is an important feature of prehabilitation[6] and can be adapted to provide a potent exercise stimulus despite limitations due to space and functional capacity.

The purpose of this study was to investigate the feasibility of incorporating in-hospital resistance exercise for colorectal resection patients.

Methods: 30 patients with colorectal cancer who had followed a prehabilitation program participated in the study. A whole body workout, targeting major muscle groups, was shown to patients by an exercise specialist in the pre-operative period. On post-operative day 1 (POD1), all patients were assessed to determine whether exercises could be performed standing, sitting or lying in bed (stratification). Each day from POD1, the patients performed at least one set of 10-12 repetitions of moderate intensity resistance training, progressing intensity and stratification, if not previously standing. In addition, all patients were encouraged to ambulate as per ERAS guidelines.

Results: On post-operative day 1 or POD1, 90% of patients participated in resistance exercise. (56.7% standing, 10% seated, 23.3% performed in-bed exercise, 10% of patients refused to participate and 0 discharged). On POD 2, 85.1% (23/n=27: 3 discharged) of patients participated in resistance exercise (3 patients refused and 1 was not seen by the kinesiologist due to discharge). By POD 3, 73.3% (11/n=15; 15 discharged) of patients participated in exercise, 3 patients refused and one was not seen by the kinesiologist due to discharge. Reasons for refusal were: fatigue, nausea/vomiting, dizziness and pain. By POD2, all patients, at least, sat up in bed to perform exercise. No adverse events due to exercise were reported.

Conclusions: It is feasible to incorporate in-hospital resistance training. A stratified approach allows for individualized exercise prescription, encouraging patient participation and preventing sedentary behavior. Importantly for prehabilitation, resistance training serves as a logical continuation of our efforts into the recovery period.

References:

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[6] Scheede-Bergdahl C, Minnella EM, Carli F.Anaesthesia. 2019 Jan;74 Suppl 1:20-26.

Table 1. Exercise modality stratification criteria

IN BED	SEATED	STANDING/MOBILE
• Unmoved by nurse/ nurses suggestion • Low BP • Dizziness • Constant Nausea/Vomiting • Unable to get from lying down to sitting unassisted • Fatigued • Feeling of weakness • Constant moderate/severe pain • Shortness of breath • Cognitively impaired	• Slightly low BP (relative to patient normal) • Mild dizziness • Occasional nausea • Able to move from bed unassisted • Fatigued • Feeling of weakness • Unstable balance • Mild pain	• Stable BP (relative to patient normal) • Free from dizziness • Mild occasional nausea • Able to move from bed unassisted • Mild fatigue • Minimal pain

Table 2. Proportion of patients performing the resistance training program by exercise modality, over the length of hospital stay

	Standing	Seated	In-bed	Refused	Not seen	Discharged
POD1 (n=30)	17 (56.7)	3 (10)	7 (23.3)	3 (10)	0 (0)	0 (0)
POD2 (n=27)	20 (74.1)	3 (11.1)	0 (0)	3 (11.1)	1 (3.7)	3 (10)
POD3 (n=12)	8 (66.7)	3 (25)	0 (0)	3 (25)	1 (8.3)	15 (56)

Data are presented as frequency (%). POD = post-operative day. Discharge percentages are calculated from discharge in relation to previous day. The remainder of percentages are based on number of subjects in hospital on each day.

Title: Multimodal prehabilitation improves insulin response to glucose load in prediabetic colorectal cancer patients

Introduction: Patients with cancer often develop insulin resistance and abnormal glucose metabolism,[1, 2] and both are characteristic of a prediabetic state, defined as HbA1C between 5.7 and 6.4%.[3] The purpose of the present study is to determine whether preoperative high intensity exercise, as part of a multimodal prehabilitation intervention, modulates plasma insulin response to a glucose load in prediabetic colorectal cancer patients prior to surgery.

Methods: A total of 19 prediabetic colorectal cancer patients [mean (SD) age = 68.4 (10.3) yrs] awaiting surgery were randomized to receive either a prehabilitation intervention [PREHAB, n=11; mean (SD) HbA1C = 5.9 (0.3) %] or standard care [CONTROL, n=8; mean (SD) HbA1C = 5.8 (0.1) %]. The four-week prehabilitation intervention consisted of a 3-day per week supervised exercise program consisting of high intensity interval training and resistance exercises, nutritional counseling with protein supplementation and anxiety reducing strategies. The CONTROL group followed standard hospital care as per Enhanced Recovery After Surgery pathways. A 75-g oral glucose tolerance test (OGTT) was performed after a 12-hour overnight fast at baseline and preoperative visit. Blood samples for the analysis of plasma glucose and insulin were collected 0, 10, 20, 30, 60, 90 and 120 min after ingestion of glucose. Primary outcomes were the change in insulin area under the curve (AUC) and time-to-peak plasma insulin response between baseline and preoperative visit.

Results: A significant difference in the change in plasma insulin AUC was observed between the PREHAB and CONTROL groups, where the PREHAB group decreased by 13% (plasma insulin AUC 35829.95 ± 12878.56 to 31303.68 ± 10896.28) and the CONTROL group increased by 22% (plasma insulin AUC 37109.44 ± 22418.49 to 45142.83 ±41775.33), $p<.0018$. Peak plasma insulin response in the CONTROL group occurred at 60 min at baseline and increased to 90 min at preoperative visit indicating reduced tissue insulin sensitivity. In contrast, the peak plasma insulin response in the PREHAB group remained at 60 min. Therefore, a significant change in plasma insulin response at 90 min was observed between the PREHAB and CONTROL group, $p=.0008$, (Figure 1).

Conclusion: Four weeks of high intensity exercise within a multimodal prehabilitation program reduced the plasma insulin response to a glucose load in prediabetic colorectal cancer patients demonstrating an improvement in tissue sensitivity to plasma insulin.

References:

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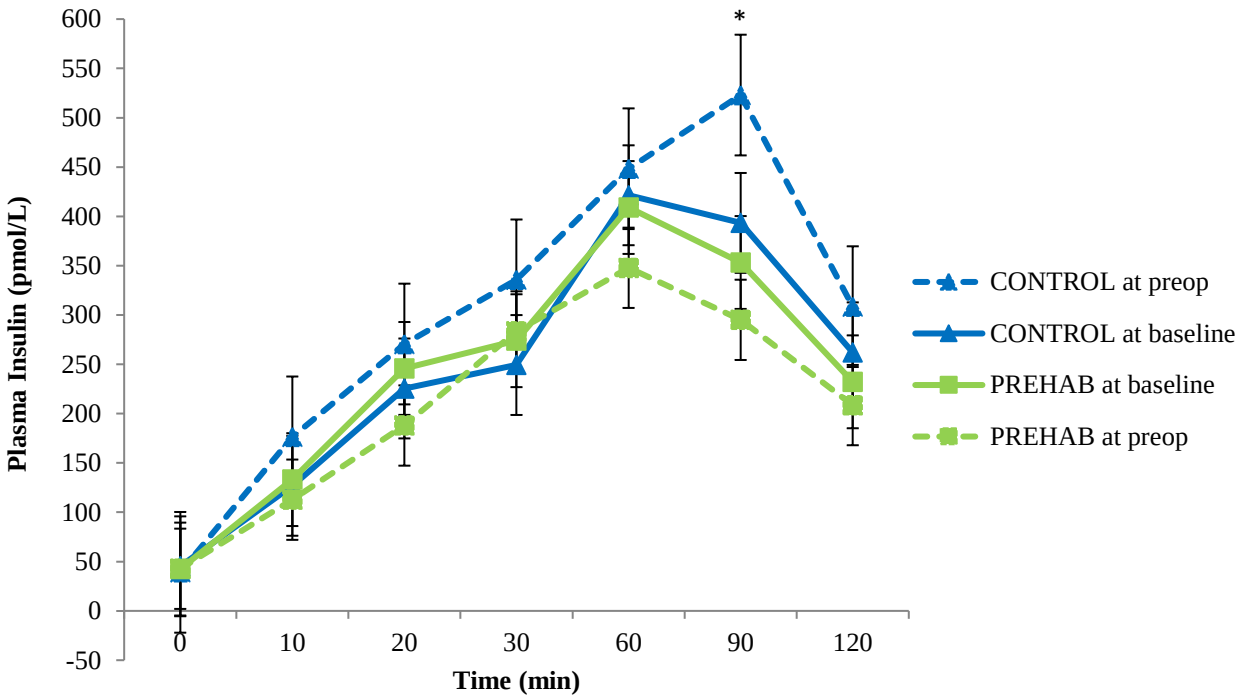


Figure 1. Mean (±SE) plasma insulin response during 2-h OGTT in prediabetic PREHAB vs. CONTROL patients at baseline and preop visit.

PR1922

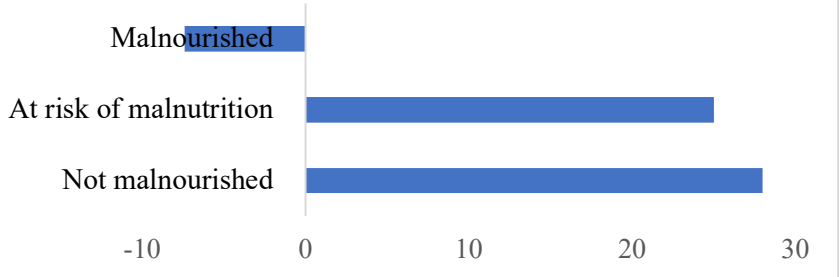
Title: Malnutrition and functional capacity: What is the effect of multimodal prehabilitation?

Introduction: Scarce healthcare resources necessitate an understanding of which patient groups benefit most from prehabilitation. In colorectal cancer, patients with poor preoperative walking capacity experience the greatest improvements in physical function from a multimodal prehabilitation program.[1] The degree to which patients with poor nutritional status respond to prehabilitation is unknown. We sought to determine whether preoperative nutritional status is a predictor of change in physical function in prehabilitated colorectal cancer patients.

Methods: We conducted a retrospective analysis of our randomized controlled prehabilitation trials for colorectal cancer surgery from 2011-2018. Prehabilitation involved personalized nutrition counselling with whey protein supplementation, resistance and cardiorespiratory exercises as well as deep breathing for anxiety reduction, beginning 4 weeks before surgery and continuing for 8 weeks after surgery. Nutritional status was measured at baseline with the Patient-Generated Subjective Global Assessment (SGA). Physical function was measured as walking capacity using the six-minute walk test (6MWT) at baseline and within one week of surgery. Poor walking capacity was defined as a 6MWT <400 meters.[1] The minimal clinically important difference in 6MWT was defined as +19m.[2] We employed multivariable linear regression to determine whether preoperative nutritional status predicted change in 6MWT before colorectal cancer surgery.

Results: Of the 186 prehabilitated patients (Mean age 69 years ±11.5) included in our analysis, 78% were not considered to be malnourished (SGA A), 16% were suspected to be malnourished (SGA B) and 7% were malnourished (SGA C). Sixty percent of the SGA B/C patients were found to have poor walking capacity at baseline. Unadjusted mean changes in 6MWT (Figure 1) suggested that malnourished prehabilitated patients experienced a -7m change in 6MWT before surgery, while adequately nourished prehabilitated patients experienced a clinically meaningful increase of +28m. Multivariable linear regression adjusted for age, sex, baseline 6MWT and each individual trial, revealed that for every drop in SGA-defined nutritional status, the preoperative change in 6MWT significantly dropped by -19.5m (SE: 9.8m, P=0.049).

Table 1: Unadjusted Mean changes in 6MWT distance (meters) before colorectal surgery



Conclusion: Despite participating in a trimodal prehabilitation program for 4 weeks before surgery, malnourished colorectal cancer patients did not experience a meaningful improvement in walking capacity before surgery. Future prospective trials should aim to understand these findings so that we can better target this vulnerable patient group.

References:

1. Minnella EM et al, Surgery,160,1070-9, 2016
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PR1923

Health ImProvement and Optimisation Project – preop HIP-OP

In 2015, the RCoA announced their 5 year vision to identify and treat long term chronic health conditions in patients undergoing surgery to reduce complications and length of stay. The HIP-OP project aimed to, with the help of a digital solution, identify and treat surgical patients with chronic health conditions early in the surgical pathway so the time spent on the waiting list was used efficiently for optimisation. 5 key areas were identified to target initially – diabetes, anaemia, atrial fibrillation, smoking and obesity.

The initial pilot was to discover the rates of comorbidities within this population and to ensure the process was feasible.

Methods

Patients requiring joint arthroplasty were used as the sample group n=80. Patients were reviewed on the day of listing for surgery by a health care assistant with minimal training. A simple screen using point of care testing and a digital solution was undertaken. In collaboration with primary care, standardised letters were created for communication of the screening tests with primary care.

Results

All patients asked to undertake the preop screen were universally enthusiastic about the process and all consented to take part. The screening process took no longer than 10 minutes and was able to be perform within existing resource.

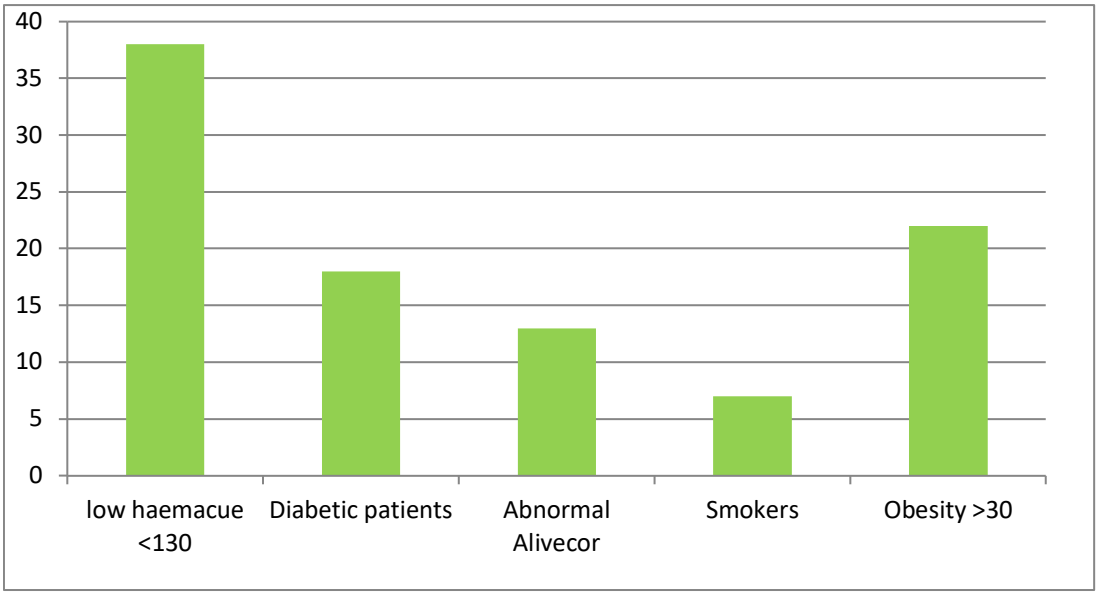
Of the 5 specific areas, over 50% of patients had an abnormality discovered during the HIP-OP process. The rates of abnormalities are documented in the table below. Of note a number of success stories have been shown which have meant delays to surgery have not been required. 3 patients diagnosed with iron deficiency anaemia have been investigated and treated appropriately. A further 2 patients were appropriately managed for atrial fibrillation and rate controlled and appropriate anticoagulation commenced in the time prior to their formal PAC appointment 6 weeks preoperatively.

Discussion

The project was a health care led project supported by a digital solution which did not require any new investment. Patients and primary care engaged with the process and we are currently awaiting the role out of the HIP-OP process to other surgical speciaility areas including our major cancer group as well as extending the interventions to include COPD, alcohol and dementia.

Results:

We have looked at the first 80 patients and the results are as follows:



Patients identified 'at risk' or with a condition have entered into the pathway via primary care or secondary care. This includes anaemia, AF, smoking cessation services or management of diabetes.

PR1924

Trimodal prehabilitation in hepato-pancreato-biliary cancer patients awaiting surgery: preliminary findings

Introduction: Little is known about the effect of prehabilitation on hepato-pancreato-biliary cancer (HPBC) patients. The study goal was to determine the impact of prehabilitation on the functional recovery of patients undergoing surgery for HPBC.

Methods: A single-centre, parallel-arm randomized controlled pilot trial was conducted. Patients were randomly assigned to either a prehabilitation or rehabilitation program. The prehabilitation group received a trimodal program comprising aerobic (daily), strength (every other day) and flexibility (daily) exercises (once-weekly supervised and home-based), nutritional counselling with whey protein supplementation, and relaxation exercises initiated 4 weeks before surgery. The rehabilitation group received the same trimodal program (unsupervised home-based) initiated immediately after surgery. Both groups continued the program for 8 weeks after surgery. The primary outcome was functional exercise capacity measured using the 6-minute walk test (6MWT). Secondary outcomes included muscle mass measured using the appendicular skeletal muscle index (ASMI) obtained from dual energy x-ray absorptiometry.

Results: Thirty-five patients were randomized to receive prehabilitation (n=17) or rehabilitation (n=18). Both groups were comparable in age, gender, ASMI and baseline 6MWT. The prehabilitation group demonstrated a clinically meaningful improvement (+19.63 m [SE, 0.25]; p=0.061) in 6MWT from baseline to pre-operative assessment. From baseline to the 4-weeks postoperative assessment, the rehabilitation group experienced a statistically and clinically significant decrease in mean 6MWT (-23.72 m [SE, 0.36]; p=0.035), whereas the prehabilitation group was able to maintain their baseline walking capacity (-0.11 m [SE, 0.32]; p=0.991). From the preoperative appointment to the 4-weeks postoperative assessment, the rehabilitation group experienced a statistically significant decrease in mean ASMI (p=.050), whereas the prehabilitation group was able to maintain their preoperative ASMI.

Conclusion: Compared to the postoperative period, the preoperative period may be a more opportune time to initiate a trimodal program to promote functional recovery in HPBC patients. Our preliminary findings indicate trimodal prehabilitation can lead to a clinically meaningful enhancement of preoperative functional walking capacity, and accelerate return to baseline walking capacity and preoperative ASMI after surgery.

PR1925

Preoperative Cardiopulmonary Exercise Testing (CPET) in Wales - A National Survey

Introduction

A 2018 survey of CPET in England estimated >30,000 preoperative CPETs are performed annually[1]. A previous survey of perioperative CPET in Wales was conducted in 2010. We aimed to evaluate how services in Wales have progressed since 2010 and establish whether consistent standards of practice are employed.

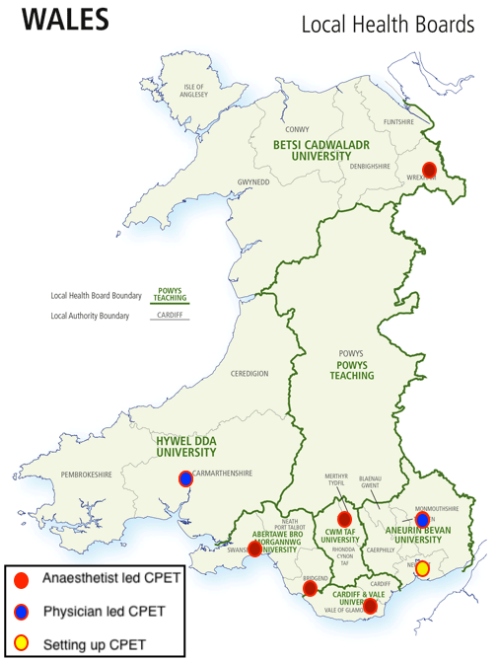
Methods

We surveyed 19 major hospitals from the 7 Welsh health boards between October and December 2018. We telephoned the Anaesthetic Departments in each hospital, determined whether CPET was available, and sent the Clinical Lead an online survey. If unsuccessful, then a telephone interview was conducted. We aimed to assess CPET service provision, conduct and result interpretation.

Results

19/19 major hospitals in Wales responded to the CPET survey. 7 hospitals (37%) deliver pre-operative CPET and one hospital is setting up a service. There is CPET provision within every Local Health Board in Wales (excluding Powys Teaching) as seen in figure 1. Most services are Anaesthetist led (71%).

Figure 1: Preoperative CPET centres within Wales



All centres used a cycle ergometer for testing. Vascular patients were the most commonly tested (86%), followed by upper GI (71%) and colorectal (57%).

All centres used Peak VO_2 as a predictor of post-operative outcome, and 57% of centres used a 15mls/kg/min threshold to identify a high-risk patient. 86% of centres use a manually determined Anaerobic Threshold, with 50% centres using a threshold of 11mls/kg/min. 71% use the ventilatory equivalent for CO_2 (VE/VCO_2) as a predictor of outcome following surgery; 60% use a threshold value of 34. Outcome of high-risk identification is summarised in Table 1.

Table 1: Action taken following identification of high-risk patient

Action	Number of Centres
Discuss risk with patient	4 (57%)
MDT Discussion	4 (57%)
Post-operative destination planning	3 (43%)
Patient optimisation	2 (29%)
Modification of Surgical Plan	2 (29%)

Discussion

We estimate >1500 preoperative CPETs are performed annually within Wales. This demonstrates significant expansion (>250%) of preoperative CPET since 2010. There is some variation in the way CPET is interpreted and used. Recent national guidelines may help to improve standardisation of interpretation and reporting of CPET tests[2]. Planning for an all Wales CPET group will facilitate collaboration and research across centres.

