O_01

Evaluation of a patient education animation to support prehabilition prior to surgery

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Introduction: Prehabilitation is the coordinated improvement of general health in the approach to surgery through modification of lifestyle factors and optimisation of medical conditions enabling patients to better withstand the stress of surgery. Educational video media are a well-established format to encourage active patient participation in healthcare [1]. We developed a short video animation to support and motivate patients to make lifestyle changes in the teachable moment prior to surgery. Our aim was to evaluate patient attitudes towards the clarity and usefulness of the animation as an educational resource.

Methods: The 2-minute animation was developed by a multidisciplinary team of Anaesthetists and General Practitioners with support from animation experts. It presents key lifestyle factors and chronic health conditions that influence perioperative risk, introduces the prehabilitation concept and benefits of early intervention. Following preliminarily feedback from the Patient Liaison Group at the Royal College of Anaesthetists, we developed a short structured evaluation questionnaire. Patients over 18 years of age were approached at preoperative assessment clinics at two UK hospital sites. After watching the animation patients were asked to complete the evaluation.

Results: 181 patients participated: 61% and 39% from Dorset and South Tees Hospitals respectively. There was a normal distribution of ages with a modal range of 55-64 years. Feedback surrounding visual-auditory aesthetics of the animation was overwhelmingly positive: 93 to 98% of patients reported video length and speed to be appropriate. Language was clear and easy to understand with no confusing vocabulary.

Ninety-four percent of participants considered the video 'useful' to watch with almost universal endorsement (99% agreed) that the link between improved general health and a smoother perioperative recovery was clearly explained. Importantly over three quarters of patients identified that they would subsequently be motivated to make lifestyle changes. Half of respondents reported that they knew where to seek additional support in achieving this, with only 24% interested in further information from the hospital teams.

Conclusion: The results of this evaluation support our animation as being a useful educational resource to assist prehabilitation efforts in patients prior to surgery. As part of our recently introduced community-based preparation for surgery programme (PREPWELL) we are using the animation to motivate patients during an introductory education seminar. Such a supported approach has shown benefits in other behavioural change settings [2,3]. At a local level we plan to make the resource more widely available to patients at an earlier stage in the perioperative pathway in the primary care setting (GP surgeries and health centres).

We would also be interested in making the resource available to the developing international prehabilitation community as part of a portfolio of resources to support clinicians and patients prior to surgery.

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O_02

PREPWELL: A multimodal cross-specialty community-based prehabilitation and wellbeing programme

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Introduction: Prehabilitation prior to major non-cardiac surgery is a key route to improved surgical outcomes. In the UK, preoperative modification of risk factors including unhealthy behaviours and under-

recognised chronic health conditions is limited by variable access to community services and a 'silo' culture between primary and secondary care limiting efficient working. PREPWELL is a pilot community based cross-specialty prehabilitation service designed to address this gap in the perioperative pathway. PREPWELL facilitates multimodal prehabilitation commencing earlier in the preoperative period, maximising the time available for patients to make meaningful changes. Service development was guided by local PPI work identifying patient willingness to engage with prehabilitation efforts given appropriate support and preference for a community-based 'one-stop' service. The service was launched in January 2018 with support from the UK Health Foundation providing capacity for 100 patients over 12 months.

Methods: Referrals are invited from vascular, orthopaedic, urology, upper GI and colorectal specialists. Eligible patients have evidence or suspicion of target risk factors including: inactivity and poor fitness, smoking, excess alcohol consumption, malnutrition, anaemia, obstructive sleep apnoea, frailty and cognitive impairment. A single ENTRY evaluation guides a multimodal prehabilitation package typically including a 6-week supervised and/or home-based exercise programme alongside: smoking services, alcohol services, sleep apnoea diagnostics and anaemia pathway access. Possible frailty or cognitive dysfunction is highlighted to responsible clinicians. Psychological status and QOL are evaluated using HADS and EQ-5D. Interventions are delivered in a community wellbeing hub typically requiring 2 visits per week. On completion an EXIT evaluation is carried out identifying preoperative modification of risk factors, changes to fitness levels and quality of life. Postoperative evaluations include length of stay, 90-day mortality, morbidity, unplanned critical care admissions and health resource utilisation. The model and outcomes closely align with existing successful European Cardiac rehabilitation platforms.