References

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2. Levett et al. British Journal of Anaesthesia. (2018)120(3):484.

Implementation of an IV iron service in a major tertiary referral centre
Does it improve preoperative haemoglobin levels and what is the optimal timing?

Preoperative IV iron is being used for the treatment of iron deficiency anaemia before major surgery (1). There is limited evidence to demonstrate (i) the effectiveness of IV iron in elevating Hb levels prior to major surgery and (ii) the time required after IV iron administration to gain maximal Hb level gain. We investigated these issues whilst developing an IV iron service commenced in the Perioperative Clinic at Freeman Hospital, Newcastle upon Tyne in December 2016

Intervention

IV iron therapy initially included ferrinjet. This was replaced by monofer (max 1.5g) and subsequently monofer (20mg/kg max 2g). No repeat dosing was administered. A prospective database of patients receiving IV iron was collected that included information on type of IV iron used, planned surgery, whether surgery was undertaken and the change in Hb between IV iron administration and the delivery of surgery.

Results

In total, 158 patients have been treated in a period of 20 months for iron deficiency anaemia. In total, 112 underwent surgery and had a Hb recorded before IV iron therapy and before surgery.

The average time from preoperative Hb measurement to administration of IV iron was reduced due to a drive in education and awareness of the protocol from 17 to 10 days. The time from IV iron treatment to surgery has fallen from 51 to 37 days.

Mean baseline Hb was 104 (SD+/-13.4). There was a significant rise in Hb levels from baseline to surgery, with the mean Hb on the day of surgery was 117.5 (SD +/-15.5); $p<0.0001$. There was no difference in the rise in Hb depending on the type of IV iron administered.

Patients were then grouped into those who had IV iron administered <14 days, 14-28 days and >28 days before surgery. There was a significant difference in the Hb rise in those who had > 14 days from IV iron to surgery ($p=0.016$) but no benefit from increasing that time to > 28 days (Table 1).

Discussion

Preoperatively administered IV iron increased preoperative Hb prior to major surgery. The increase was more significant in patients were there was at least >14 days from administration to surgery.

Time from IV iron to surgery	Rise in Hb mean (SD)	Blood transfusion rates
<14 days	10.3 (9.26) *	41.3%
14-28 days	17.9 (17.1)	13.3%
>28 days	18.2 (14.8) * p=0.016	11.9%

References

1) NICE guideline NG24. Nov 2015:Blood transfusion

Title: Improving recognition and treatment of preoperative anemia can decrease the incidence of admission anemia in ERAS patients

Introduction: Based on NSQIP data for our institution, the incidence of anemia in patients presenting for radical cystectomy (RC) and gynecologic oncology (GO) surgery was 40.8% and 43.2%, respectively . The transfusion rate from start of surgery to 72 hours post-op was 26.6% (RC) and 14.5% (GO). Our hospital's perioperative blood management program (PBMP) recommended that all preoperative RC patients with a hemoglobin (Hgb) <135 g/L and all GO patients with a Hgb <115 g/L be evaluated for iron deficiency anemia, and treated when appropriate. Despite this recommendation, an audit revealed that only 43% of RC patients meeting that criteria were referred to PBMP, with a subset of those patients receiving oral and/or IV iron prior to surgery.

Methods: A multidisciplinary group consisting of family physicians, surgeons, anesthesiologists, a transfusion medicine specialist, an endocrinologist, and nursing staff, in addition to a quality coach was created in September 2017. Through bimonthly meetings, the patient's journey from their initial consultation with the surgeon to their admission to hospital was mapped. Education about PBMP referral criteria, the timeline necessary for treatment (minimum 3 weeks), and average transfusion rates was provided, and the referral process was simplified. For data collection and analysis, the WHO definition of anemia was used (< 130 g/L for men and < 120 g/L for females), in addition to hematocrit (Hct), as it is a routine NSQIP metric. Statistical comparisons were done using Fisher t-tests.

Results: Between October 1, 2017 and October 31, 2018, 94 consecutive RC and 327 consecutive GO cases (elective) were followed. Their data was compared to historical NSQIP data (Oct 2015-Sept 2017). During this timeframe, there was a significant decrease in preoperative anemia (p=0.02)† and a trend toward decreasing transfusion rates for GO, but not yet with RC (Table 1). This finding was coincident with an increase in referral rate and treatment within our PBMP.

Table 1:

	RC		GO	
	Pre intervention n = 222	**Oct 1/17 – Oct 31/18 n = 94**	**Pre intervention n = 276**	**Oct 1/17 – Oct 31/18 n = 327**
Preoperative anemia (%)	40.8	26.9	36.6	26.9†
Preoperative Hct	39.2 (male), 36.5 (female)	41.0 (male), 39.0 (female)	36.0	39.0
Transfusion rate (% pts)	29.3	29.8	14.5	10.7
Referral rate (%)	41.0	79.4	41.0	79.4

Conclusion: Greater education regarding perioperative anemia, together with an improved referral process to PBMP resulted in a decrease in the incidence of anemia preoperatively, with a trend toward a decrease in transfusions. Recognition and optimization of anemia, diabetes, and frailty are three of the modifiable risk factors our multidisciplinary team are focusing on improving prior to major oncology surgery.

Title: Is supervised home-based exercise feasible for older adults prior to colorectal cancer surgery?

Introduction: Preoperative physical fitness is associated with postoperative recovery, and physical exercise is known to improve physical capacity. However, there are still challenges in recruiting vulnerable older people to preoperative physical exercise interventions, and time constraints in preoperative cancer care to consider. Further research is needed to identify the optimal intervention type, duration, and intensity of exercise. Therefore, we evaluated if a supervised home-based exercise intervention was feasible for people aged 70 or older prior to colorectal cancer surgery.

Methods: People ≥70 years of age scheduled for colorectal cancer resection were recruited during an 18-month period, and randomized to an intervention group receiving supervised home-based physical exercise or a usual care group following the standard preoperative path. The intervention contained three exercise modalities (respiratory, strength, and aerobic), with a patient-specific activity integrated. It consisted of 2–3 supervised sessions a week in the participants' homes, for 2-3 weeks or until surgery, and a self-administered exercise program in between. The primary outcome was process feasibility including recruitment rate, compliance to the intervention, and acceptability. The secondary outcome was scientific feasibility including treatment safety, description of dose level, and estimation of treatment results.

Results: Twenty-three participants out of 66 eligible patients were included, corresponding to a 35% recruitment rate. The median age was 76 years with an age range of 70 to 90 years. Ten participants were randomized to the intervention group and eleven to the standard care group. Two participants were excluded due to medical reason and long travel distance, respectively. A median of 6 supervised sessions was conducted over a 17-day (range 14-24) exercise period. Compliance with the supervised exercise sessions was 97%, and the participants found the intervention acceptable. For the self-administered exercise, a median of 19 inspiratory muscle training sessions, 6 functional strength sessions, and 8.5 aerobic sessions were reported. Challenges reported by the instructors were the time constraints, and difficulties in achieving high exercise intensities on the Borg CR-10 scale. Post-intervention comparison between groups showed a statistically significant difference only in inspiratory muscle strength in favor of the intervention group ($p<0.01$).

Conclusion: An intensive preoperative supervised home-based physical exercise intervention can be conducted for older adults with similar physical status as this study population prior to colorectal cancer surgery. However, modifications are needed for a larger trial with the aim to evaluate efficacy, to improve recruitment rates and to achieve planned intensity levels.

LeakCheck: AB TRACT ACCEPTED OR EBPOM EB 1929

Preoperative upper limb strength increases with multimodal prehabilitation

Introduction

Surgical stress causes loss of lean body mass, decline in physical strength and delay in recovery of activities of daily living. The purpose of this study was to determine whether upper limb strength increases in patients undergoing colorectal cancer resection and engaged in resistance exercise and high intensity aerobic bicycle training as part of multimodal prehabilitation.

Methods

Prospective data from an ongoing RCT[1] on multimodal prehabilitation were collected. Adult patients scheduled for non-metastatic colorectal cancer resection were included, if no absolute contraindications to exercise were detected. The intervention group (PREHAB) underwent three supervised exercise training sessions per week for four weeks. This included a high-interval aerobic training conducted on a bicycle, consisting of 4 bouts of 3-min high intensity cycling (at 90% peak VO_2). The whole-body resistance training program consisted of eight exercises performed at a volume of 2 sets of 10 repetitions. The training load was 65% of estimated maximal effort, and was progressed by 5% every week. The control group (CONTROL) received standard of care which included the ERAS perioperative pathway. The primary outcome was the preoperative change in muscular strength, assessed by the submaximal One-Repetition Maximum test (1-RM),[2] which estimates the maximum weight a person can lift for a single repetition of a given exercise. To avoid any confounders with the cycling motion of the aerobic activity, the chest press was selected to represent upper body muscle strength. Tests were conducted at baseline and before surgery using the same protocol to allow comparability.

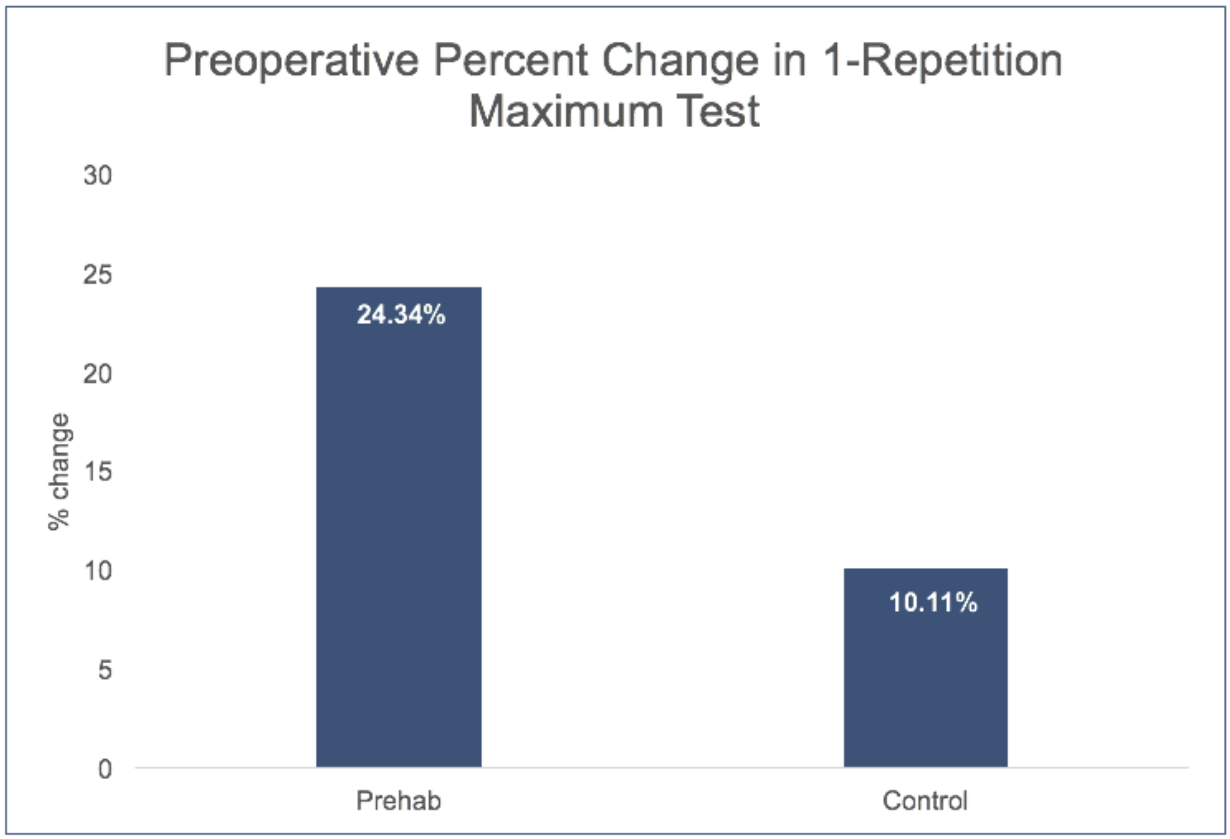
Results

Forty participants were included, 29 in PREHAB (mean age 60 years (SD13.23)), and 21 in CONTROL (mean age 63 years (SD 13.1)). Patients undergoing prehabilitation reported a significant improvement in upper body muscle strength compared to control: mean 1-RM preoperative change, 24.34% (SD 29.55) in the PREHAB group vs. 10.11% (SD 17.42) in the

CONTROL group, P=0.042. Change in strength of participants in the prehabilitation group was 2.4 times larger than that of the control group.

Conclusion

Preliminary results suggest that resistance training in the context of multimodal prehabilitation enhances preoperative strength in patients undergoing colorectal cancer resection.



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PR1931

ENGAGEMENT IN MODERATE OR VIGOROUS PHYSICAL ACTIVITY PRIOR TO MAJOR CANCER SURGERY MAY REDUCE LENGTH OF HOSPITAL STAY

Abstract

Introduction: Physical activity engagement prior to surgery is commonly associated with better postoperative outcomes. However, the role of preoperative physical activity on patient undergoing major cancer surgery remains unknown. The aim of this study was to investigate the association between the engagement on preoperative physical activity and length of hospital stay, postoperative complications and discharge destination.

Methods: Prospective cohort of 152 patients undergoing elective pelvic exenteration or cytoreduction surgery. Engagement in moderate and/or vigorous physical activity was assessed using the International Physical Activity Questionnaire Short-Form. Main outcomes included length of hospital stay, in-hospital complication rate and rate of patients discharge to home. Non parametric statistics were used to compare main outcomes between patients that engaged or did not engage in moderate and/or vigorous physical activity prior to surgery.

Results: Of the 152 patients enrolled, 81 (53%) engaged in moderate and/or vigorous physical activity in the week before their surgery. Patient characteristics were similar between groups. Patients that engaged in moderate and/or vigorous physical activity at the preoperative were discharged from hospital 3 days earlier when compared with patients that did not engage in moderate or vigorous physical activity (15 days versus 18 days; p=0.022). No statistically significant difference was observed in postoperative complication rates (67% versus 76%; p=0.222) and discharge to home (94% versus 83%; p=0.101).

Conclusions: Engagement in moderate and/or vigorous physical activity during the preoperative period appears to reduce length of hospital stay of patients undergoing major cancer surgery.

PATIENTS UNDERGOING MAJOR CANCER SURGERY ARE READY FOR A DEFINITIVE TRIAL INVESTIGATING THE EFFECTIVENESS OF A PREOPERATIVE EXERCISE PROGRAM: RESULTS FROM THE PILOT PEPA TRIAL

Introduction: Survival outcomes for patients undergoing major abdominal cancer surgery are now acceptable; however, the high rate of postoperative complications remains a challenge. Currently, there is some evidence suggesting that preoperative exercise may reduce postoperative complications. The primary aim of this pilot trial was to establish the feasibility and acceptability of a preoperative exercise program designed to improve patient outcomes after cytoreductive surgery and pelvic exenteration. The secondary aim was to obtain pilot data on the likely difference in key surgical outcomes to inform the sample size calculation for a full-scale randomised controlled trial.

Methods: Patients schedule to undergo cytoreductive surgery or pelvic exenteration were invited to participate. Participants were randomised (1:1 ratio) to a 2-6 weeks' preoperative, face-to-face, individualised exercise program (intervention group) or to usual care (control group). Feasibility was assessed with consent rates to the study, and for the intervention group, retention and adherence rates to the preoperative exercise program. Acceptability of the exercise program was assessed with a semi-structured questionnaire. In addition, postoperative complication rates, length of hospital stay and quality of life measures were collected at baseline, day before surgery and in-hospital.

Results: Of 122 patients screened, 26 (21%) were eligible and 22 (85%) accepted to participate in the trial and were randomised to the intervention (11; 50%) or control group (11; 50%). No difference in baseline characteristics were found, with most patients being male (55%) and presenting a median age of 63 years, with 11 (50%) undergoing pelvic exenteration. All participants completed the trial with no crossovers. Adherence to the preoperative exercise sessions was 92.7%, with all participants satisfied (33%) or extremely satisfied (67%) with the overall design of the preoperative exercise program. No significant differences in postoperative complication rates, length of hospital stay and pre-discharge quality of life outcomes was found between groups.

Conclusions: The results of our pilot trial demonstrate that a preoperative exercise program is feasible and acceptable to patients undergoing major abdominal cancer surgery. There is an urgent need for a definite trial investigating the effectiveness of a preoperative exercise program on postoperative outcomes in patients undergoing major abdominal cancer surgery.

Effects of prehabilitation on in-patient step counts after major abdominal surgery for gastrointestinal cancer: Study methodology

Enhanced Recovery After Surgery protocols include early postoperative mobilisation given related benefits to clinical outcomes and recovery. Prehabilitation, a process of optimizing preoperative health, may support early postoperative mobilisation due to benefits on pre- and postoperative functional capacity; however, its effects on early ambulation and the potential moderation effects of step counts on postoperative outcomes remains unknown. The proposed study aims to examine the effects of a bimodal prehabilitation intervention compared to usual care on inpatient step counts following major abdominal surgery for gastrointestinal (GI) cancer.

Our study protocol describes a secondary analysis within a larger two-arm randomized controlled trial examining the effect of prehabilitation on quality of life and clinical outcomes for GI cancer patients undergoing major surgery. Eligible patients include those who: i) are ≥ 18 years of age; ii) have a pathologically or radiologically confirmed diagnosis of an operable GI cancer; iii) have an expected LOS of ≥5 days; iv) are fluent in English; and v) will have ≥21 days of prehabilitation opportunity (i.e. prehabilitation window). N=128 will be randomized 1:1 to prehabilitation (PREHAB) or usual care (UC). PREHAB participants will engage in a combined preoperative aerobic and resistance exercise program plus mindful relaxation. UC will receive standard preoperative counselling including cancer-specific physical activity guidelines. Postoperative in-patient ambulation (mean steps/day and trajectory) will be collected with Fitbit activity trackers and assessed via linear mixed effect regression modeling. The effect of increased step counts as a moderator of the impact of prehabilitation on change in one-month functional capacity measured with a 6-minute walk test will also be assessed via a series of linear regression analyses according to the product-of-coefficients test.

Examining the effect of prehabilitation on early ambulation and the effect of in-patient steps as a moderator on change in one-month functional capacity will advance our understanding of early ambulation and its impacts on postoperative outcomes. The potential findings may also serve to better inform standard of care both pre- and postoperatively, and provide further support for a multimodal approach to prehabilitation in this population.

Multimodal prehabilitation to reduce the incidence of delirium and other adverse events in elderly patients undergoing elective major abdominal surgery: a controlled before-and-after study.

Abstract

Background
Delirium is a frequent complication in elderly patients undergoing major abdominal surgery. Increased health-care costs, morbidity and mortality rates and institutionalization are common consequences of postoperative delirium. Multicomponent interventions such as the Hospital Elder Life Program have been proven effective in reducing the incidence of delirium, however despite these interventions, incidence rates remain high. New strategies or therapies to reduce the incidence of delirium further are therefore necessary. Previous interventions mainly focus on preventing delirium during admission. New prevention programs implemented prior to admission, or prehabilitation programs, could possibly provide an additional decrease in delirium incidence. The objective of this study was to assess the effectiveness of prehabilitation in reducing the incidence of delirium in elderly patients.

Methods
A single-center controlled before-and-after study was conducted, including patients aged 70 years or older who underwent elective abdominal surgery for colorectal carcinoma or an abdominal aortic aneurysm between January 2013 and October 2015 (control group) and between November 2015 and June 2018 (prehabilitation group). The prehabilitation group received interventions to improve patients': 1. Physical health, by providing them with unsupervised home-based exercises; 2. Nutritional status, by providing patients with dietary advice and supplementary proteins; 3. Risk factors for delirium, by performing a comprehensive geriatric assessment and providing patients with individualized interventions; and 4. Preoperative anaemia by providing patients with intravenous iron injections. The primary aim was reduction in incidence of delirium. Secondary outcomes were additional complications, length of stay, unplanned ICU admission, length of ICU stay, readmission rate, institutionalization, and in-hospital or 30-day mortality.

Result
A total of 627 patients, 360 control patients and 267 prehabilitation patients, were included in the final analysis. The mean number of prehabilitation days was 39 days. The prehabilitation

group was significantly older, had a higher burden of comorbidities and was more physically impaired at baseline. At adjusted logistic regression analysis, delirium incidence was reduced significantly from 11.7 to 8.2% (OR 0.56; 95% CI 0.32 – 0.98; P=0.043). No statistically significant effects were seen on secondary outcomes.

Conclusion
Current prehabilitation program is feasible and safe, and can reduce the incidence of delirium in elderly patients undergoing elective major abdominal surgery. The program had no effect on length of stay, readmission rate, institutionalization and in-hospital or 30-day mortality. This program merits further evaluation.

PR1935

Prehabilitation World Congress 2019

Inclusion of up to 1 table and 1 figure is permitted. Abstract length should not exceed 400 words and should be submitted in 12pt Times Roman font.

1. Title: Frequency and severity of sarcopenia and physical function in a cohort of surgical prehabilitation patients

2. Introduction: Sarcopenia and suboptimal performance status are both associated with postoperative complications and morbidity among cancer patients. Prehabilitation has been effective in improving fitness, muscle strength and quality of life. Our objective was to describe the frequency of sarcopenia and sarcopenic obesity in a cohort of patients referred for a prehabilitation program and the association between body composition and physical function.
3. Methods: Retrospective study of 99 consecutive patients referred for comprehensive prehabilitation in preparation for intended oncologic surgery. Visits included Physical Medicine and Rehabilitation (PM&R) evaluation of functional impairment and nutrition management, and physical therapy for individualized, home-based exercise. Body composition including skeletal muscle, visceral adipose tissue, subcutaneous adipose tissue were measured from routine computed tomography images obtained within 30 days of the prehabilitation consultation using the SliceOMatic software (TomoVision, 2012). Sarcopenia was defined using gender-adjusted norms. Sarcopenic obesity was defined as sarcopenia with a body mass index greater than 25. Physical function measures including the six-minute walk test (6MWT), five-times sit-to-stand

(5xSTS), and grip strength (GS) were obtained from physical therapy visits during the consultation (baseline) and at preoperative follow-up visits (if available).

4. Results: Mean (SD) age was 72.6 (9.7). Mean (SD) prehabilitation duration was 82.7 (91.1) days. The most common primary cancer diagnoses were gastrointestinal (59%), genitourinary (15%), gynecological (7%), sarcoma (7%). Forty-nine patients (49%) were sarcopenic and of these, 28 (28%) fulfilled the criteria for sarcopenic obesity. There was a negative correlation between age and skeletal muscle mass (P=0.04). There was no significant association between sarcopenia or sarcopenic obesity and baseline physical function or changes in physical function. 6MWT and GS at baseline were lower than age and gender-related norms (P<0.0001). Sixty-one patients (61%) underwent surgery. There was no association between sarcopenia and having surgery. During the preoperative period, the 6MWT improved from mean 321.1m to 356.5m (P<0.001) and the 5xSTS improved from mean 10.8s to 9.4s (P<0.001). There was no difference in functional improvement between the sarcopenic and non-sarcopenic patients according to sex.
5. Conclusion: There was a high incidence of sarcopenia and sarcopenic obesity in a cohort of patients referred to PM&R for prehabilitation. Sarcopenia and sarcopenic obesity were not associated with worse physical function. The diagnosis of sarcopenia should not preclude the decision for surgery, as these patients' physical function may improve with a comprehensive, multimodal prehabilitation program.
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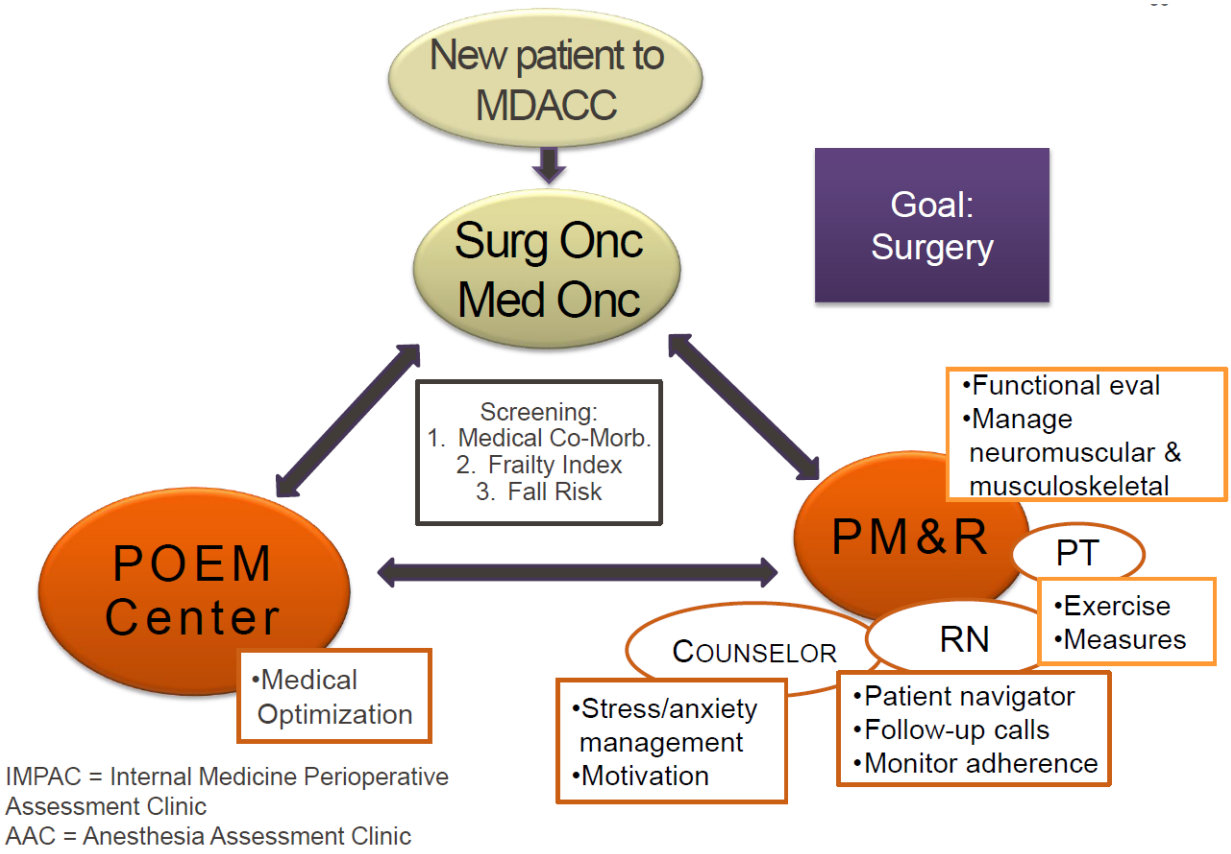

IMPAC = Internal Medicine Perioperative Assessment Clinic
AAC = Anesthesia Assessment Clinic

PR1936

Titel: Prehabilitation in older patients awaiting CABG surgery - Effects on hemodynamics, functional capacity and quality of life.

Introduction: The majority of patients awaiting coronary artery bypass graft surgery (CABG) are physically inactive to avoid further risks. Aim of this randomized controlled trail was to investigate the effect of a preoperative supervised two week endurance training on the pre-, peri- and postoperative outcomes of patients awaiting elective CABG.

Methods: 203 patients (67.1±8.4y) were randomly assigned to either an intervention group (IG) or a control group (CG). Patients of IG participated in a preoperative aerobic endurance exercise program on a cycle ergometer with monitioring with six training sessions within two weeks. Exercise intensity was 70% of VO_2peak. Patients of CG were physically inactive. At baseline (T1), one day before surgery (T2), at the beginning (T3) and at the end (T4) of cardiac rehabilitation (CR) measurements of endothelial function using pulse wave analysis (values obtained by Mobil-O- Graph®) as well as six minute walking test (6MWD) and timed up and go test (TUG) were performed. In addition patients were asked to fill the MacNew questionnaire for quality of life (QoL).

Results: All patients of IG tolerated the preoperative exercise training very well and there were no complications. In both groups functional capacity improved significantly during preoperative period. The benefits were significantly more pronounced in the IG (6MWD IG: Δ50.5m, $p<0.001$; CG: Δ14.2m, $p<0.001$; $p=0.003$; TUG: IG: Δ0.8s, $p<0.001$; CG: Δ0.1s, $p<0.001$; $p=0.018$). During the preoperative period significant interaction between groups was also found in systolic and diastolic BP with greater benefits in the IG (systolic BP: IG: Δ8.2mmHg, $p<0.001$; CG: Δ3.2mmHg; $p<0.001$; $p=0.020$; diastolic BP: IG: Δ5.6mmHg, $p<0.001$; CG: Δ1.2mmHg, $p<0.001$; $p=0.003$). Significant interaction between groups during preoperative period was found in all domains of QoL too. IG was showing more pronounced improvements than CG (IG: Δ0.3-0.4, $p\leq0.001$; CG: Δ0-0.1; $p\leq0.001$; $p<0.001$). Similar and sustained effects could be demonstrated in the postoperative period with better developments in 6MWD (T1vs.T3: IG: Δ-64.7m; CG: Δ-100.8m; $p=0.013$; T1vs.T4: IG: Δ+47.2m; CG: Δ+5.7m; $p<0.001$) and TUG (T1vs.T3: IG: Δ+1.4s; CG: Δ+2.6s; $p=0.003$) in IG compared to CG.

Conclusion: A short-term endurance training in these patients is feasible and effective. The focus of prerehabilitation in elderly patients should be set on enhancement of functional capacity in phase II CR to prevent care dependency and support the possibility of independant living.

Relationship between preoperative physical performance and postoperative outcomes on the micro and macro level

INTRODUCTION:

Older people have a reduced reserve capacity and are often physically inactive which further increases the risk of reduced health and increased health care utilization in a perioperative setting. The objective was to examine the associations between preoperative physical performance and physical activity with micro (health-related) and macro (system) level outcomes after abdominal cancer surgery in older people.

METHODS:

A prospective cohort study included 197 people over the age of 70 scheduled for abdominal cancer surgery. Physical performance and self-reported physical activity were assessed before surgery and before discharge. Micro level outcomes consisted of: postoperative complications (Clavien Dindo), mobility (ability to rise from a chair) and self-reported symptoms. Macro level outcomes consisted of length of stay (LoS) and discharge destination. Data were analyzed with appropriate regression analyses based on data level and distributions.

RESULTS:

Fifteen percent were unable to rise from a chair at discharge and 54% experienced at least one postoperative complication at 30-day follow-up. Median length of stay was 7 days and 9% were discharged to further care. Multivariable analyses showed that on the micro level, better physical performance was associated with reduced odds of higher complication severity and worse postoperative mobility. A higher level of decline in physical performance was associated with more self-reported symptoms. On the macro level, better preoperative inspiratory muscle strength was associated with shorter LoS in hospital, and better preoperative physical activity level and physical performance reduced the odds of being discharged to further care rather than home.

CONCLUSION:

The results emphasize the importance of acknowledging the physical performance rather than chronological age as well as its association with health care utilization. Objectively measured physical performance is an important addition to conventional risk assessments in preoperative care as it is associated with postoperative outcomes both on the micro and macro level. This will help to identify patients at high risk in need of prehabilitation, which should include interventions affecting preoperative physical performance.

References:

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Karlsson E et al. Postoperative physical decline in older people undergoing abdominal cancer resection – a prospective cohort study. Eur J Geriatr Oncol, 2019: Jan 17.

ESTABLISHING A PREHABILITATION EXERCISE SERVICE FOR PATIENTS IN A NATIONAL CANCER CENTRE

Objectives

Exercise in preparation for surgery is associated with a lower postoperative complication rate and earlier restoration of functional status. However, many patients do not engage in sufficient physical activity before surgery. A service was established to examine the feasibility of providing exercise based prehabilitation in a national cancer centre.

Methods

Oncology patients scheduled for surgery in >2 weeks were referred to the physiotherapy team. Patients were then contacted and invited to attend twice weekly exercise classes under the supervision of Chartered Physiotherapists in St James's Hospital. Patients completed a high intensity programme of resistance and aerobic exercise. In addition, participants were prescribed a home exercise programme for completion on a further three days of the week. Patients unable to attend supervised exercise classes were supplied with educational materials on increasing exercise capacity in the pre surgical period.

Results

During the first 6 months of the programme 154 patients were referred. The largest amount of patients were referred from the thoracic service (n=100), followed by upper GI (n=42), colorectal (n=11), Gynaecological (n=1) services. A total of 41 patients attended the prehab service. The median number of classes attended was three. An additional 74 patients unable to attend the service were supplied with educational materials on increasing exercise capacity in the pre-operative period. Reasons for nonattendance included a) patients living too far from the hospital (n=56), b) no time to complete the prehab programme before the scheduled surgery date (n=17). No adverse events were recorded during the first 6 months of the programme. Patient feedback for the service was rated as excellent.

Conclusions

It is safe and feasible to offer a prehabilitation service to surgical oncology patients in a national cancer centre as a part of perioperative care.

PR1939

Association between preoperative anaemia, blood transfusion rates and outcomes after primary joint arthoplasty

Background

Preoperative anaemia is associated with worse surgical outcomes and increased blood transfusion rates and costs. There has been a drive to treat anaemia to optimise patients prior to surgery. Consensus guidelines (1) set preoperative a cut-off value for treatment but the appropriateness of these values for different surgical specialities remain to be confirmed. We reviewed the relevance of preoperative Hb measurements to postoperative outcomes in patients listed for orthopaedic surgery.

Method

This is a single centre, retrospective review of a prospectively held database of 1096 consecutive patients undergoing primary joint arthroplasty, between 1st Jan to 31st Dec 2015 prior to an anaemia intervention being instituted. The study received a priori Caldicott approval. We investigated preoperative haemoglobin, transfusion rates, and hospital stay. We aimed to examine whether receiving a blood transfusion per se was associated with prolonged hospital stay and whether preoperative Hb level was associated with increased transfusion rates.

Results

We had complete data recorded for all 1094 patients undergoing joint replacement. The perioperative blood transfusion rate was 6%. Transfusion was associated with decreased preoperative Hb (117.5 (15.9) vs 134.4(13.5) P<0.001), increased hospital length of stay (11.7 (11.2) vs 5.4 (12.3) p<0.001 and increased surgical time 153 mins (53.2) vs 124 mins (39.2) p<0.0001.

Based on consensus guidelines for anaemia (1), the transfusion rate was 12.6 vs 2.0% and length of stay 6.5 vs 4.7 p<0.0001. However, simple ROC curve analysis showed an optimum sensitivity/specificity trade-off predicting transfusion was 115 (AUROC 0.79 sens .91 spec .53). Using this cut off limit it was associated with dramatically increased length of stay as well as postoperative transfusion. Above this level of Hb (115) the length of stay though increased was far less clinically significant above and below 130.

Conclusion

We believe this data to be novel in determining an optimum trade-off value in the preoperative setting for knee replacement surgery. In a cost limited pathway, potentially treating patients with a Hb >115 will not significantly impact on length of stay or blood transfusion rates. As part of the PDSA cycle, we now aim to use this data to inform the intervention for anaemia prior to joint replacement.

	n	LoS	% transfused
Consensus guidelines anaemia	444	6.4 (7.2)	10.8%
Consensus guidelines no anaemia	652	4.7 (4.4)	2.0%
Hb<115	99	9.35 (11.6)	27%
115 - 130	343	5.5 (5.1)	6.1%
>130	652	4.7 (4.4)	2.0%

1) Munoz et al. International consensus statement on the peri-operative management of anaemia and iron deficiency Anaesthesia 2017 Feb;72(2):233-247.

PR1940

Effectiveness of a short-therm Mindfulness-based intervention in reducing anxiety and depression in a multimodal prehabilitation program

Introduction: Anxiety and depression are common factors in patients who have to operate on oncological surgery and it suppose a worse surgical outcome. That's why techniques to improve these factors are included in the prehabilitation programs. The most widespread is mindfulness.

Methods: It's a prospective study that included patients planned for radical histerectomy surgery, radical cystectomy and low anterior resection of rectal cancer. They were evaluated in a first prehabilitation visit with the hospital anxiety and depression scale
(HADS), there were excluded patients with psychiatric history. 4 sessions of mindfulness guided by a coach were programmed. We re-evaluated with HADS in a second visit before surgery. We compared with the historical cohort in which intervention was carried out with 4 sessions of Chi-Kung.

Results: Eight patients were analyzed for the pilot study, we compared with 52 of our historical cohort. 88% of patients of the mindfulness group improve against 62% in the Chi-Kung group (t exact Fisher p=0,24). The main improve in the Mindfulness group was 4,8 points instead 1,47 in the Chi-Kung group (t student p=002).

Conclusion: Although it is an initial analysis with few patients, we found a significant improve of anxiety and depression scores in patients with Mindfulness therapy. A short-therm Mindfulness-based intervention is effective in patients waiting for cancer surgery.

PR1941

A pilot prehabilitation programme for patients undergoing major surgery in three specialty cancer groups.

Introduction

There is a growing body of evidence supporting prehabilitation in cancer patients. In this context, prehabilitation is described as an intervention between diagnosis and acute treatment with focus on targeted interventions to optimise health (Silver and Baima 2013).
We aim to evaluate the impact of a multimodal prehabilitation programme on patients undergoing major oncological surgery. The results presented are based on the first year of a two year Macmillan funded pilot project. Tumour groups involved in this pilot were Gynae-Oncology (ovarian), HPB (pancreatic) and Urology (bladder).

Methods

A rolling 5 week prehabilitation programme was developed, including a combination of supervised exercise classes and educational wellbeing sessions. Exercise classes occurred twice weekly, combining aerobic and resistance training. Patients were given a home based exercise program to supplement this. Wellbeing sessions covered fatigue and sleep, nutritional advice, meeting the Anaesthetist and signposting to support services.
Patients unable to attend were supported remotely, via telephone follow up, with a home based exercise programme.
Functional capacity was measured with 6 minute walk test (6MWT), number of sit to stands in 1 minute (STS60) and hand grip strength (HGS) before and after the prehabilitation programme. Patient feedback was gained using a devised wellbeing questionnaire.

Results

A total of 80 patients were enrolled into the programme in year one (40 Bladder, 21 Pancreas & 19 Ovarian). We gained complete data in 46 patients.
There was an average 41m improvement in the 6MWT (8% increase), an average 4 rep increase in STS60 (15% increase), and an average improvement in HGS of 0.86kg (3% increase).
There was a high level of satisfaction with the programme -100% felt it was beneficial and would recommend prehabilitation.

	Average Age	Average 6MWT pre	Average 6MWT post	Average STS60 pre	Average STS60 post	Average HGS pre	Average HGS post
HPB (13)	68 (45 – 79)	529m	597m	26	32	32.35kg	32.71kg
Gynae Oncology (7)	62 (39 – 78)	484m	512m	23	28	22.46kg	24.04kg
Urology (26)	68 (55 – 82)	540m	571m	26	30	31.76kg	32.57kg

Conclusion

The results of this pilot demonstrated an overall improvement in functional capacity, with high satisfaction levels from patients. In this pilot, delivery of a multidisciplinary prehabilitation programme to multiple tumour groups proved feasible. Limiting factors to patients completing prehabilitation included travel burden, limited time frames and changes to management plans.

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Impact of a prehabilitation program on Quality of Life (QoL)

Introduction

Prehabilitation is becoming a recognised way of preparing the patient to the surgery. In the present study we want to show the impact of a prehabilitation program on QoL.

Methods

We included 172 patients planned for radical histerectomy surgery, radical cystectomy and low anterior resection of rectal cancer during a period of three years (2016-2019). All patients were visited three times for our prehabilitaion unit, two times before surgery and one more after. Between the 1st and the 2nd visit, a minimum time of 4 weeks was necessary to consider the training program effective. The training program consist in interval aerobic exercise, respiratory exercises with an incentive spirometer and strong and stretching exercises. The Short Form Health Survey-12 questionnaire (SF-12, Spanish version 2)[1] was used to assess the physical and mental components of QoL in the three visits. We are compared the SF-12 results of the first and the second visit. We have used the *t* test (p: 0.05) for the Statistical analysis.

Results

Of the 172 patients recruited, 66 were finally analysed for the present study. 106 patients were lost, incomplete/incorrect filled out questionnaire or not completed program exercise correctly. Mean SF-12 physical summary scores in the first visit and the second visit were 39.77±12.72 and 42.24±11.75, respectively (*P*=0.0192); SF-12 mental summary scores were 51.91±9.4 in the first visit and 50.26±11.35 in the second visit (*P*=0.1433).

Conlcusion

The results of the patients that followed the program perfectly show that mean SF-12 physical summary scores after the training program improve 2.46 points and is considered statistically significant. Instead, we don´t find differences between the SF-12 mental summary scores. We can conclude that our prehabilitation program is a great tool to improve the physical capacity of our patients. However we have to raise the percentage of patients that perform it in an adequate way. Regarding the mental component we have to design new strategies to improve the results.

1. 1 Schmidt S, Vilagut G, Garin O Cunillera O, Tresserras R, Brugulat P et al. Reference guidelines for the 12-Item Short-Form Health Survey version 2 based on the Catalan general population. *Med Clin (Barc)* 2012; **139**: 613-625.

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Abstract Prehabilitation World Congress 2019

Usability of "Beter Voorbereid 1.0": a preoperative eHealth application.

Introduction

Improving lifestyle risk factors, such as physical inactivity, nutrition, smoking or alcohol consumption, prior to major surgery can enhance postoperative recovery.[1] The eHealth application "Beter Voorbereid" (Better Prepared) was developed to help patients improve their preoperative lifestyle by offering information, advice and exercises tailored to the patients' needs. The aim of this pilot study was to evaluate the usability of this first version of the mobile eHealth application in patients undergoing major elective surgery.