Results: As of March 2018 49 referrals have been received. The main sources of referral have been: Orthopaedics (31%), Vascular (29%) and upper GI (22%). Sixteen patients have entered the service, 15 are awaiting ENTRY evaluation and 18 (37%) patients have declined participation. Of those patients declining participation, 61% have had travel-related reasons. Of the 16 participants identified as having lifestyle risk factors, interventions subsequently recommended by project staff have been universally accepted by patients. A number of chronic health conditions have also been identified earlier in the perioperative pathway (Table 1). Participants have attended 82% of planned supervised exercise sessions. Currently, 5 patients have undergone preoperative EXIT evaluation.

Conclusion: Our early results demonstrate high levels of patient engagement (73%) with this new pilot Prehabilitation service. To date inactivity and increased alcohol consumption have been identified as the main lifestyle risk factors. Encouragingly previous research by our team has identified these as the 2 main areas where patients are amenable to lifestyle change, a fact reinforced by universal acceptance of prescribed interventions within the current project. Patient feedback interviews have also been very positive about the service.

Risk factor	Number of patients with risk factor	Intervention offered	Number of patients accepting intervention
Inactivity and poor fitness	16	Programmed exercise	13 (Supervised) 3 (Home-based)
High ARISCAT score (elevated risk of respiratory complications)	5	Inspiratory muscle training (IMT)	5
Smoking	2	Smoking cessation	2
Hazardous alcohol intake	10	Alcohol reduction advice	10
Elevated BMI (>35)	1	Nutritional advice for elevated BMI	1
Suspected Obstructive Sleep Apnoea	1	Expedited OSA diagnostics	1
Anaemia	3	Early preoperative anaemia pathway access	3
Suspected Frailty	1	Suspected Frailty highlighted to GP	1

Table 1: Breakdown of risk factor identification and intervention uptake amongst PREPWELL service participants.

O_03

The role of intravenous iron carbossymaltose supplementation in non-anemic patients undergoing to elective hip or knee arthroplasty in our ERAS protocol, one of our pillars for a correct preahbilitation

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Summary: It is evidence that perioperative anemia represents a negative prognostic factor to postoperative mortality and morbility. For that reason, our team of hip and knee arthroplasty, took the goal to identify not only anemic patients but also not anemic patients with iron deficiency in pre-admission assessment and treats them with intravenous iron at least 4 weeks before hospital admission.
Materials and Methods: Observational-monocentric-cohort-prospective study .Included two groups of patients 50. One group treated with iron carbossymaltose (47 females). Inclusion criteria: patients with hemoglobin levels between 12 and 14 g/dl and ferritin levels lower than 100 mcg/l. Patients with kidney failure, liver failure, intravenous iron allergy and septic patients were not included. Selected patients were treated with intravenous iron carbossymaltose 1 g in pre-admission assessment, 4 weeks before surgery. Second control group 50 patients (42 females) same criteria , but no iron infusion.Primary end point is the comparison between hemoglobin delta (= Hb at hospital admission – Hb at 4 weeks after surgery) of treated patients group (delta 1) and of not treated patients group (delta 2). Secondary end points are: number of blood transfusions in postoperative period, hemoglobin levels at pre-admission assessment, at first and fourth day after surgery, allergic reactions and comfort/discomfort of the patient.
Results: In treated patients group the average of hemoglobin levels at the hospital admission was 12,5 g/dl. No difference between hemoglobin levels at pre-admission assessment and at hospital admission. The average hemoglobin levels at 4 weeks after surgery was 12,1 g/dl with delta 0,4 g/dl, only 1 patient received blood transfusion. Urticarial reaction and nausea after administration within 2 patients. In no treated patients group the average of hemoglobin level at the hospital admission was 13,1 g\dl , no discomfort of patient was recorded . The average hemoglobin level at 4 week after surgery was 11,2 g\dl with delta 1,9 g\dl. Four patient were transfused, six patients report discomfort in the treatment for ponv and clinical orthostatic hypostenia . Difference between two groups were statistically significant (p<0,001)
Discussion: Intravenous iron carbossymaltose infusion showed safety because not inducing important allergic reactions. Blood transfusion was administrated to 1 patient only, because his clinical comorbidities needed a higher threshold for blood transfusion (10 g/dl). The average of fall of postoperative hemoglobin levels was 2,7 g/dl. 4 weeks after surgery, hemoglobin levels were similar to basal levels (delta 0,4 g/dl), we evaluated that the outcome of patient were better than no treated patients.