Methods

A concurrent triangulation mixed methods design was used to evaluate the usability in two hospitals in the Netherlands.[2] Patients were recruited at the day of their preoperative screening. They received push notifications as a reminder to read their daily advice. The System Usability Scale (SUS) was used to quantify usability (range 0-100).[3] Semi-structured interviews were conducted by telephone to gain detailed insights.

Results

The mobile app was used by 53 participants: 23 men and 30 women. Their mean±SD age was 55±14 years, with a BMI of 25.5±5.3 kg/m^2. The recommended physical activity were met by 22.6% of the participants, 11.3% smoked cigarettes and 69.8% consumed at least one unit of alcohol at least once a week. The SUS was completed by 32 participants (60%). The mean SUS score was 68.2 (marginally acceptable). The question *'Would you like to use this system more frequently'* produced the lowest scores.

The interviews were conducted with twelve participants: 6 men and 6 women. Half of the interviews were conducted preoperatively and the other half postoperatively. Interviewees were

between 35 and 76 years old, used the app between 3 and 42 days and had an average hospital stay of 4 days. Qualitative analysis suggests that the login procedure was difficult, but the app itself was easy to use. Interviewees appreciated the daily notifications. They experienced few errors in the app and could easily recover from errors. The exercises did not match the interviewees' level of physical fitness. Interviewees who used the app two to three weeks preoperatively were most satisfied.

Conclusion

The "Beter Voorbereid" app is a promising eHealth tool, but some improvements are necessary. The main areas for improvement are the login procedure, variety of the exercises and optimizing the timing of first use of the app. After improvements are made, a full-scale RCT will be conducted to evaluate the effectiveness of the app on postoperative physical recovery.

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PR1944

Title

Preoperative High Intensity Interval Training in patients scheduled for colorectal and thoracic surgery: The PHIIT trial

Author Information

ClinicalTrials.gov Identifier NCT02674815

Funding Acknowledgement: This trial was funded by a grant from the Royal City of Dublin Hospital Trust and a research bursary from the Irish Society of Chartered Physiotherapists.

Ethical Approval: Approval for this study was granted by the Saint James's Hospital/The Adelaide and Meath Hospital, Dublin, incorporating the National Children's Hospital, Joint Research Ethics Committee Dublin.

Introduction

Patients with lower levels of cardiorespiratory fitness, are at increased risk of postoperative complications, prolonged length of stay and mortality (Moran et al., 2016a). Preoperative exercise interventions can improve postoperative outcome, however current moderate intensity exercise programmes are longer than the standard colorectal and thoracic surgery pathway (Moran et al., 2016b). High intensity interval training (HIIT) produces greater improvements in fitness than moderate intensity exercise, however adherence rates of high intensity exercise interventions are low (Liou et al., 2015, Carli et al., 2010). The aim of this study is to assess the feasibility of a HIIT programme prior to colorectal and thoracic surgery.

Methods

Patients scheduled for colorectal and thoracic surgery were recruited. All patients underwent a HIIT programme prior to surgery. Patients baseline cardiorespiratory fitness was assessed via cardiopulmonary exercise testing pre- and post-intervention prior to surgery. Postoperative complications, length of stay and 30-day mortality were recorded.

Results

A total of 20 patients were recruited (recruitment rate: 39.2%). Patients performed a median of 8 sessions (range 2-11) over a median of 19 days. Adherence and compliance rates were 84% and 88%, respectively. There were no adverse events associated with the exercise intervention. Furthermore, there was a significant improvement in cardiorespiratory fitness as measured by ventilatory threshold (VT) (10.35 vs. 11.80 ml/kg/min, p=0.003) (Figure 1) and VO_2peak (15.32 vs. 16.89 ml/kg/min, p=0.023) after a mean of 7 (SD: 3) HIIT sessions.

Conclusion

The PHIIT trial demonstrated a preoperative HIIT programme was safe and had high adherence and compliance rates. Furthermore, there was a significant increase in cardiorespiratory fitness warranting the need for further RCT's to validate the efficacy of a preoperative HIIT programme to increase cardiorespiratory fitness.

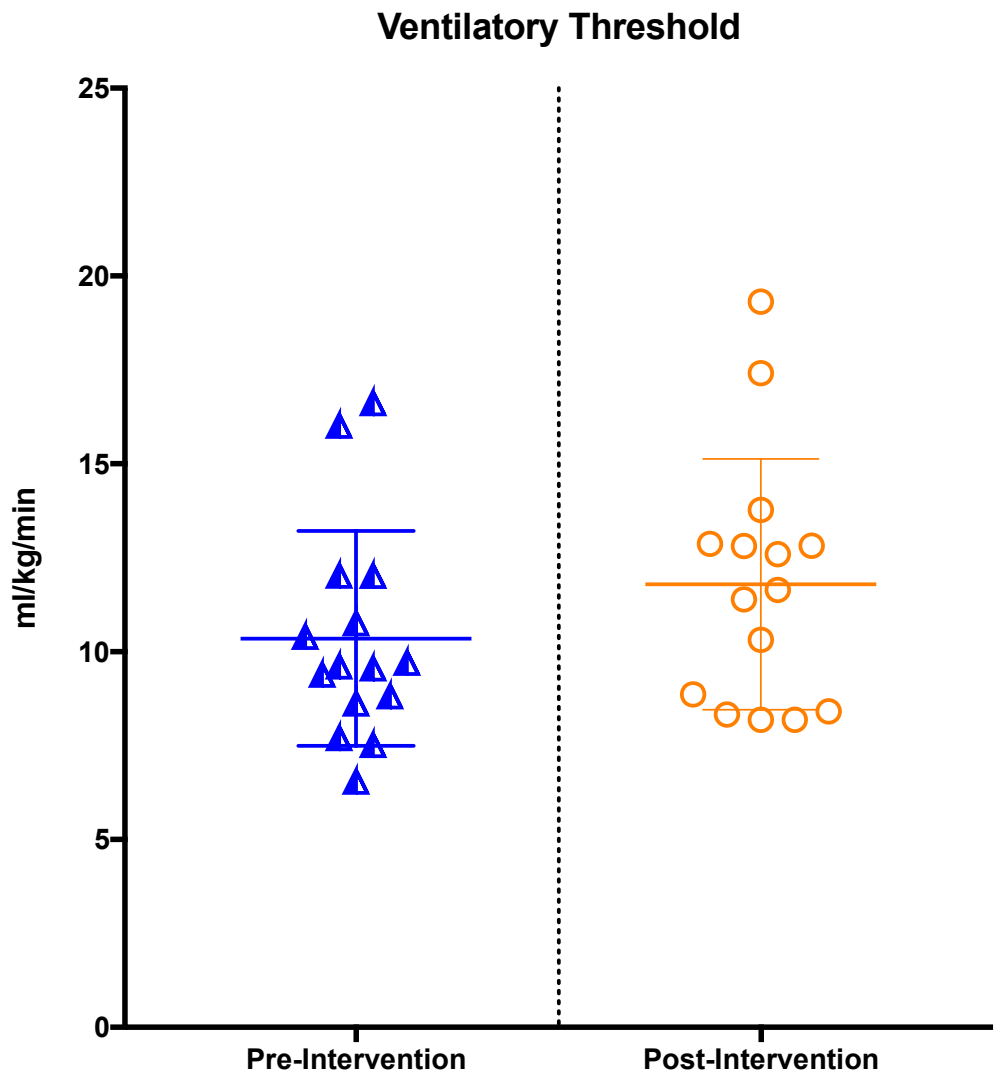

Figure 1: Comparison of pre-and post-intervention ventilatory threshold.

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EDICT: A 2-week exercise prehabilitation for patients facing primary surgical resection of colorectal cancer: A feasibility trial.

Introduction:
The NHS constitution mandates a 62-day limit from referral to treatment of suspected cancer. For patients with colorectal cancer, surgical resection, follows histopathological and radiological diagnostics. Increasing referrals and decreasing numbers of radiologists[1] have lengthened the diagnostic pathway, reducing the time available for prehabilitation.
We investigated whether 2-weeks of exercise was feasible prior to colorectal surgery and whether this could affect objectively-measured changes to patient fitness.

Method:
Consecutive colorectal cancer patients, awaiting resection, were screened for EDICT. Consenting patients undertook a baseline cardiopulmonary exercise test (CPET). Their physiological data informed individualised, high-intensity interval training programmes. Patients pedalled a stationary bicycle, for 3-minutes at 80% of anaerobic threshold power, followed by 2 minutes at 50% of the difference between anaerobic threshold and peak oxygen uptake. Intervals were repeated 6 times, at each of 6 exercise sessions, completed over 2-weeks.
Blinded analysis of a repeat, pre-operative CPET was undertaken by a Consultant Anaesthetist, to determine physiological adaptation.

Results:
Of 52 patients approached, 22 consented to participation. 3 patients withdrew consent following cycling discomfort. 2 patients did not complete the trial due to equipment failure, while 1 missed his repeat CPET due to short-notice medical appointment. 16 of 22 patients (72%) completed the trial, attending 96% of exercise appointments with no adverse events. Oxygen uptake at anaerobic threshold increased by a mean of 1.33mls/O_2/kg/min^{-1} (95% CI 0.31 to 2.34; p=0.016) (See Fig.1)

Conclusion:
These data demonstrate the safety and feasibility of a 2-week prehabilitation programme, for patients awaiting primary surgical resection of colorectal cancer.
42% of patients approached consented to the trial, completing 96% of exercise sessions. A further 21 patients were not considered because surgical date was less than 2-weeks from treatment decision. To satisfy patient appetite for prehabilitation, streamlining of the diagnostic pathway must be considered, while avoiding breach of the 62-day target.
We report a statistically significant increase in oxygen uptake at anaerobic threshold following 6 exercise sessions. Low objectively measured physical fitness is predictive of post-operative risk[2], so this narrow window should be considered a plausible opportunity to affect positive outcome.
This was a single-arm feasibility trial, however these data highlight the imperative for larger randomised-controlled trials, investigating not only the risk evaluation utility of CPET, but individualised care[3], pre-operative exercise prescription[4] and examination of whether this confers improved post-operative outcomes.

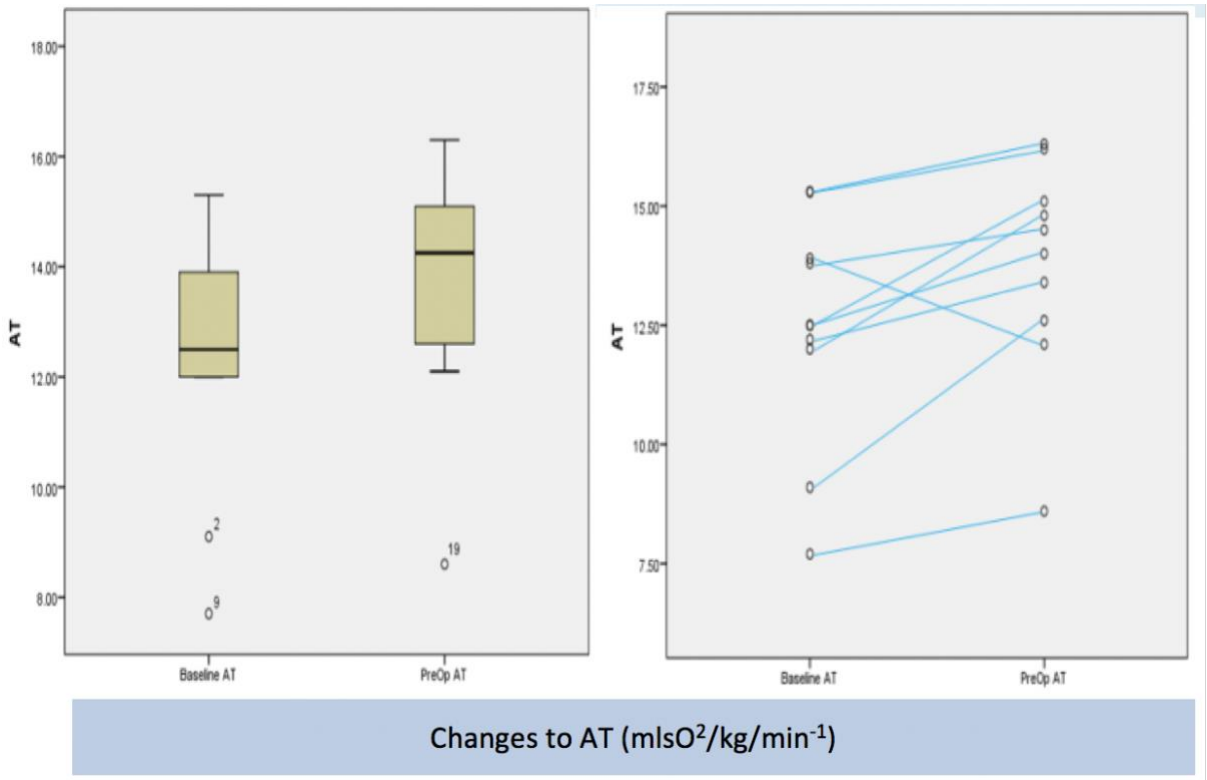

Figure 1: Graphical representations of changes in oxygen uptake at anaerobic threshold, from baseline to pre-operative, following 2-weeks of High-Intensity Interval Training by patients awaiting primary surgical resection of colorectal cancer.

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Prehabilitation in patients 'unfit' for Abdominal Aortic Aneurysm Surgery

Introduction

Prehabilitation increases preoperative functional reserve leading to improved surgical outcomes. Where patients are deemed too high-risk prehabilitation may provide a gateway to improve health and facilitate intervention. We describe two patients with Abdominal Aortic Aneurysm (AAA) disease who were initially deemed to have excessive risk for surgery, and were offered lifestyle and fitness regimes through our recently implemented community-based prehabilitation service: PREPWELL[1].

Methods

Patient 1: 69-year-old male: 58mm AAA, hypertension, mild anaemia, smoker and BMI of 33. Baseline cardiopulmonary exercise testing (CPET) demonstrated concerns due to low physiological reserve (table 1). Patient agreed to a 6-week home-based exercise programme (aerobic, strength and inspiratory muscle training), and a smoking cessation referral.

Patient 2: 83-year-old male: 54mm AAA, atrial fibrillation, COPD and hypertension. Clinically he reported significant functional limitation (2 METs) due to shortness of breath. Baseline CPET demonstrated low physiological reserve, cardiovascular deconditioning and limited respiratory reserve (table1). Patient attended 15 supervised sessions (over 11weeks) consisting of a graduated aerobic and strength programme supplemented by home-based exercise.

Table 1: Summary table of patients' baseline and repeat CPET tests.

	CPET	Peak Oxygen Consumption (predicted) ml/kg/min	Anaerobic Threshold (predicted) ml/kg/min
Patient 1	Baseline	12.3 (20.4)	7.0 (10.2)
	Repeat	16.5 (20.4)	9.2 (10.2)
	% change	+ 34.2	+ 31.4
Patient 2	Baseline	10.9 (20.3)	6.8 (10.3)
	Repeat	10.7 (21.1)	8.1 (10.5)
	% change	- 1.8	+ 19.1

Both patients underwent repeat CPET (table 1) on programme completion followed by re-evaluation by the vascular multidisciplinary team (MDT).

Results

At re-evaluation patient 1 had achieved smoking cessation and a clinically meaningful improvement in fitness of >30%. Following MDT discussion the patient was re-categorised from 'very high' to 'intermediate/high' risk and underwent successful open AAA surgery with no perioperative complications.

Despite a degree of physical limitation and advanced age, patient 2 attended 70% of his supervised classes achieving a submaximal fitness improvement of approximately 20%.

Following MDT review he was re-categorised from ‘very high’ to ‘high’ risk and underwent successful endovascular surgery (EVAR) with no perioperative complications.

Conclusion

These cases highlight the significant potential for prehabilitation initiatives to expand treatment options in patients who are deemed to be too high risk for surgery. Initiatives such as PREPWELL can provide important additional choices to patients and perioperative teams in shared decision-making by potentially facilitating intervention and helping alleviate the stress of living with a life-threatening condition.

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INDIVIDUALIZED TRIMODAL PREHABILITATION REDUCES LENGTH OF STAY IN LOW ANTERIOR RECTAL RESECTION AFTER NEOADJUVANT THERAPY.

PR1947

Introduction:

There are few studies reporting results of prehabilitation (PHB) in terms of reducing length of stay (LOS) or postoperative complications.

Our goal of the study was to determine if the trimodal prehabilitation plan we started to apply in rectal surgery reduced the LOS in these patients.

Methods:

We analyzed two cohorts of patients scheduled to low anterior resection surgery after neoadjuvant therapy:

- ➔ PHB group (2018-2019): patients entered in an individualized trimodal prehabilitation plan during 4 weeks after finishing neoadjuvant therapy. It consisted in:
  - Interval exercise (supervised if <400m in 6 minutes walking test-6MWT) and inspiratory muscle training.
  - Protein supplementation (specialized nutritional support if MUST>2)
  - Psychological recommendations (specialized support if HADS>10)
- ➔ Historical Group (2016-2017): No actions until surgery.

We recorded demographic data (sex, age, BMI, ASA) and intraoperative data (hemoglobin levels, duration, laparoscopic surgery). In PHB group we also determined differences between the two visits (4 weeks of PHB) in:

- Meters walked in 6MWT.
- Nutritional condition assessed by MUST score (0-6).
- Emotional condition by HADS test (0-42).

The main outcome was the LOS after surgery.

We also analyzed the incidence of postoperative complications (clavien dindo).

Statistical analysis: student t test (LOS)

Results:

We included 29 patients in PHB Group and 37 in Historical Group.

No differences in demographic or intraoperative data.

In the PHB Group:

- Distance walked in 6MWT improved in 76% of patients (mean increased from 461m to 500m).
- Only 1 patient presented MUST>2 and mean value of albumin was 4.3g/dL.
- HADS scores improved in 62% of patients (mean decreased from 10.5 to 9.4).

The Length of stay in the Historical Group (2016-2017) was 16.7 days (±9.7) while in the PHB Group was 12 days (±7.1). $p<0.05$.

Complications assessed by clavien dindo classification were:

- Historical Group: 0-1 (59%), 2 (19%), 3-4 (22%)

- PHB Group: 0-1 (52%), 2 (38%), 3-4 (10%)

Conclusions:

- Trimodal prehabilitation reduces 4 days the length of stay in Rectal Surgery after Neoadjuvant therapy
- Our individualized trimodal PHB plan improves functional capacity assessed by 6MWT in most of the patients

HIGH RISK ANALGESICS & PERI-OPERATIVE INTERVENTION

Program Evaluation of a Multimodal Program for Allogeneic Hematopoietic Stem Cell Transplant Patients

Introduction

Allogeneic hematopoietic stem cell transplantation (allo-HSCT) after high dose chemotherapy is standard care in patients with various hematologic malignancies. Exposure to these treatments can cause severe fatigue, loss of muscle mass, deteriorated cardiopulmonary capacity, and disability. Implementing exercise and anxiety management interventions before and after transplant have shown promise in mitigating the deleterious effects of chemotherapy and allo-HSCT. Multimodal peri-transplant interventions (MPIs) have the potential to positively impact patients' physical and psychosocial well-being, quality of life, and overall survival, and represent a relatively low-cost non-pharmacological approach to maintain well-being. The Princess Margaret Multimodal Peri-transplant (PMTT) program is an existing intervention offered to allo-HSCT patients designed to optimize mental and physical functioning through the inpatient transplant process and includes exercise, relaxation, and music therapy classes. The present study is a program evaluation of the PMTT program grounded in the RE-AIM framework (Reach, Effectiveness, Adoption, Implementing, and Maintenance). The proposed evaluation will study program feasibility and investigate the effects of the PMMT program on physical, psychosocial, and medical outcomes in order to establish the impact of the intervention.

Methods

Patients awaiting an allo-HSCT transplant will be recruited over a six-month period from the Princess Margaret Cancer Centre in Toronto. Outcome measures will be collected six days prior to transplant, at discharge from hospital, and 100 days after transplant and include: physical and psychosocial outcomes (self-efficacy, cognitive function, physical fitness, fatigue, quality of life, and anxiety and depression); and medical outcomes (presence Graft versus Host Disease, complications related to the transplant, time to bone marrow engraftment, length of hospital stay, and readmission to hospital). The program evaluation will be performed in accordance with the RE-AIM framework. Data will be analyzed using linear mixed model analysis to assess changes among different time points, and all available data will be included using the intention-to-treat principle. Participant demographics, medical characteristics, adherence, and participation to the program will be reported using descriptive statistics (frequency and percentages).

Discussion

Despite extensive research in stem cell transplant, to our knowledge, no study has performed an evaluation of a MPI in allo-HSCT patients. This study will provide a broader understanding of clinical programming uptake and implementation in allo-HSCT units. Exploring the feasibility and effectiveness of the program will enhance current protocols and stimulate the interest of a greater number of clinicians and health care professionals, ultimately improving patient satisfaction and program uptake.

PR1950

Does Multimodal Prehabilitation Attenuate Chemotherapy-related Cardiovascular Dysfunction in Women with Breast Cancer?
Methodology for an Exploratory Study

Introduction: Neoadjuvant chemotherapy (NACT) improves surgical options in women with breast cancer (BCa) yet may result in cardiovascular (CV) toxicity manifesting as impairment in ventricular performance and latent adverse vascular remodeling. Cardiorespiratory fitness (CRF; e.g., VO_2 peak) provides a global measure of CV function and, when combined with more novel and sensitive measures of ventricular function (e.g., strain), may be able to facilitate earlier detection of treatment-related CV impairment. Although substantial preclinical data and early human studies suggest a cardio-protective role of exercise delivered concomitantly with cardiotoxic therapy, the role of prehabilitation in attenuating treatment-related CV impairment remains unexplored. The growing concern of CV disease in long-term BCa survivors warrants the assessment of non-pharmacological strategies to prevent NACT-related cardiovascular toxicity. Accordingly, we present the rationale and cardiovascular methodology to assess the effect of prehabilitation on CV toxicity within a larger randomized controlled trial of multimodal prehabilitation in BCa patients receiving NACT.

Methods: N=30 BCa patients scheduled to receive NACT and subsequent surgery will be recruited from the Princess Margaret Cancer Centre in Toronto. Participants will be randomized 1:1 to either usual care (UC) or multimodal prehabilitation (PREHAB). For the duration of NACT, PREHAB participants will receive: i) a home-based exercise prescription (to be completed three times per week) including moderate-intensity aerobic training and upper-quadrant specific resistance training; ii) dietetic counselling; iii) a stress management intervention delivered by a psychosocial oncology trained psychologist; and iv) a smoking cessation intervention when applicable. Outcome measures will be collected at baseline (prior to NACT) and two weeks after NACT is complete and include: i) CRF via VO_2 peak; ii) cardiac morphology and function (left and right ventricular strain, left ventricular ejection fraction, ventricular volumes, and diastolic filling parameters) at rest and under stress via 2-D echocardiography; and iii) vascular function including intima-media thickness and arterial stiffness (pulse wave velocity). Data will be analyzed using ANCOVA for between-group differences at two weeks post-NACT.

Discussion: Findings from this trial will establish feasibility of the proposed outcome measures and provide pilot data to conduct power calculations for a larger scale trial. To our knowledge, this is the first study that investigates the role of multimodal prehabilitation as a potential cardio-protective mechanism in individuals with cancer receiving cytotoxic therapy.

A teachable moment in lung cancer care: smoking cessation advice as part of a prehabilitation program

Introduction:

It is well established that smoking cessation improves surgical outcomes for patients with lung cancer. Smoking cessation has now been incorporated into many prehabilitation programmes prior to surgery. It has also been proposed that a diagnosis of lung cancer can represent a 'teachable moment,' for smokers.

The aim of this study was to review whether there were any differences in the self-reported quit rate amongst smokers with a diagnosis of lung cancer compared to other disease groups. The secondary aim was to investigate if lung cancer patients who attend a prehab programme are more likely to quit/ have a successful quit attempt than those who don't.

Methods:

This was a retrospective audit of all cases seen in a walk-in smoking cessation clinic within a large cardiothoracic specialist hospital from 2016 – 2019.

Results:

127 cases were seen over this time period. 62 were female (48%). The mean age was 49 years (SD +/-16.3 years). 17% (22/127) had a diagnosis of lung cancer, 16% (21/127) had other respiratory conditions, 4.7% (6/127) had cardiovascular disease, 15.7% (20/127) had other medical conditions and 42.5% (54/127) had no underlying disease.

44% (56/127) self-reported successfully quitting smoking, 30.7% (39/127) didn't quit and 22% (28/127) were lost to follow-up. Of the patients with Lung cancer, 54% (12/22) quit compared to 23% (5/21) with other respiratory conditions, 50% (3/6) with cardiovascular disease, 55% (11/20) with other medical conditions and 46.2% (25/54) without any underlying disease.

Within the prehabilitation group, 58% (11/19) of patients with a diagnosis of lung cancer managed to successfully quit compared to 33% (1/3) of patients with a diagnosis of lung cancer who didn't participate in a prehabilitation program.

There was a trend towards improved quit rates in smokers with a diagnosis of lung cancer when compared to those with other respiratory diseases ($p=0.0618$) with this trend appearing stronger in those who underwent prehabilitation ($p=0.0515$).

Conclusions:

Smoking cessation remains a cornerstone for optimisation of patients prior to undertaking active treatment for lung cancer. The factors that determine efficacy of smoking cessation remain complex and can't be entirely attributed to a single variable, however our data would suggest that a new diagnosis of lung cancer may present a 'teachable moment' and when incorporated into structured education and rehabilitation programmes offers a better chance for cessation.

Non supervised prehabilitation in the elderly

PR1952

Introduction

Elderly patients are often proposed for major surgery, despite that their multiple comorbidities, poor physical and nutritional status increase their perioperative risk overall. The inclusion of these patients in multimodal prehabilitation programs to improve their preoperative functional capacity could be beneficial. Non-supervised prehabilitation program is not clear to be effective in these patients. The aim of this study is to assess the effectiveness of a non-supervised trimodal prehabilitation program in patients over 75 years undergoing major surgery.

Methods

We conducted an observational study including all patients over 75 years undergoing major surgery (radical cystectomy, colorectal surgery, hysterectomy, Whipple procedure) from January to December 2017. During the four weeks before surgery, patients were enrolled in a trimodal prehabilitation program with non-supervised physical exercises (intervallic, strength, elasticity and respiratory), a nutritional program with protein supplements and cognitive support based on mindfulness. Their basal physical status was assessed with a 6-minute walking test (6MWT). Three weeks later, a new evaluation was performed and the results were compared to the basal physical evaluation. The main study outcome was the variation of the maximum oxygen consumption (VO2) between the first visit and after the training period calculated according the 6MWT

Results

27 patients were included. 20 patients of these patients (74%) comply with the prehabilitation program correctly. 7 patients (26%) did not follow the program appropriately. Lack of compliance was due to poor interest in the program or difficulties to follow it. There was a 5.5% increase in VO2 in compliant patients, whereas patients with poor compliance performed worse (decrease in 0,4%).

Conclusion

Prehabilitation programs are effective and advisable in the elderly. Three fourths of patients improved their functional capacity with a four weeks non supervised training program. Patients with poor compliance probably need a supervised program to achieve better results.

The impact of a 2-week pre-operative exercise programme on patients awaiting primary surgical resection of colorectal cancer

PR1953

Introduction:
REPPS study retrospectively investigated whether participation in a 2-week exercise trial, (EDICT: ClinicalTrials.gov: NCT02056691), undertaken by patients with colorectal cancer before primary, elective surgical resection affected patient-reported quality-of-life. A secondary outcome explored whether this yielded any long-term behavioural changes, evaluated by increases in physical activity.

Method:
Of 16 patients completing the EDICT exercise programme, 14 were clinically suitable for approach. 6 patients volunteered for interview. Ethics allowed for a sample size n=5. Using a phenomenological framework[1], patients undertook semi-structured interviews to explore perceptions of quality-of-life across physical and psychological domains. Interviews took place up to 24 months following surgery.

Results:
Quality-of-life:
All patients reported positive changes to both physical and psychological quality of life. Several described these domains as interconnected, rather than discrete variables.
Physical: ‘feeling fitter’, ‘toned-up’, ‘stopped a decline’, ‘slept better’ ‘increased appetite’. Two patients reported feeling ‘stiff’ post-exercise. Three patients felt the programme could have been more challenging.
Psychological: ‘increased positivity’, ’control’, ‘proactivity’, ‘enjoyment’, ‘distraction from diagnosis’, ‘focus’.

Figure 1. Word cloud of common themes across the 5 patient interviews.

Behaviour change:
No change in post-operative exercise behaviour was noted. All patients felt that they led an active lifestyle prior to participation and four patients reported encouraging others to exercise more.

Conclusion:
These patient-reported experiences demonstrate that a 2-week prehabilitation programme exerts positive impact on patient-reported physical and psychological quality of life.
The engendered positivity and regaining of control provided a counter-point to the

fear of a cancer diagnosis. This suggests that pre-operative exercise should be incorporated into routine surgical care pathways as pre-operative psychological well-being can confer positive rehabilitation benefit[2].
Objectively measured, positive changes to physical fitness were reported by the main trial correlating with patients feeling fitter and better. Most believed that the programme was too short or not intense enough, implying positive appetite for exercise, although the authors recognise potential selection bias among this population[3].
The lack of longer-term behaviour change presents ongoing challenge. Patients reported apprehension and uncertainty regarding which exercises to undertake and when to start exercising post-operatively.
Prehabilitation requires additional investigation, incorporating specific behaviour change techniques[4] which might exploit the teachable moment[5] generated by a cancer diagnosis.
The length of time between surgery and the interviews (up to 2 years) raises the possibility that full recovery may have created recall bias. This does not detract from resoundingly positive themes of the patient reports, in particular psychological well-being, which demonstrates patient support for wider implementation of pre-operative exercise programmes.

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The Impact of a Perioperative Medicine Programme on postoperative outcomes of Urological Patients.

Introduction

A perioperative medicine programme was introduced in 2016 at University Hospital Southampton (UHS). Comprising of early risk assessment via CPET testing, education and behaviour change advice given via surgery school and comorbidity management via high risk patient shared decision making clinics. Urology patients were one of the pilot cohorts for this pathway. This abstract presents the impact of this service on postoperative outcomes including pulmonary complications, critical care utilisation and overall length of hospital stay.

Methods

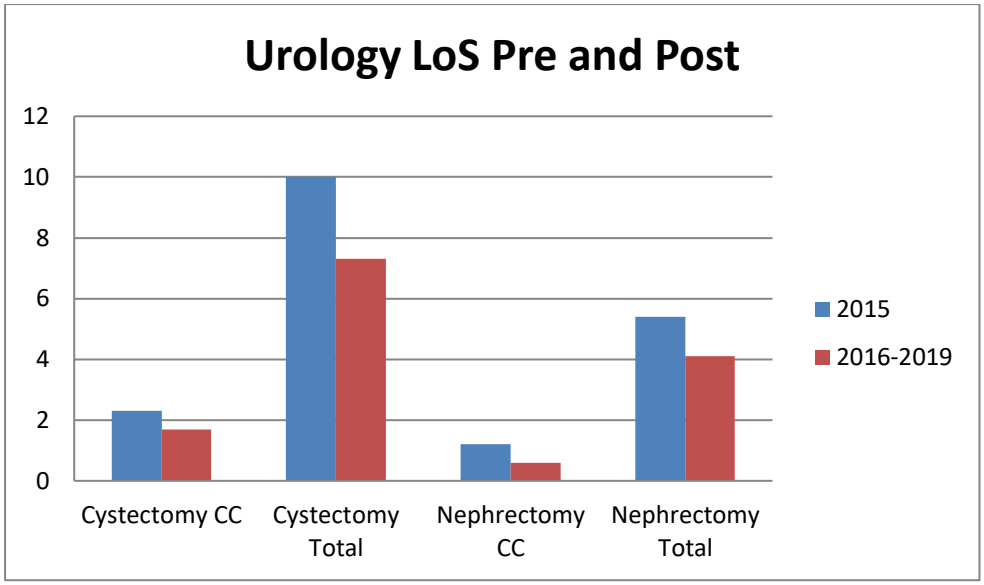
From April 2016 outcome data has been collected prospectively on all urological patients referred to the perioperative medicine team, undergoing cystectomy and nephrectomy at UHS. This has been compared with baseline outcome data collected retrospectively from 2015 before the introduction of the perioperative medicine programme.

Results

From April 2016 to March 2019, 318 patient underwent elective urological resection cystectomy (n=133) and nephrectomy (n=185) at UHS. Of these 87% were seen by the perioperative medicine team. Outcome results were averaged over the 3yr period 2016-2019 and compared with data from 2015.

CYSTECTOMY	**Critical care days Mean (range)**	**Total Length of Stay Mean (median)**	**Pulmonary Complications (n=)**
2015 (n=53)	2.3 (0-24)	10 (6)	9.4% (5/53)
2016-2019 (n=124)	1.7 (0-15)	7.3 (5.5)	6.5% (8/124)

NEPHRECTOMY	**Critical care days Mean (range)**	**Total Length of Stay Mean (median)**	**Pulmonary Complications (n=)**
2015 (n=67)	1.2 (0-14)	5.4 (6)	9.0% (6/67)
2016-2019 (n= 154)	0.6 (0-9)	4.1 (3)	7.1% (11/154)



Compared with the baseline. Patients undergoing cystectomy / nephrectomy since the introduction of the perioperative medicine pathway stayed 0.6 days less in critical care, 2.3 and 1.3 respectively days less in hospital, and had a reduction in pulmonary complications of 31% (cystectomy) and 22% (nephrectomy).

Conclusion

A perioperative medicine pathway is useful in patients undergoing elective urological resection and appears effective in reducing length of stay and postoperative pulmonary complications.

PR1955

Preventing functional decline in allogeneic BOne marrOw tranSplanT: the BOOST study; preliminary feasibility data and characteristics.

Introduction: Allogeneic bone marrow transplant (BMT) is an intensive treatment for haematological cancer, which can have significant impact on physical and psychological health [1, 2]. This study aims to determine the feasibility and preliminary efficacy of increased physiotherapy-guided physical activity pre-transplant and group-based inpatient exercise during transplant. This abstract aims to describe recruitment feasibility and participants' baseline characteristics.

Methods: Single-site prospective cohort study. Consecutive adult patients planned for allogeneic BMT for haematological cancer are recruited pre-transplant over a 6-month convenience recruitment period. For this study, all participants receive pre-transplant education and exercise prescription followed by supervised group exercise during their hospital admission for transplant. Outcomes include physical function (short physical performance battery), functional exercise capacity (incremental shuttle walk test- ISWT), grip and quadriceps strength (hand-held dynamometry), frailty (Cardiovascular Health Study frailty screening scale), and physical activity and health-related quality of life questionnaires; assessed pre-transplant, admission to and discharge from hospital, and 60-days post-transplant.

Results: Data are presented for the first 5-months of recruitment. 43 consecutive patients were assessed for eligibility, 95% were eligible, and 100% (n=41) consented to participate. Forty-one patients (71% male, mean ±SD age 50.8±13.8 years, BMI 27.4 ±4.7) with a variety of haematological conditions (31% acute myeloid leukaemia; 17% myelodysplastic syndrome) were recruited and had baseline assessment performed 2-10 weeks pre-BMT. At baseline, the median [IQR] ISWT distance was 560 [475-807] metres; 83% of participants did not reach predicted ISWT distance compared to normative data [3]. Mean (±SD) 4-metre gait speed was 3.17 ±0.38seconds, which is slower than normative age matched data [4]. Baseline strength was lower than the healthy population with (mean ±SD) 58.7±15.8lbs and 30.2 ±11.3kgs for quadriceps and grip respectively. 33% of participants reported they do not meet physical activity guidelines (<600 MET minutes/week). 15% of participants were classified as 'frail' and 59% were classified as 'pre-frail'. For the first 30 participants, mean (±SD) length of hospital stay for those classified as 'frail', 'pre-frail' and 'not frail' is 22.5±2.4, 22.3±7.4 and 20.7±4.3days respectively. Pre-transplant frailty was not clearly associated with increased short-term mortality. Longer term mortality and readmission rates will be determined.

Conclusion: All patients approached consented to this study, with baseline data highlighting that overall physical domains of health in these people are lower than the average population. This study is ongoing, and will provide insight into feasibility of exercising during acute phases of BMT and changes in physical and psychosocial function over time.

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Word count = 400

1.TITLE:
Are patients with severe valve disease scheduled for valve replacement suitable for prehabilitation programs?

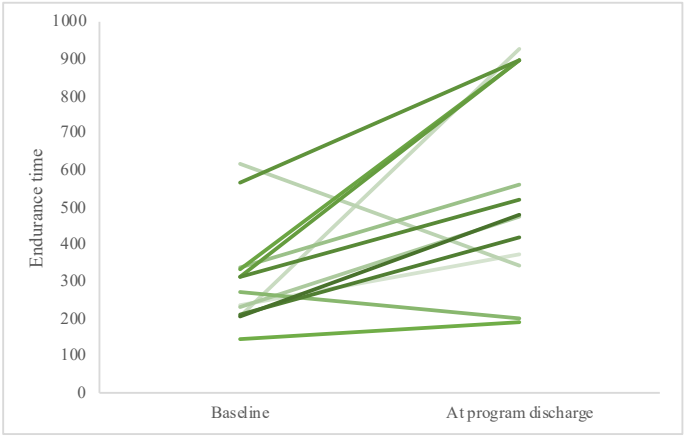
2. INTRODUCTION:
Prehabilitation (preHAB) has showed efficacy to reduce postoperative complications and to accelerate recovery after surgery. Enhancement of the aerobic capacity through moderate-to-high intensity exercise training seems to play a key role in preHAB programs.
In cardiac surgery, there is little evidence for preHAB, mainly in ischemic heart disease. Classically considered at high risk for exercising, patients with severe valve disease have usually been excluded from exercise and preHAB programs. However, they may potentially benefit from it given their usual sedentary habits and important cardiopulmonary limitations.
This is a pilot study evaluating the response to moderate-to-high exercise training in patients with severe aortic stenosis (SAS) or severe mitral regurgitation (SMR). Secondly, we aimed to analyse the feasibility and safety of the preHAB program.

3. METHODS:
We included adult patients with SAS or SMR, scheduled for cardiac surgery in ≥4 weeks. Exclusion criteria were: i) unstable cardiac disease, or ii) left ventricular outflow tract obstruction, or iii) exercise-induced arrhythmia.
The preHAB program lasted a minimum of 4 weeks and consisted in: i) supervised and ECG-monitored in-hospital moderate-to-high intensity exercise training (>70-80% of peak work rate) and strength training, prescribed by a physiotherapist, performed 1 hour twice a week ii) nutritional counseling/supplementation and iii) mindfulness sessions once a week.
The main study outcome was the difference in the endurance time (ET) in a constant-work cardiopulmonary exercise testing (CPET) between baseline and at program discharge. Secondary outcome was the change in daily physical activity.

4. RESULTS:
Up to now, 13 patients have been included (10 male/3 female, 69±12years old, 6 SAS and 7 SMR). After the preHAB program (4 weeks, just before the surgery), patients showed a significant increase in their functional capacity measured by an enhancement of the ET in the CPET (from 308 (139) to 554 (268) sec, p= 0.006, ΔET 96 %). Individual data are displayed in Figure 1. There was also an increase in self-reported physical activity reflected by the Yale Physical Activity Survey (from 32±10 to 47±18, p=0,003). No adverse events were observed either during the CPET assessment or during the exercise training sessions.

5. CONCLUSION:
Patients with SAS or SMR enhanced their endurance capacity and presented no adverse events during the exercise training. Our preliminary results support that patients with severe valve disease are suitable and a promising target population for preHAB programs. Further studies are needed in order to clarify and define the response and benefit from it in this population.

Figure 1: Change in the endurance time between baseline and at program discharge just before surgery.


1000
900
800
700
600
500
400
300
200
100
0
Endurance time
Baseline
At program discharge

PR1957

TITLE: COULD A WEB-BASED LIFESTYLE INTERVENTION USED IN PATIENTS WITH CORONARY HEART DISEASE BE SUITABLE FOR PATIENTS PRE SURGERY?

Introduction: Cardiac Rehabilitation (CR) is an intervention offered to patients diagnosed with heart disease; components include health education, advice on cardiovascular risk reduction, physical activity and stress management. **ACTIVATE YOUR HEART®** (AYH) is an online CR programme that has been designed by CR specialists and patients at the University Hospitals of Leicester NHS Trust. The **AYH®** CR programme is used routinely for cardiac patients post myocardial infarct and revascularisation treatment has been shown to be clinically effective against other traditional hospital based CR programmes.

AYH® could be adapted as a prehabilitation option to help address lifestyle factors in the general population. For example; motivating people to increase their exercise/physical activity, address nutritional optimisation, alcohol, smoking status, and psychological wellbeing, Scheede-Bergdahl et al (2019).

Methods: The following pre and post patient reported outcome measures are routinely collected; knowledge (Leicester CHD Knowledge questionnaire), Mood (Hospital Anxiety and Depression scale; HADS), disease specific quality of life (MacNew heart disease quality of life instrument), exercise capacity (Incremental Shuttle walking test; ISWT). Web usage statistics are also collected.

Results: N=50 (90% male, mean age of 66.42 (SD 7.9) completed pre to post measures. Knowledge, exercise capacity, mood and quality of life improved significantly (Table 1). Web usage statistics captured the number of goals set, goals completed, and entries of exercise, weight and stress throughout the programme (Table.2).

Conclusion: The **AYH®** CR programme is currently utilised routinely in following acute infarct and cardiac surgical patients. It has potential to be deployed as a prehabilitation tool to optimise exercise/physical activity, lifestyle and psychological wellbeing prior to surgical intervention.