O_04

A pre-operative community-based exercise programme for prostate and colorectal cancer patients: feasibility and preliminary effectiveness study

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Introduction: Low physical fitness predicts poor surgical outcome. Pre-operative exercise training optimises fitness. MedEx, a community-based exercise programme, represents a more scalable and sustainable alternative to hospital-based programmes. To our knowledge, this is the first time to investigate the feasibility and preliminary effectiveness of delivering a pre-operative community-based programme in Ireland.
Methods: Prostate and colorectal cancer patients scheduled for surgery referred from the Mater hospital to MedEx commenced the study within 2 – 7 days following diagnosis. Participants underwent baseline assessment to measure physical measures for lower limb strength (10 repetition sit-to-stand test); upper limb strength (handgrip test); cardiorespiratory fitness (6-minute time trial); flexibility (sit-and-reach test) and health related quality of life (HRQoL) (EQ-5D questionnaire). Participants undertook either a supervised exercise programme at MedEx or a home programme (for those living outside of Dublin). Exercise training was delivered in the time window available, included aerobic and resistance training using a range of exercise modalities, in 60 minute sessions, 3-5 days per week. Repeat assessments (within 1-week before surgery) were conducted.
Results: Thirty-seven (17 prostate and 20 colorectal) participants were recruited. For prostate participants, baseline mean (SD) age was 63 (7) years with a body mass index (BMI) of 28.9 (3.6) kg/m^2 and for colorectal participants (16 were male), 56 (12) years with a BMI of 30.3 (6.5) kg/m^2. Of these, 30

(16 prostate and 14 colorectal) completed the study and 7 were lost to follow up: 1 prostate due to change in treatment pathway and 6 colorectal due to work commitments (1), change in surgery date (4) and disease progression (1). Of the 30 that completed, 25 undertook the supervised programme at MedEx (13 prostate and 12 colorectal) and 5 the home programme, (3 prostate and 2 colorectal). The average duration of pre-operative exercise training was 3.5 weeks for prostate and 3 weeks for colorectal participants. Prostate participants attended 9 (5) sessions and colorectal 9 (10) (home-based exercise sessions were self-reported). There were no serious adverse events. Pre-operative exercise training resulted in improvements in physical fitness (although not all were statistically significant) and HRQoL. For physical measures in the prostate participants, from baseline to post-intervention/pre-surgery lower limb strength changed from 16.4 (6.4) sec vs. 14.4 (5.6) ($p<0.05$); upper limb strength 33(10) kg vs. 34 (9); cardiorespiratory fitness 705 (156) metres vs. 734 (149); and flexibility: 4 (13) cm vs. 6 (10). For colorectal participants: lower limb strength changed from 15.5 (5.7) sec vs. 14.1 (4.4); upper limb strength 33 (9) kg vs. 35 (9); cardiorespiratory fitness 785 (228) metres vs. 816 (249); and flexibility 7 (7) cm vs. 11 (7) ($p<0.05$). In addition, overall HRQoL in both prostate and colorectal participants significantly improved from baseline to post-intervention/pre-surgery: 71 (18) % vs. 77 (14) and 77 (15) vs. 87 (6.7); $p<0.05$.
Conclusion: Community-based pre-operative exercise training is feasible. Physical fitness levels and quality of life can be increased within short pre-operative time-windows. These data have informed the design of an adequately powered randomised controlled trial to investigate this in colorectal cancer.

O_05
The effect of prehabilitation on sarcopenia development during neoadjuvant chemotherapy for oesophagogastric cancer: A randomised controlled trial
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Introduction: Neoadjuvant chemotherapy (NAC) and surgery improves 5-year survival in patients with oesophagogastric (OG) cancer. NAC induces loss of skeletal muscle mass and function, leading to the development of sarcopenia (defined as >5% skeletal muscle (SM) loss in patients with a BMI of >20kg/m^2). This is a poor prognostic indicator of outcome. We assess whether a Prehabilitation programme (during NAC) results in a reduced rate of SM loss compared with 'standard care'.
Methods: A single-centre, randomised controlled trial was conducted in patients undergoing NAC for OG cancer. Patients were assigned to a 15-week prehabilitation programme comprising twice weekly supervised aerobic and resistance training and a thrice weekly home exercise plan (Prehab), or standard care (Control). Patients underwent CT imaging at baseline (week 0) and following NAC (week 10). Analysis was performed using Tomovision SliceOmatic software, with a single slice at the third lumbar vertebra. Height provided the skeletal muscle index (SMI, cm^2/m^2). Hand grip strength (HGS) using an analogue dynamometer at weeks 0 and 10 supplied functional outcome.
Results: Since December 2016, 46 patients have been recruited, with a 15% drop-out rate (7/46). All patients received NAC. To date, complete dataset is available for 29 subjects (Prehab n=16; Control n=13). Groups were matched for baseline demographics, SMI and HGS (p=ns): Mean SMI 53.71±10.15 cm^2/m^2 and HGS 46±11.13 kg at baseline. There was a weak correlation between baseline HGS and SMI (0.58). No difference was observed in the rate of sarcopenia development during NAC (Prehab 68.75% (11/16) vs. Control 69.23% (9/13); p=0.98), however there was a trend towards a smaller amount of skeletal muscle loss in Prehab subjects compared with Controls (-3.02±3.22 cm^2/m^2 vs. -5.28±3.00 cm^2/m^2; p=0.38). Similarly, NAC induced a trend towards lesser decline in mean HGS in the Prehab group versus Controls (-1.07±1.28 kg vs. -2.08±3.84 kg; p=0.25). A greater mean visceral fat loss was seen in the Prehab subjects compared with Controls (-16.04 vs -7.95; p=0.02).
Conclusion: Analysis to date demonstrates a non-significant trend towards preservation of muscle mass and HGS, and significantly more visceral fat loss in patients receiving Prehab during NAC. The full dataset will be available by June 2018.