Scheede-Bergdahl, C, Minnella, E and Carli F. Multi-modal prehabilitation: addressing the why, when, what, how, who and where next? *Anaesthesia* 2019; 74 (Suppl. 1), 20–26

	Pre Mean (SD)	Post Mean (SD)	Mean Change	Sig.
Knowledge	0.7 (0.1)	0.8 (0.07)	0.1	p<0.001
ISWT	554.9 (163.5)	618.7 (173.8)	63.8	p<0.001
HADS (Anxiety)	3.5 (2.6)	1.9 (1.8)	-1.6	p<0.001
HADS (Depression)	3.0 (3.5)	1.4 (2.3)	-1.6	p<0.001
MacNew	5.9 (0.7)	6.4 (0.6)	0.5	p<0.003

Table 1.Pre to post outcome measures on Knowledge (Leicester CHD Knowledge questionnaire), Exercise capacity (ISWT), Mood outcome (HADS), Quality of life (MacNew questionnaire).

	Mean
Number of exercise entries	65.6
Number of weight entries	8.6
Number of stress entries	8.4
Number of goals set	5.8
Number of goals completed	4.6

Table 2. Web usage statistics for N=50 patients. Programme length approximately 12 weeks.

Associations bet een postoperati e muscle asting and postoperati e outcomes in older patients undergoing colorectal cancer surgery: a retrospecti e study

Evaluating the ACS-NSQIP surgical risk calculator in predicting 30 day complications and Length of stay in Gynaecology Oncology patients

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PR1960

Co-designing a Pre-rehabilitation Intervention: Head & Neck Patients Want and Need Input *Before* Diagnosis

Key Words:
prehabilitation, exercise, health-promotion, Head and Neck Cancer

Introduction:

Pre-rehabilitation (prehab) aims to maximise patients' physical and mental preparedness before a health-care challenge such as oncology-treatment[1], to mitigate the impact of cancer and its treatment, promote recovery, reduce financial-burden, and improve care quality[2]. Exercise-training is a key component[3]; however, the short diagnosis-to-treatment time in Head and Neck Cancer (H&NC) is likely insufficient to observe exercise-benefits[4,5]. Whether commencing prehab *before* diagnosis would be acceptable to H&N patients, and feasible to deliver at this pathway-point, is unknown.

This study aimed to assess patient's exercise-perceptions and pre-diagnosis prehab-needs, to inform a future prehab-intervention trial.

Methods:

A questionnaire capturing exercise-perceptions was co-designed and tested with previous H&NC patients. Convenience-sampled adults, referred for biopsy of suspected H&NC, completed the questionnaire and a set of descriptive "patient-related factor" measures (IRAS ID 224093). Questionnaire data were triangulated with themes, ascertained by framework-analysis of additional interviews.

A target of n=100 was determined to ensure a sizeable proportion (n=30) with confirmed cancer.

Results

Sixty-two patients (n=22 with cancer) have completed the study to date, with 53 questionnaire and 6 interview analyses complete. Recruitment is summarised in Figure 1.

At entry to the investigation process, a third had impairments and/or health promotion needs, outlined in Table 1, including current smoking, weight-loss, symptom-burden, and undue limited physical function.

Most participants (69%, n=32/46) expressed interest in pre-diagnosis exercise-advice, wanting individualised recommendations and encouragement/reassurance. Explanatory themes included 'aiding preparation (for future investigation/treatment)', 'raising awareness of potential benefit', and receiving 'safety advice'.
If offered, 75% (33/44) reported they would attend exercise to 'gain benefit', 'maintain normality', 'keep/get fit' and 'prepare', provided it was offered in a way acceptable to them.

Other appointments, physical symptoms, and current fitness were the highest-ranked barriers to participation, rather than traditional motivational issues[6,7]. Furthermore, capacity for exercise to improve physical/psychological state was highlighted as a clear enabler to taking-part, even in those unsupportive of pre-diagnosis exercise-advice, who raised a need for individualisation of support.

Conclusion

A role for pre-diagnosis prehab intervention exists because suspected H&NC patients have impairments and/or health-promotion needs, even when commencing the investigation process. This study found a group keen to engage in early prehab through individualised exercise-guidance.
Whether ultimately diagnosed with cancer or not, offering health-promotion interventions when cancer is first suspected may augment behaviour-modification, embracing the teachable-moment concept, to achieve timely beneficial health-outcomes.
In conclusion, the epoch from initiation of investigations to commencing definitive treatment represents a novel window for prehab.

Word count = 399

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Figure 1: CONSORT Flow-diagram

PR1960

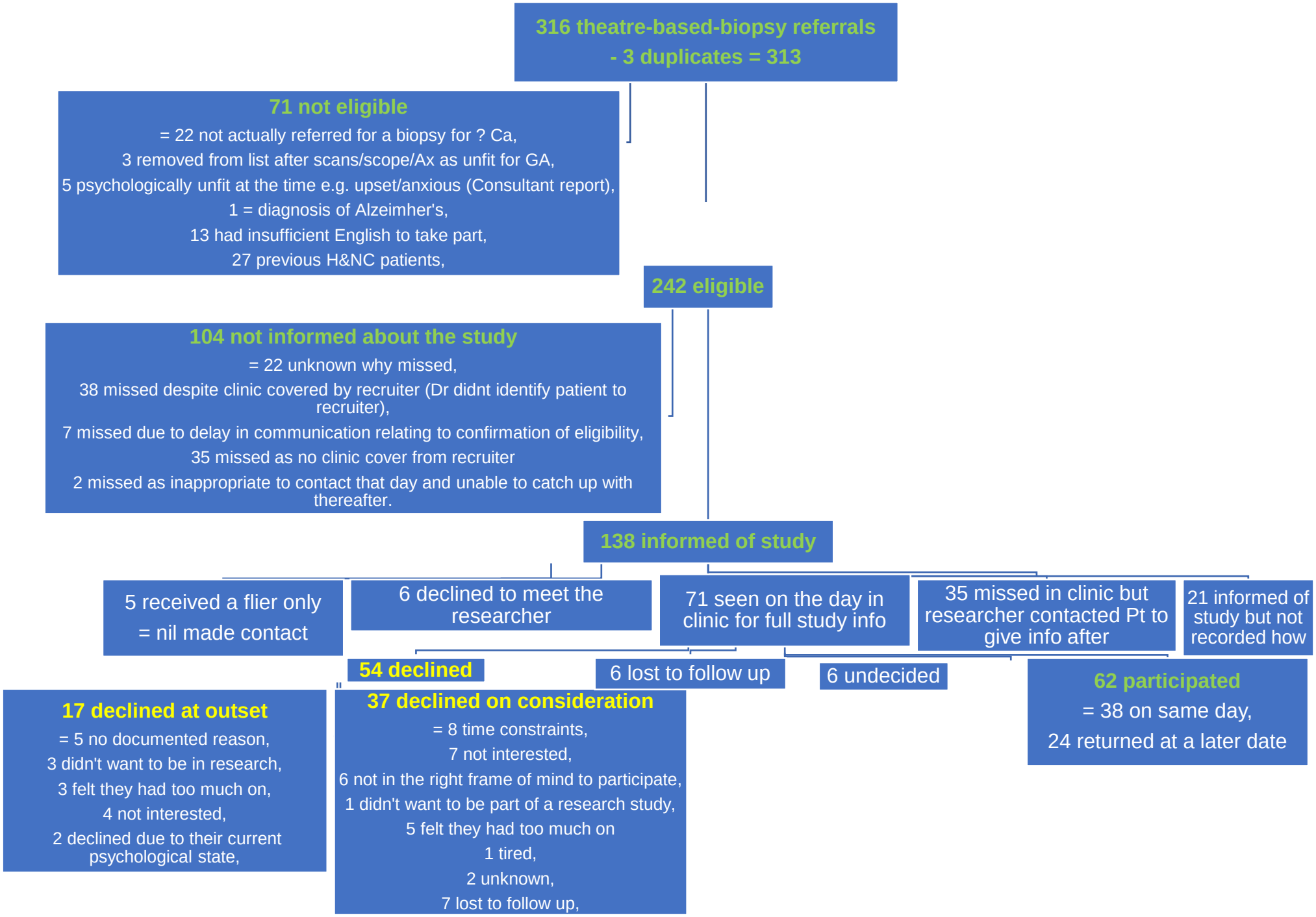
316 theatre-based-biopsy referrals
- 3 duplicates = 313
71 not eligible
= 22 not actually referred for a biopsy for ? Ca,
3 removed from list after scans/scope/Ax as unfit for GA,
5 psychologically unfit at the time e.g. upset/anxious (Consultant report),
1 = diagnosis of Alzeimher's,
13 had insufficient English to take part,
27 previous H&NC patients,
242 eligible
104 not informed about the study
= 22 unknown why missed,
38 missed despite clinic covered by recruiter (Dr didnt identify patient to recruiter),
7 missed due to delay in communication relating to confirmation of eligibility,
35 missed as no clinic cover from recruiter
2 missed as inappropriate to contact that day and unable to catch up with thereafter.
138 informed of study
5 received a flier only
= nil made contact
6 declined to meet the researcher
71 seen on the day in clinic for full study info
35 missed in clinic but researcher contacted Pt to give info after
21 informed of study but not recorded how
54 declined
6 lost to follow up
6 undecided
62 participated
= 38 on same day,
24 returned at a later date
17 declined at outset
= 5 no documented reason,
3 didn't want to be in research,
3 felt they had too much on,
4 not interested,
2 declined due to their current psychological state,
37 declined on consideration
= 8 time constraints,
7 not interested,
6 not in the right frame of mind to participate,
1 didn't want to be part of a research study,
5 felt they had too much on
1 tired,
2 unknown,
7 lost to follow up,

Table 1: "Patient-Related Factor" Measures – Key findings are highlighted

Domain	Measures	All participants with data currently uploaded, N=53	Those without Cancer N=32	Those with Cancer N=21
i) Demographics	Age	Mean 55 years (SD+/- 16) Range 23-85	Mean 51 (SD/-16) Range 23-79	Mean 62 (SD+/-14) Range 23-84
	Gender	M = 36 : F = 17	M = 21 : F = 11	M = 15 : F = 6
	Ethnicity	White British/Irish/other = 35 Black = 6, Asian = 7 Mixed = 2 Other = 3	White British/Irish/other = 19 Black = 2, Asian = 7 Mixed = 1 Other = 3	White British/Irish = 16 Black = 4, Asian = 0 Mixed = 1
	Carer support	Lives alone = 11 (21%)	Lives alone = 5 (15%)	Lives alone = 6 (28%)
ii) Health Status	Self-reported General Health	Poor = 6 (11%)	Poor = 2 (6%)	Poor = 4 (20%)
	Smoking load	Current = 15 (30%) Ex = 18 Never = 17	Current = 12 (39%) Ex = 7 Never = 12	Current = 3 (15%) Ex = 11 Never = 5
	History of alcohol problems	1	0	1
	BMI Recent unintentional weight loss	Average 26.3 With 5/42 underweight (12%) 10 (21% of those that answered)	Average 26.4 With 3 scoring BMI 18.5-20 7 (24% of those that answered) With 4 >10% of body mass lost	Average 26.1 With 2 scoring under BMI 18.5 3 (15% of those that answered) With 1 >10% of body mass lost
iii) Functional Status	ECOG performance score	13/35 (35% restricted)	7/22 reported restricted (31%)	6/13 reported restricted (46%)
	Self-reported Limited Physical Activity	19/51 (37%)	10/31 (31%)	9/20 (45%)
	Vulnerable-Mild Frailty on Edmonton Frail Scale	16/51 (31%)	11/31 (35%)	5/20 (25%)
	Help required for day to day function	14/50 (28%)	9/30 need help (30%)	5/20 need help (25%)
iv) Physical Status	Obstructive Pattern Spirometry	11/34 (32%)	6/21 (28%)	5/13 (38%)
	Peak Cough Flow (potentially a marker of aspiration risk)	8/10 below 360 l/min "normal"	3/3 below 360 l/min "normal"	5/7 below 360 l/min "normal"
	Handgrip	21/39 (54%) <80% predicted	15/26 (58%) <80% predicted	6/13 (46%) <80% predicted
	Timed Up and Go	6/39 slower than "normal"	4/27 slower than "normal"	2/12 slower than "normal"
	Gait speed over 10m	4/33 slower than "normal"	3/21 slower than "normal"	1/12 slower than "normal"
	Slower than age related "normal" on Sit to stand in 1 minute	15/28 (54%)	11/19 (58%)	4/9 (44%)
v) Symptoms	scored >3 (slower than "normal) on MRC Breathlessness Score	8/50	5/31	3/19

	Pain Visual Analogue scale	26/48 (54%) moderate pain	18/31 (58%) moderate pain	8/17 (47%) moderate pain
	FACIT fatigue score below normal <80% age related mean	27/44 (61%) 13/44 (29%)	19/31 (61%) 9/31 (29%)	8/13 (61%) 4/13 (31%)
	HADS anxiety and depression score	A: 10 abnormal (19%) : 19 borderline (37%) D: 6 abnormal : 7 borderline	A: 8 abnormal (25%) : 13 borderline (40%) D: 4 abnormal : 5 borderline	A: 2 abnormal : 6 borderline (31%) D: 2 abnormal: 2 borderline

COMPASS vs. CPET in risk prediction prior to Abdominal Aortic Aneurysm Surgery

Authors:

Introduction

Cardiopulmonary exercise testing (CPET) is the gold standard evaluation used to categorise risk in our Trusts Abdominal Aortic Aneurysm (AAA) pathway. However, demand often outstrips supply, therefore it is important to consider screening tools that may help in rationalisation of the need to perform CPET. COMPASS[1] is a highly evolved re-application of the P-POSSUM platform dependent on clinical, physiological and laboratory variables to predict perioperative risk across a range of procedures.[1] The aim of this project was to assess the utility of COMPASS in predicting CPET risk categories.

Methods

One-hundred and two patients with AAA disease who had undergone preoperative CPET (2012 – 13) were identified and categorised into low/intermediate or high/very high-risk groups using a combination of three variables; peak oxygen consumption, anaerobic threshold and ventilatory equivalents for CO_2 (at threshold). Preoperative risk estimates were undertaken retrospectively for the same patient cohort with COMPASS, with categorisation into the same two groups based on National Vascular Registry data[2]. The utility of COMPASS in predicting CPET risk categories was based on a sensitivity and specificity analysis (MedCalc) with a receiver operator curve (ROC) area under curve (AUC) calculated using SPSS.

Results

Full datasets for risk categorisation with CPET and COMPASS were available for 88/102 patients (86%). Table 1 demonstrates agreement of risk categories, with the majority of patients high/very high risk; 61.4% and 84.1% for CPET and COMPASS respectively. The sensitivity, specificity, positive and negative predictive values for COMPASS in predicting CPET categories was 92.6%, 29.4%, 67.6% (95% CI 62.3 – 72.4%) and 71.4% (95% CI 45 – 88%) respectively. The ROC AUC was 0.67.

Table 1: Patient risk category matrix for CPET and Compass

		CPET risk group numbers				
Compass risk group numbers		Low	Intermediate	High	Very high	Total
	Low	0	0	1	0	1
	Intermediate	9	1	2	1	13
	High	5	9	17	3	34
	Very high	6	4	19	11	40
	Total	20	14	39	15	88

Conclusion

Agreement between the two modalities was superior in higher risk patients, with COMPASS tending to over-predict CPET risk category. Although this inherently makes it a safer screening tool for CPET (higher risk patients not missed) it has greater resource implications. Our results demonstrate that a greater number of patients than necessary would be directed for CPET, making its use in resource rationalisation for this patient group limited. Our unit policy therefore remains unchanged with CPET performed for all patients under consideration for AAA surgery. (398 words excluding section headings)

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PR1962

A pilot survey of attitude towards prehabilitation components in the context of global health knowledge among senior citizens.

Introduction.

Prehabilitation holds the potential to revolutionize surgical care. However, the patient is required to take an active role in preoperative preparation, which is an approach that turns away from the paternalistic model of medical care. Apart from clinical guidelines, more research is needed to examine whether potential beneficiaries are ready to adopt a new paradigm effectively. Studies conducted at the turn of the century have explored some correlates of adherence to physical activity in the older age. Bearing in mind that senior people constitute the most important target group for prehabilitation efforts, we assessed their attitude. The number of projects researching this subject is limited.

Methods.

A short survey was conducted before each public lecture about prehabilitation (a part of a municipal project). It consisted of two open-ended and four close-ended questions and assessed knowledge of health determinants and attitude towards preoperative activities. The respondents were expected to rank on a scale from one to five each of the components of the potential multimodal prehabilitation programme.

Results:

62 questionnaires were included in the preliminary results. Mean age of the respondents was 68, 79% were female, 95% of the participants were retired. 78% of the respondents had experienced surgery.
Information about the perioperative period and preparation for the surgery was expected in the first order from the surgeon and the anesthesiologist, secondly form the GP practitioner. A nurse was the lowest ranked health professional as the source of perioperative information. Among preoperative interventions majority of participants accepted cessation of smoking (84%), abstinence (77%), and adherence to a specified diet (56%) as very important. General healthy eating, daily breathing exercises and increased physical activity were ranked as very important by 44%, 35% and 30%, respectively. Relaxation (28%) and regular physical exercises (27%) were considered as very important the least often.

Conclusion.

Knowledge about the importance of preoperative physical exercise, breathing and relaxation techniques among elderly is scarce. High rate of adherence to prehabilitation regimes may prove difficult to achieve among senior patients. It would be beneficial to create more advanced psychological tools to group different types of patients according to their attitude to prehabilitation.

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Title: Navigating the Whirlwind: Self-Efficacy in Colorectal Patients Receiving Surgical Therapy.

Introduction: A cancer diagnosis is a critical, traumatic event for patients, and leads individuals into an unknown future. Combined with the gold-standard of surgical therapy for colorectal patients, these two events are damaging to the patient's sense of self-efficacy - being able to make choices for one's self in the midst of a difficult situation. Prehabilitation has been shown to increase patient's post-operative results. Increasing self-efficacy, has also been shown to have a positive effect on post-operative outcomes. **Methods:** Patients who are currently participating in trials at the Perioperative Program (POP) at the Montréal General Hospital, selected to be given a semi-structured interview (SSI). The SSI were designed to ask patients to reflect on their psycho-emotional state at and around the time of receiving the diagnosis of cancer, at the time of preparation of surgery, a comparison of their expectations of surgery and the experience of the patient at the time of surgery, and finally a description of their time recovering from surgery. Post-interview, qualitative analysis was undertaken using Charmaz's Grounded Theory Framework. **Results:** Fourteen interviews of 12 patients were conducted. Nine specifically mentioned control or accepting that the universe is up to something and we must accept it. Thirteen interviews contained themes of lack of information, perceived or actual. All of the interviews within the intervention group of the main colorectal study at POP, referenced their time at POP as giving them a sense of regaining their control or regaining their sense of self. **Conclusion:** Through their use of language regarding control, the patients almost uniformly expressed an injury to their self-efficacy at the time of cancer diagnosis. Through talking with the patients and helping them integrate their process into the broader context of their daily life, prehabilitation programs naturally perform a meaning-making intervention, and thereby increase the self-efficacy of patients preparing for surgery or cancer treatments, helping them give voice and vision to the unknown of what lies ahead of them.

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Title: Postponed surgery to optimize patients with acute obstructive colon cancer - a retrospective study

Prehabilitation in elderly patients undergoing cardiac surgery: A randomised controlled trial.

Introduction:

An increasing number of patients over the age of 70 are undergoing elective cardiac surgery in the UK (1). The prevalence of frailty and co-morbidities in this group increases the risk of death, postoperative complications and length of stay (2). Although it is recognised in many specialities that there is a need to optimise patients' health prior to surgery, there is a paucity of data demonstrating the ability to improve function prior to cardiac surgery, and its subsequent impact on post-operative outcomes.

The primary objective of this trial is to assess the impact of a pre-operative cardiac rehabilitation intervention (prehabilitation) on pre-operative functional exercise capacity in patients over the age of 70 awaiting cardiac surgery.

Methods:

A single centre prospective randomised controlled trial will assess the impact of a cardiac prehabilitation intervention on pre-operative functional exercise capacity. Patients over the age of 70 years awaiting cardiac surgery will be randomised to receive either standard care, or a four week prehabilitation intervention consisting of supervised cardiac prehabilitation sessions, high intensity inspiratory muscle training and a home exercise programme. Change in the six-minute walk test (6MWT) from baseline to post intervention will be used to assess the impact of the intervention on functional exercise capacity (3).

Secondary objectives will evaluate the impact of the intervention on respiratory function (Maximal inspiratory pressure) and post-operative outcomes including length of stay, complications and health related quality of life. We will also assess the fidelity and quality of the intervention, the mechanisms of impact, and the contextual factors that may influence the effectiveness of the intervention.

Baseline measures will be collected prior to randomisation and repeated following the intervention (prior to surgery) to assess the impact of the intervention on preoperative physical function.

Outcome data will also be collected post operatively, and at 6 and 12 weeks following surgery to assess the impact of the prehabilitation intervention on a range of post-operative outcomes.

Conclusion:

This trial will evaluate if a prehabilitation intervention can improve pre-operative physical and functional outcomes in older patients awaiting cardiac surgery. It will also explore the impact of optimising preoperative function on post-operative outcomes and inform the design of a large multicentre trial to demonstrate the effectiveness and cost effectiveness of cardiac prehabilitation on post-operative outcomes in this population.

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PR1966

Safety and feasibility of Prehabilitation to Improve Cancer Surgery Outcomes in adolescents and young adults newly diagnosed with Extremity Sarcomas: The PICaSO-ES Study

1

Introduction: Oncologic treatment of extremity sarcomas (ES) involves localized and systemic therapies that are associated with significant postoperative complications[1] and treatment-related physical[2,3] and psychological[4] deficits persisting years posttreatment. Both postoperative complications[1] and incident comorbidities[5] are strong independent predictors of mortality in ES patients, especially in adolescents and young adults (AYAs).[5] Recent evidence has shown that vigorous exercise is a safe and time-efficient means of optimizing physical[6,7] / psychosocial[8] outcomes and reducing mortality[9] in cancer survivors, including AYAs, and may be similarly beneficial in a prehabilitation context. The purpose of this study is to assess the safety, feasibility, and preliminary efficacy of a vigorous exercise-based multimodal prehabilitation intervention on peri-/postoperative outcomes in AYA ES patients.

Methods: Thirty AYA ES patients undergoing surgery with a minimum 21-day surgical wait-time, an expected length of stay ≥5 days, and no absolute exercise contraindications will be recruited and randomized (1:1) to receive multimodal prehabilitation (PREHAB) or usual care (UC). PREHAB patients will receive a personalized exercise program comprised of 4-5 days of aerobic exercise (i.e., 2 supervised, facility-based, high-intensity sessions and 2-3 home-based, moderate-intensity sessions) and 2-3 days of home-based resistance exercise delivered by specially trained Registered Kinesiologists. PREHAB patients will also be trained to engage twice-daily in a mindfulness-based stress management intervention shown to improve coping in cancer patients.[10,11] UC patients will receive preoperative counselling, pedometers and information on the general exercise guidelines for people with cancer. Feasibility outcomes include measures of recruitment, safety, tolerability, self-reported compliance, and attrition. Exploratory outcomes include the 90-day global health score (EORTC QLC-C30),[12] 30- and 90-day surgical complications, length of stay, peak aerobic exercise capacity, and other facets of psychological and functional wellbeing (e.g., anxiety and depression,[13] and working ability[14]). Outcomes will be assessed at recruitment, immediately pre-operatively, and post-operatively at 1, 3, and 6 months. Baseline characteristics will be compared between groups using t-test or chi-square test. Longitudinal changes in all outcomes will be analyzed using repeated measures ANCOVA, controlling for baseline values and relevant confounding variables. The primary analyses will be conducted according to intention-to-treat.

Projected Outcomes/Impact: PICaSO-ES will (1) be the first to assess the safety and feasibility of multimodal prehabilitation in AYA ES patients, and (2) inform the development of an adequately powered phase II trial. Ultimately, this body of work will help challenge and refine the current presurgical management and care standards to optimize treatment and HRQoL outcomes across multiple AYA cancer populations.

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MOVED TO EBPOM CATEGORY PR1967

Peri-operative Anaemia Management:
A Real-world Experience of the Intravenous (IV) Iron Service at the Surgical Day Unit,

Title: **Study protocol to examine the effect of perioperative exercise on physical, clinical and psychological outcomes in lung cancer patients**

Introduction
Lung cancer surgery offers a curative intent but is associated with post-operative complications, prolonged recovery time, morbidity and mortality. Surgery is also associated with a significant reduction in physical fitness. Low levels of physical fitness are a predictor of poor post-operative outcome. Perioperative exercise training may improve physical fitness and ultimately post-operative recovery. However, the optimal model of delivery for perioperative exercise merits investigation. This randomised control trial (RCT) will examine the effect of perioperative exercise compared to usual care (no formal exercise training) on physical, clinical and psychological outcomes in lung cancer patients.

Methods
This RCT aims to recruit 60 participants scheduled for lung cancer surgery. Participants will be randomly assigned into 4 groups; Group 1: pre-surgical and post-surgical exercise; Group 2: pre-surgical exercise and post-surgical usual care; Group 3: pre-surgical usual care and post-surgical exercise; Group 4: usual care. The exercise intervention will involve attendance at ExWell, a community-based chronic illness rehabilitation programme. Participants assigned to exercise will complete 60 minutes of moderate to vigorous intensity exercise involving a combination of aerobic and resistance training on a minimum of 3 days per week.

Assessments will be completed at baseline, following the pre-surgical intervention, 2 weeks post-surgery, and following the post-surgical intervention (10 weeks). The following outcomes measures will be assessed:

- Physical outcomes: Aerobic fitness (cardiopulmonary exercise test, 6-minute walk test and stair test), muscular strength (hand grip and sit-to-stand), body composition (body mass index) and physical activity (accelerometer).
- Clinical outcomes: Pulmonary function, postoperative morbidity (Post-operative Morbidity Survey), immune function, cancer stage, length of hospital stay, hospital readmissions and smoking status.
- Psychological outcomes: Quality of life (Euro-QoL EQ-5D and Functional Assessment of Cancer Therapy for Lung Cancer) and patient activation (Patient Activation Measure).

Conclusion
Evidence of the relation between physical fitness and surgical outcomes may improve the accuracy of risk estimation of patients undergoing surgery and thus inform and improve patient care. Identifying the optimal time and mode of exercise during the lung cancer journey may translate to better patient outcomes. Recruitment start of this RCT is Summer 2019.

The utility of frailty screening in predicting severe postoperative complications in older patients undergoing colorectal cancer surgery: a retrospective study

Title: Mapping the pre-operative cancer pathway to investigate the feasibility of implementing prehabilitation

Authors and Affiliations:

Introduction:
Patients with physiological and psychological resilience are better prepared to withstand the challenge of surgery[1]. Prehabilitation should be considered an integral part of peri-operative care[2], addressing NHS England Long-Term Plan (LTP) including personalised care, early diagnosis, tackling health inequalities and maximising value[3]. We report the feasibility of implementing a multi-modal prehabilitation trial, WesFit (NCT:03509428).

Methods:
WesFit will determine the effects of multi-modal prehabilitation, prior to major intra-cavity cancer surgery. We conducted a 9-month process evaluation at the Sponsor site, focused on colorectal and urological cancer cohorts. Principal recruitment barrier was inadequate time to undertake prehabilitation due to surgery scheduled for <2 weeks. We set out to, 1) map the current surgical cancer pathways, and 2) trial an earlier referral process.

Results:
Median time to surgical decision was 33days and 36days for colorectal and urology patients respectively (Figure 1a/b). Median time from surgical decision to surgery was 26 days (colorectal) and 25 days (urology). However, the surgical decision was communicated to patients after 6 days for colorectal and 6.5 days for urology, leaving a median time to deliver prehabilitation of 20 days and 18.5days for colorectal and urology respectively. WesFit did not delay surgery (zero breaches to the 62-day target). By initiating cardiopulmonary exercise testing prior to MDT decision we enabled patient staging alongside tumour staging and maximal shared decision making at the outpatient consultation, including trial recruitment. Patients denied entry to the trial due to time constraints fell from 31% to 16% (colorectal) and from 35% to 19% (urology). Average monthly recruitment increased from 1.7 to 4.75 patients (Table 1).

Conclusion:
We demonstrate a pressing need to accurately map and streamline clinical cancer pathways, prior to implementation of a prehabilitation service. Bringing forward the initial

prehabilitation referral increases the time available to participate in prehabilitation, while fully informing MDT and shared decision making processes prior to surgery. This presents an opportunity to accelerate diagnosis communications with the patient. Streamlining these pathways in line with the Governments NHS Long Term Plan is an effective and feasible solution to achieve implementation of a prehabilitation service. Earlier referral for physiological assessment and optimisation has potential to reduce waiting-time breaches (38% of trusts met the 62-day waiting time in November 2018[4]). We would also urge any interested sites to begin a mapping process now in anticipation of a prehabilitation service.

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Tumour Speciality	**Mar – Nov 2018**	**Dec 2018 – Mar 2019**
Colorectal	37/121 = 31%	10/62 = 16%
Urology	25/72 = 35%	8/43 = 19%
Average recruitment per calendar month	**1.7 patients**	**4.75 patients**

Table 1: Comparison across 2 time-points of the proportion of patients who were eligible for the WesFit trial, but unable to be recruited due to time to surgery

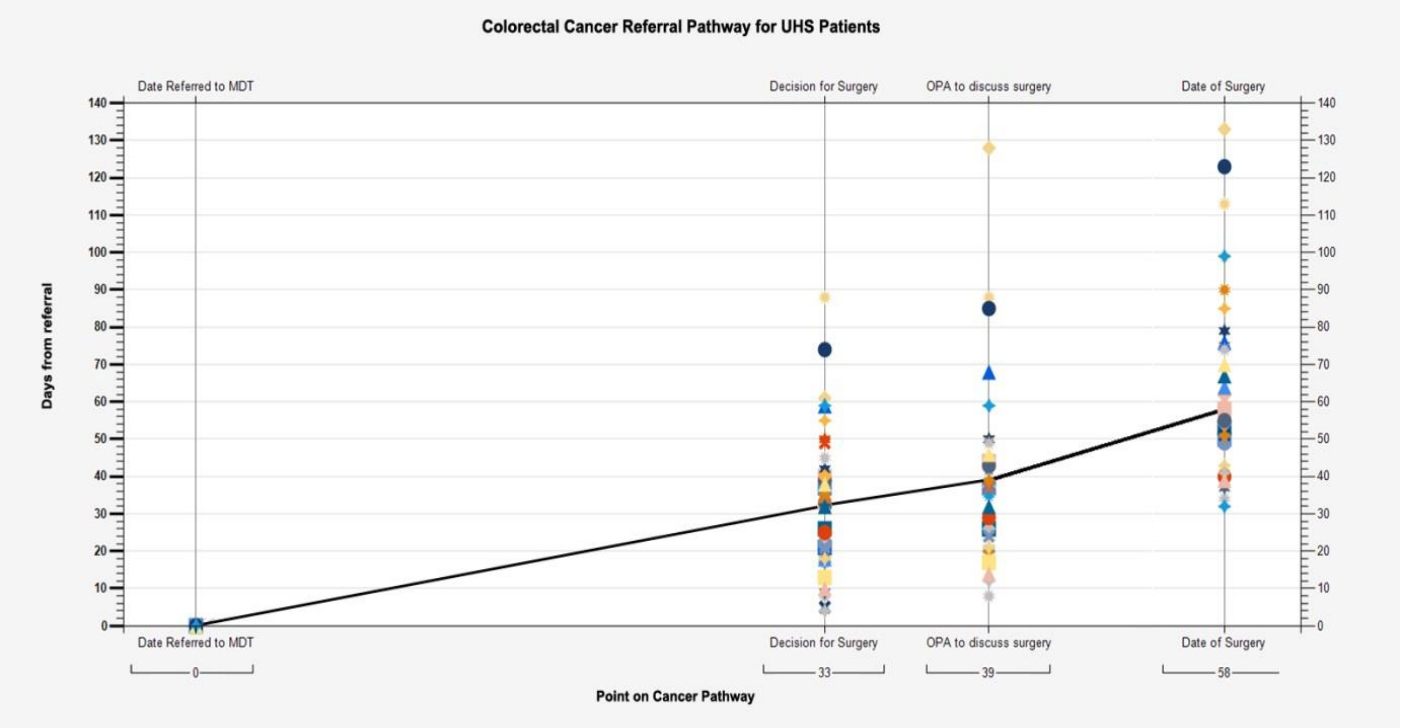

Figure 1a: The colorectal surgical cancer referral pathway for University Hospital Southampton patients reflecting referral to MDT up until surgery.

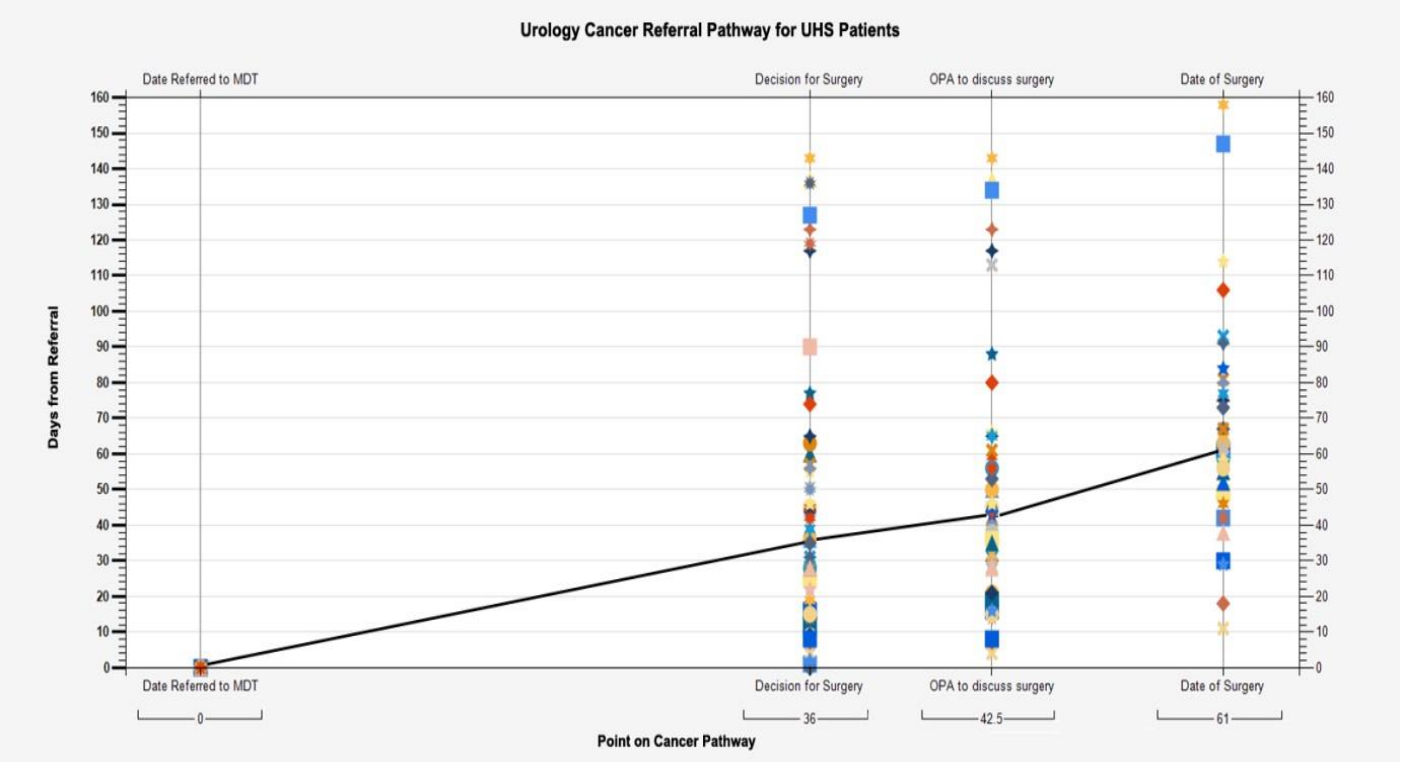

Figure 1b: The urology surgical cancer referral pathway for University Hospital Southampton patients reflecting referral to MDT up until surgery.

Cost Outcome Analysis of the South Tees Community Prehabilitation and Wellbeing Project (PREPWELL) Exercise Intervention

Introduction

The South Tees PREPWELL service is a pilot, community-based multimodal prehabilitation and wellbeing project. The programme is multi-specialty and available to patients undergoing major non-cardiac surgery from point of listing. Intervention is centred on a planned 6 week exercise programme with twice weekly, 60 minute exercise sessions incorporating circuit-based aerobic and resistance training and supplementary home based activity including inspiratory muscle training (IMT) and nutritional support. We conduced a cost outcome study to evaluate the costs of delivering the intervention and the impact on patient health related quality of life.

Methods

Cost analysis was conducted from a National Health Service (NHS) and Local Authority (LA) perspective using 2018 £ prices. Costs associated with the exercise intervention were micro-costed and estimated on a per-patient basis. Three intervention cost components were identified: Capital costs of materials, staff time associated with delivery and overhead costs e.g. room rental. Capital costs included; purchase of essential equipment for supplementary home-based sessions, nutritional supplements and patient information materials. Outcomes in the economic analysis were identified and measured using a multi-attribute utility measure of Health Related Quality of Life (HRQOL); EQ-5D-5L. HRQL and associated utilities were obtained at preoperative 'one-stop' ENTRY and EXIT evaluations addressing multiple risk factors.

Results

27 patients participated in the face-to-face programme and completed ENTRY-EXIT evaluation. Mean age was 67 years (range 42-84). Mean programme duration was 9.7 weeks (range 2.5-32). Mean total intervention cost per patient was £404.86. This cost varied significantly by speciality (range £475.9 in orthopaedics versus £203.22 in urology). This reflected the number of sessions available and attended, in turn related to waiting times. A weekly average total cost of £52.35 per patient was therefore estimated across all specialities. Average health related quality of life scores improved at programme EXIT evidencing that the intervention had a positive impact. HRQOL improved by a mean (SD) score of 0.038 from 0.76 (0.13) at ENTRY to 0.80 (0.13) EXIT.

Conclusion

The costs of PREPWELL were related to the number of sessions attended by participants driven by waiting times for surgery. This is comparable to the per-patient cost of established cardiac rehabilitation programmes[1]. Health Related Quality of Life improved across all surgical specialities preoperatively. Interventions of this nature need to be embedded across a patient pathway in which a whole systems approach is taken.

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Implementing Vascular Prehabilitation: A Quality Improvement Journey

Introduction

Prehabilitation describes enhancing patients' functional capacity before surgery to improve postoperative outcomes (1). Although this concept is gaining evidentiary support globally, implementation remains challenging. The aortic aneurysm (AA) repair pathway at St. Thomas' Hospital is well-suited for prehabilitation as patients typically wait 6-8 weeks for surgery so we can intervene at the so-called teachable moment (2). We established a novel prehabilitation service as part of an overall pathway redesign.

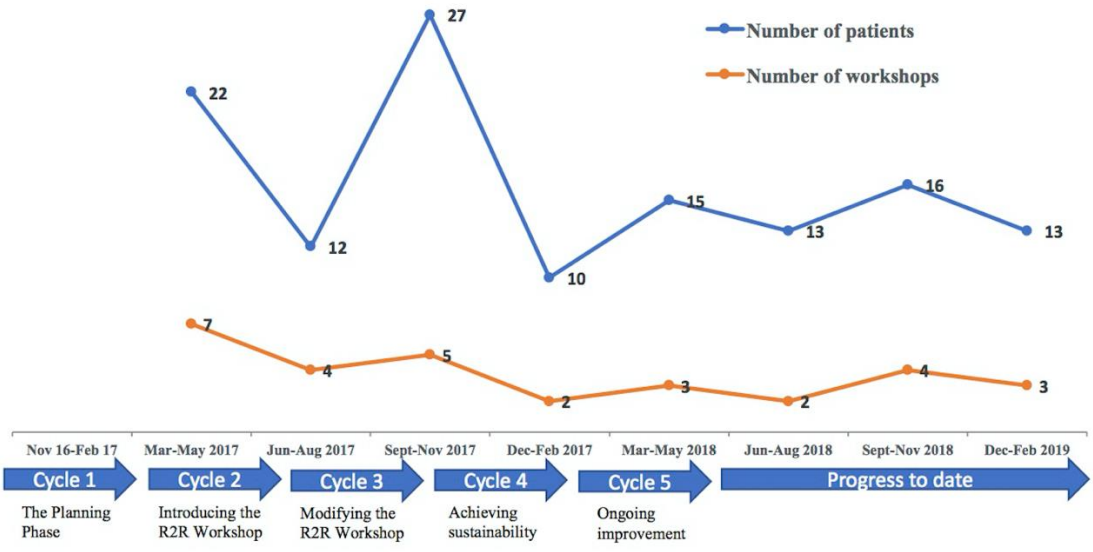
Method

Prior to formal design, we generated interest from patients and the multidisciplinary team (surgeons, anaesthetists, clinical nurse specialists (CNS), physiotherapists) to develop a strategic consensus. We created a workshop entitled the Road 2 Recovery (R2R) to target AA patients and modified this using the Model for Improvement (3).

Results

We completed 5 plan-do-study-act (PDSA) cycles over 24 months (Figure 1).

Figure 1: PDSA cycles completed



Major elements of change:

1. **Workshop format & content:** powerpoint presentation includes physiology of aneurysm, guidance on nutrition, smoking cessation and addressing anxiety in the peri-operative phase. Prehabilitation packs developed.
2. **Logistics & planning:** workshops held ad-hoc initially, now regularly scheduled same day and time
3. **Patient recruitment:** vascular CNS helping to recruit patients from clinics and book them into the workshop using PiMS
4. **Staff recruitment:** job planning now includes prehabilitation, anaesthetic trainee involvement
5. **Sustainability & funding:** business case successful, external grant funding received, full time designated physiotherapist

The R2R workshop is held following outpatient clinic; patients attend after their appointment to minimise the burden of travel (cycle 2). Led by an anaesthetist and physiotherapist, it lasts 2 hours and patients are educated on the perioperative journey. We modified the presentation following qualitative patient feedback (cycles 2-4) and take-home information is provided (cycle 4). Consistent attendance has been achieved as patients are booked electronically (PiMS) by the CNS with the recommendation that this be considered part of overall care (cycle 3). A successful business case and formal job planning resulted in sustainability (cycles 4 + 5). As of February 2019, 128 patients have attended 30 workshops, approximately 30% of eligible patients.

Conclusions

The process of implementation is ongoing but feedback is consistently and increasingly positive. Lessons are numerous but crucial is the engagement of key stakeholders with patients themselves being paramount. We also recognise the need for continued review and improvement.

Our formal study will assess adherence to this home-based programme as well the efficacy of mentoring using mobile technology software. We will investigate whether patients modify behaviour and improve their outcomes.

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PR1973

The effects of a community-based pre-operative exercise programme on perceived wellbeing and quality of life in people with newly diagnosed prostate cancer:

A qualitative study

Background: People with a newly diagnosed prostate cancer are often treated by surgery. The time window between cancer diagnosis and surgery causes high levels of uncertainty and stress, which negatively impact quality of life (QoL). This study explored the effects of a community-based pre-operative exercise programme on perceived wellbeing and QoL in people with newly diagnosed prostate cancer.

Methods: A community-based pre-operative exercise programme was prescribed in the time between cancer diagnosis and surgery, and could be completed at the exercise centre or at home, dependent on patient location. Following completion of the exercise programme (within 1 week before surgery), participants took part in a semi-structured interview which covered four broad QoL domains including physical, psychological, social and spiritual wellbeing. Data were analysed using thematic analysis (a bottom up/inductive analysis).

Results: From November 2017 to June 2018, 11 participants with newly diagnosed prostate cancer were recruited. Mean (standard deviation (SD) age was 60 (7) years. Mean (SD) number of days between referral and starting the exercise programme was 4 (5) days. Seven participants

completed the exercise training programme at the centre, three at home and one a combination of centre and home. The mean (SD) duration of pre-operative exercise training was 4 (2) weeks. Adherence rates to the centre-based programme was 84 % and 100 % to the home-based programme (self-reported). Engagement in the pre-operative exercise programme provided participants with: (1) a teachable moment; (2) acted as a vehicle to recovery; (3) a sense of optimism; and (4) social connectedness.

Conclusion: This community-based pre-operative programme enhanced wellbeing and improved perceived QoL. Further research is required to explore this in a larger adequately powered sample.

Key Words: surgical-oncology, prostate cancer, surgery, community, pre-operative exercise training, quality of life.

PR1974

A phase 1 study examining the feasibility and effectiveness of a community-based pre-operative exercise programme for people with newly diagnosed oesophageal and gastric cancer scheduled for neoadjuvant cancer treatment and surgery.

Background: Neaodjuvant cancer treatment (NCT) reduces physical fitness prior to surgery. Low pre-operative fitness levels may compromise a patient's ability to undergo surgical resection and are associated with poor post-operative outcomes. The aim of this study was to assess the feasibility and effectiveness of a community-based pre-operative exercise programme (initiated immediately after cancer diagnosis) in people with oesophageal and gastric cancer and scheduled for NCT followed by surgical resection.

Methods: An exercise programme was prescribed before, during and after NCT and continued until surgical resection. Outcome measures were assessed in all participants upon inclusion and repeated post-NCT and pre-surgery. Assessments were made of cardiorespiratory fitness (6-minute walk test), upper and lower body strength (sit-to-stand and hand grip), health-related quality of life (HRQoL) (EQ-5D questionnaire) and fear of surgery (questionnaire).

Results: From May to December 2018, 10 patients were referred to the exercise programme. Eight patients (6 male and 2 female) participated in this study with a mean (range) age of 63.0 (50 - 74) years and body mass index (BMI) of 25.5 (20.5 – 37.7) kg/m^2. Of these 8 patients, 2 were lost to follow up due to development of medical morbidities and 2 dropped out due to personal reasons. Four patients completed the exercise programme and exercise trained for a

mean (range) of 11 (7 - 15) weeks and completed 23 (13 - 31) exercise sessions. One patient missed the pre-surgery assessment due to illness. Results are presented in Table 1. From baseline assessment to post-NCT, improvements were noted in cardiorespiratory fitness, lower and upper body strength, HRQoL and fear of surgery. From post- NCT to pre-surgery, there were improvements in lower and upper body strength, cardiorespiratory fitness, HRQoL whilst fear of surgery was increased. Overall, from baseline to pre-surgery, there were improvements in all components of fitness and HRQoL.

Conclusion: This community-based exercise programme, delivered during NCT and continued until surgical resection for people with oesophageal and gastric cancer, is feasible and improves HR components of fitness and HRQoL. This data has informed the design of the PERIOP-OG trial which is a pragmatic multi-centre, randomised controlled trial, investigating the benefits of a community-based exercise training programme compared to standard usual care (no formal exercise). Clinicaltrials.gov identifier: NCT03807518.

Table 1. Outcome measures at baseline, post-NCT and pre-surgery

Outcome measure	**Baseline**	**Post- NCT**	**Pre-surgery**
Body mass index (kg/m^2)	28.2 (23.9 – 37.7)	28.3 (23.8 – 34.8)	30.3 (25.9 – 37.4)
Lower body strength: Sit-to-stand (sec)	14.2 (11.7 – 18.9)	12 (9.5 – 14.9)	11.6 (10.7 – 12.8)
Upper body strength: Hand Grip (kg)	34.6 (26.9 – 42)	37.6 (30.5 – 42)	41 (32.3 – 46.4)
Cardiorespiratory fitness: 6MWD (m)	588 (520 – 656)	656 (591 – 700)	688 (604 – 780)
HRQoL (EQ-5D: health status) (%)	72.5 (55 – 85)	83 (80 – 90)	85 (80 – 90)
Fear of surgery score	34 (19 – 55)	17 (12 – 21)	32 (24 – 44)

Data are presented as mean (range).

Abbreviations: NCT (neoadjuvant cancer treatment), 6MWD (6-minute walk distance test), HRQoL (health related quality of life)

Preoperative home-based exercise prehabilitation in patients scheduled for liver or pancreatic resection: the first results of the PRIOR study

Background: Preoperative exercise prehabilitation can improve the physical fitness of high-risk patients before major intra-abdominal surgery. To maximize compliance, literature suggest patients' preferred method for prehabilitation, is home-based and (semi) supervised. We hypothesize that a home-based exercise program is feasible and may improve the preoperative anaerobic threshold in patients scheduled for liver or pancreatic resection. We assume to reach an average increase in anaerobic threshold (AT) of 1.5 ml/kg/min in patients with low cardiorespiratory reserve (AT<11 ml/kg/min) during waiting time for surgery.

Methods: This study is a multicenter study with a pretest – posttest design. Potentially high risk candidates will undergo a CPET. Patients with an AT <11 ml/kg/min will participate in a four-week (12 sessions in total) of semi-supervised home-based exercise program. After the prehabilitation program, patients will undergo a second CPET.

Results: Sixty five patients performed a CPET, of whom 31 (48%) scored an AT <11 ml/kg/min (median 11,4 IQR 3,2). Eventually 13 patients out of 31 (42%) participated in the prehabilitation program. Eighteen patients could not adhere to the exercise program due to various reasons (i.e. logistics, severe comorbidity, time schedule). Two patients quit during the study. Six out of 11 (54%) patients improved in AT (median 1,6 IQR 1,0). One patient did not perform a maximum test in both pre- and post-test, but outcome improved based on VO_2 peak. Two patients did not perform a post-test, of whom one improved based on his weekly steep ramp test. One patient achieved the same AT in the pre- and post-test. A decrease in AT was shown in one patient.

Conclusion: This data shows that it is a challenge to offer patients a home-based exercise program. However, eight of 11 patients who did complete the program were able to improve their physical fitness. Completion of the study is required to answer whether a home-based exercise program is feasible.

The role of Cardio Pulmonary Exercise Testing (CPET) in preoperative triage.

Title

Interdisciplinary co-design and co-delivery of system level Greater Manchester Prehab4Cancer service.

Introduction

The importance of Prehabilitation and active recovery pathways in cancer are being increasingly recognised by patients and healthcare providers around the world.[1,2] The elements of exercise, nutrition and wellbeing appear core to improving patients' outcomes and quality of life. There are a variety of medical, nursing, AHP and exercise professionals who can meaningfully contribute to the design and delivery of prehabilitation.[2]

GM Cancer, which serves more than 2.8 Million people, is the first UK cancer alliance to introduce large scale prehabilitation as a standard of care for cancer patients. Through transformation funding Prehab4Cancer will support more than 1,000 patients per year undergoing cancer interventions (major surgery, chemotherapy and radiotherapy) through freely accessible preparation and recovery physical activity, nutritional and wellbeing packages across Manchester over the next 2 years. This is being done using interdisciplinary working and a personalised care approach to assessment and stratified service provision.[3].

Methods

To deliver this system change, GM Cancer is working with multi-disciplinary professionals from local NHS providers, community GM Active cancer-rehab qualified fitness instructors, Macmillan patient representatives and Manchester Allied Health Sciences. Prehab4Cancer has been co-designed utilising advice from national and international multimodal experts who facilitate collaboration, innovation and study within the programme. Physiological, disability and QOL outcomes are recorded at several intervals pre and post treatment. Health Innovations Manchester is supporting the digital component of this programme.

Upskilling training is embedded into this service model. This is respectful of GM Active's expertise in exercise prescription but ensures instructors communicate well with participants recently diagnosed with cancer, noticing and responding to distress using level 1 psychological skills.[2] Reflective sessions supported by an Oncology Psychologist and Specialist Occupational Therapist further enhance staff support and improved patient experience.

Results

- Reduced morbidity and improved survival over the next 2 years
- Improved PROMs and PREMs
- Reduced healthcare and social costs
- Improved family and carer satisfaction metrics

Conclusion

GM Cancer is the first UK cancer system to undertake large scale prehabilitation.. It offers opportunities for replication elsewhere and collaborative working at regional and national level, but most importantly provides excellent cancer care.

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PR1978

A Perioperative Anaemia Service – A cost effective way of reducing blood transfusions in elective surgery

Introduction

The association of anaemia and poor outcomes after major surgery is well established (Baron et al., 2014; Musallam et al., 2011) . It is also well established that blood transfusion is harmful (Acheson, Brookes, & Spahn, 2012; Wilson et al., 2017). There is some evidence for a reduction in blood transfusion when perioperative anaemia is actively managed (Diez-Lobo, Fisac - Martin I, Bermejo-aycar, & Munoz, 2007; Lidder et al., 2007) and 'perioperative anaemia services' are quite common, with national guidelines supporting their existence (Munoz et al., 2017) with an increasing evidence for their cost-effectiveness (Froessler, Rueger, & Connolly, 2018). Whilst we await robust outcome data for treatment leading to improved outcomes the fiscal piece is becoming difficult to ignore.

Method

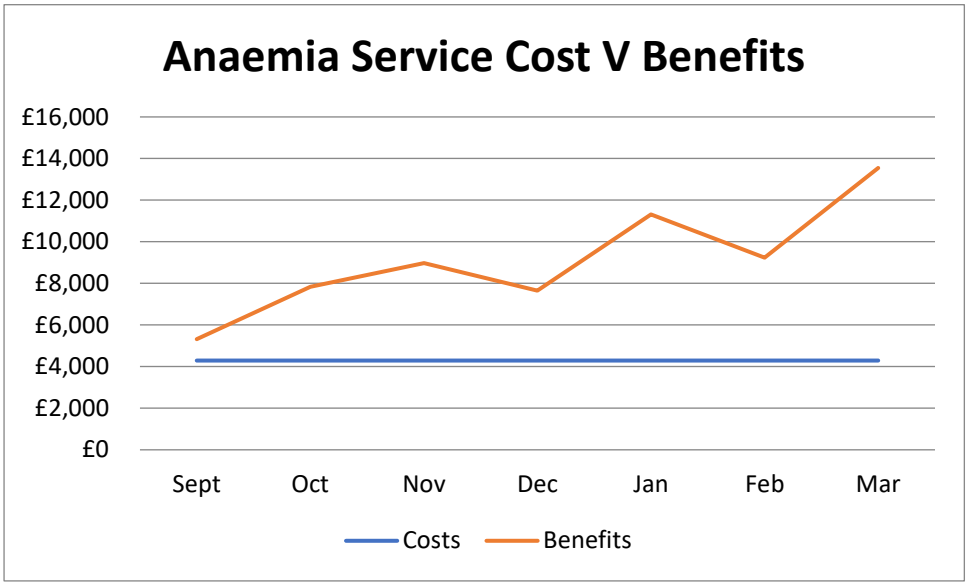
A retrospective observational audit was undertaken in 2016 to determine the baseline prevalence of anaemia and transfusion for all cystectomies, and colorectal resections (Delroy-Buelles, Fernandes, & Plumb, 2017). Following this, a pilot anaemia service was run in colorectal and urology from 2017-2018 to assess the feasibility of an 'anaemia service' and gather data for a business case to fund a perioperative anaemia nurse and 1PA of consultant time. These posts were funded from September 2018, when the service was widened to include all GI, Liver, urological and maxfax resections. Here we outline the financial efficiencies demonstrated by the service.

Results

During the first 7 months of the funded service, 471 patients were referred to the service with an Hb <120. A tariff of £49 was applied to each patient to cover the time spent reviewing the anaemia status and planning treatment within a virtual clinic. An average of 30% of all referred patients required an iron infusion. This was charged as a day case procedure (£300) which was offset against the cost of the average dose of IV iron (£200). Blood transfusion savings were calculated based on a 50% reduction in transfusion rate identified in the pilot service, where 19% of anaemic patients required a transfusion.

		Sept	Oct	Nov	Dec	Jan	Feb	Mar	TOTAL
Anaemia costs	**0.8 WTE B6 Nurse**	£2,699	£2,699	£2,699	£2,699	£2,699	£2,699	£2,699	£18,893
	1 PA Consultant	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£7,000
	0.3 WTE B3 Admin	£592	£592	£592	£592	£592	£592	£592	£4,144
TOTAL		£4,291	£4,291	£4,291	£4,291	£4,291	£4,291	£4,291	**£30,037**
Number of referrals		31	60	69	54	86	68	103	**471**
Anaemia Benefits	**Virtual Clinic Tariff @£49 for all referrals**	£1,519	£2,940	£3,381	£2,646	£4,214	£3,332	£5,047	£23,079
	Anaemia Iron Infusions - Income from admission minus cost of iron £300-£200=£100 per patient	£2,000	£1,600	£1,700	£2,000	£2,300	£2,000	£2,500	£14,100

	Blood transfusion savings £300 per infusion saved, based on 50% reduction	£1,800	£3,300	£3,900	£3,000	£4,800	£3,900	£6,000	£26,700
TOTAL		£5,319	£7,840	£8,981	£7,646	£11,314	£9,232	£13,547	**£63,879**



The overall cost of the service over 7 months = £30,037, the benefits =£63,879, resulting in a net benefit of £33,842 .

This net benefit does not account for length of stay reductions, as a recent GIRFT Provider report has reported anaemic surgical patients have an average length of stay 2.5 days longer than non-anaemic patients (NHS Improvement, 2018) .

Conclusion

Investment in a perioperative anaemia service has proven to be cost effective in optimising anaemic patients prior to surgery. Net benefit is likely to increase with time as referrals increase and length of stay savings realised.

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PR1979

Preventing Post-operative Delirium in Elective Lower Limb Arthroplasty

Introduction:

Delirium is a post-operative risk and it carries significant morbidity and mortality. Patients who develop delirium tend to have longer lengths of stay and poorer outcomes. This can have serious impacts for patients and their loved ones. This risk is increased by the use of opiate based and neuropathic medications.

The post-operative pain regime we utilise for elective lower limb arthroplasty patients consists of Paracetamol, Gabapentin, OxyContin which is then stepped down to Dihydrocodeine and OxyNorm for breakthrough.

We have developed a system of adapting patients' analgesia if they are deemed to be at high risk of delirium.

Methods:

Patients who are 65 years or older are screened prior to admission by liaising with the local psychiatry liaison team regarding whether they have any previous issues or contact with mental health services.

Patients are stratified into low, medium or high risk groups based on the following criteria:

GREEN	• Aged below 65 years old. • No Significant Sensory Impairment • No history of cognitive decline. • Independent with mobility • No polypharmacy
AMBER	• Over 65 years of age. • Polypharmacy – 4 medications or more • 1 Sensory Impairment • Restricted mobility
RED	• Over 65 years of age. • Physical co morbidities • Polypharmacy • 1+ Sensory Impairments • Psychiatric Co morbidities

For high risk patients, the pain regimen is adapted by:

- Avoiding Gabapentin, OxyContin and OxyNorm
- Extending intravenous Paracetamol duration from 24 to 72 hours
- Using oral NSAIDs such as Ibuprofen or rectal NSAIDs such as Diclofenac
- If required, using mild opiates such as Codeine 15mg or Dihydrocodeine 30mg
- If necessary, using low dose Oramorph (2.5mg-5mg) for breakthrough

Results:

Some patients have been managed successfully with solely intravenous Paracetamol and NSAIDs. If we have felt this to be insufficient, we have utilised low dose Codeine either as required or regularly if deemed necessary.

Oramorph has been avoided in most instances.

3 patients suffered from delirium over a 12 month period; 2 of these had pre-existing cognitive impairment.

Conclusion:

Avoiding opiates and neuropathic analgesia in high risk patients can reduce the incidence of delirium. Having an awareness of delirium risk and a thorough patient background enables clinicians to tailor post-operative analgesic regimens in an attempt to reduce the chance of this occurring.

Use of Oramorph on Discharge in Elective Lower Limb Arthroplasty

Introduction:

As the inpatient length of stay for elective lower limb arthroplasty patients has reduced to an average of 24-72 hours, it has become apparent that some patients experience significant issues with pain control post-discharge.

Patients may still require stronger opiates that they would usually receive if they were still inpatients. Once at home, they may experience difficulties being reviewed in primary care due to mobility and also service pressures; and in the worst case scenarios this can lead to preventable readmissions.

Our usual discharge analgesia consists of Paracetamol and Dihydrocodeine. As a response to the above, we have developed a service whereby patients are assessed pre-admission with regards to whether they may be prescribed Oramorph as breakthrough analgesia on discharge from hospital.

Methods:

All patients attend a validation appointment with a specialist joint replacement nurse within 2 weeks of surgery. This is to ensure that there are no outstanding issues.

If a patient is deemed to be at low risk of post-operative delirium, they are offered Oramorph. Some patients decline this based on previous experiences with Morphine or if they feel that mild opiates are sufficient.

Oramorph (100ml of 10mg/5ml) prescriptions are prepared the week before admission to prevent delays in discharge.

Patients who are 80 years or older are assessed on a case by case basis once they are admitted. The reason for this is that in our initial trial period, we found a lot of declines. Additionally, they tend to remain inpatients for longer at which point their pain is better controlled.

Results:

1 patient readmitted within 30 days of discharge over a 12 month period due to pain control issues.

We experienced a significant reduction in telephone calls from patients regarding sub-optimal pain control.

Up to 5% of patients issued with Oramorph returned an unused bottle.

Conclusion:

As we strive to reduce the length of stay of elective lower limb arthroplasty patients, they will inevitably experience issues post-discharge that in the past would have been addressed prior to discharge.

With regards to pain control, we have responded to this by including Oramorph as a discharge medication after assessing them.

Consequently, there have been less readmissions due to poor pain control and increased patient satisfaction.

PR1981

Post-operative Ferinject Usage in Elective Lower Limb Arthroplasty

Introduction:

Patients undergoing lower limb arthroplasty will experience a degree of blood loss and a significant number of them may receive red cell transfusions in the post-operative period.

Red cell transfusions carry potential risks including transmission of blood-borne infections and increased incidence of prosthetic infection.

Additionally, blood product supplies are finite and therefore, using alternatives helps preserve stock for patients with significant clinical need.

Over the last 12 months, we have utilised Ferinject as an alternative in patients with significant post-operative anaemia in an effort to reduce red cell transfusion. This drug can be administered quickly and replenishes the body's iron stores and this assists in the formation of new red cells.

Methods:

Ferinject infusion is considered in patients with a post-operative haemoglobin < 100g/L. This is usually administered in the first 48 hours post-operatively.

A follow up full blood count is arranged 28 days post-Ferinject infusion to assess the response. At this point, a decision can be taken whether any further anaemia management is required.

Results:

Two thirds of patients have a haemoglobin rise of 30-50g/L within 28 days of receiving Ferinject.

Red cell transfusions have been reduced by a third.

One patient did not respond and was referred to haematology for investigation. The remainder of patients responded and did not require any further intervention i.e. further Ferinject or oral iron replacement.

Conclusion:

This work suggests that the use of Ferinject post-operatively in lower limb arthroplasty patients is associated with reduced red cell transfusions.

The majority of patients have had a haemoglobin rise of at least 20g/L within a month of infusion and none of them required further anaemia management such as oral iron replacement.

Transfusion inevitably results in patients in hospital till at least the next morning for a check haemoglobin. This is not the case if Ferinject is used instead resulting in reduced length of stay.