O_06
Prehabilitation in total hip arthroplasty: personalized training for the at-risk elderly
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Introduction: Frail elderly are at risk for negative outcomes after total hip arthroplasty (THA) and may

profit from prehabilitation. However, training programs are often not adapted to the wishes and possibilities of these frail elderly. In the thesis "Optimization of physical functioning of patients before and after total hip arthroplasty" the aim was to investigate which patient related personal and environmental factors affect functioning before and after THA and to develop and evaluate a preoperative training program appropriate for at-risk elderly.
Methods: The thesis contains five published studies that were carried out by an embedded scientist in daily practice in a regional hospital (1). Current content and effectiveness of prehabilitation for THA was assessed with a systematic review. Regression analyses in a cohort of 315 patients was used to evaluate which people are at risk for short-term delayed recovery of functioning after THA (> 3 days to mobilize independently) (1,2). To get insight in motivations, personal meaning and context, a case study with a narrative analyzes of the stories of a patient, her physiotherapist and her daughter was performed (3). Furthermore, a pilot randomized controlled trial (RCT) was performed to study and develop the content of intensive supervised home-based prehabilitation adjusted to the abilities, preferences and environment of frail elderly (4).
Results: The 12 included studies in the review made clear that prehabilitation was not effective in THA and that information about adequate patient selection, content, dosing and monitoring were missing.In our cohort study, the combination of older age (>70 years), comorbidity and a poor functional mobility (Ten-meter Walk Test > 10,0 seconds and Timed up and go test > 10,5 seconds) was identified to predict delayed recovery of functioning (AUC 0.85, 95% CI 0.79-0.91). Furthermore, not obesity but the combination of muscle weakness (based on hand grip strength) and obesity was a predictor for delayed recovery. The case report helped us to clarify personal meaning and motivations of a patient in prehabilitation. Where the patient was mainly motivated to do enjoyable social activities and stay independent, the physiotherapist focused more on improving and evaluating functions and activities. In the pilot RCT, we reach a high intensity in the training without serious adverse events and with a good participation-rate of frail elderly (70%), high adherence to the supervised home-based sessions (99%) and high satisfaction. When compared to a former pilot RCT with an inpatient training program, participation rate was higher (70% vs 34%).
Conclusion: Taken together, these findings can be used to develop a personalized functional therapeutic exercise program for high-risk people, to be carried out in their own home and living context, with a content tailored to their personal abilities and goals to achieve the necessary therapeutic effect during prehabilitation. Such a program is feasible for even the frailest elderly and has the potential to optimize physical performance. The latter will have to be shown in a next clinical study.
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O_07
Prehabilitation for Women Undergoing Breast Cancer Surgery
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Introduction: Approximately 90% of women diagnosed with stage I-III breast cancer (BCa) undergo surgery. Although effective at disease management, surgery can result in lasting impairments that impact quality of life (QOL), including fatigue, upper quadrant dysfunction (UQD), and decreased levels of physical activity. While there is a compelling body of data to suggest that physically fit surgical candidates have better postoperative outcomes, the impact of structured prehabilitation prior to BCa surgery has received little attention. The purpose of this single-arm study is to assess the feasibility of a structured prehabilitation program prior to BCa surgery and to derive preliminary estimates of intervention efficacy on clinically relevant outcomes including QOL and functional walking capacity, which is a known predictor of surgical outcomes.
Methods: Thirty (n=30) women with BCa undergoing surgery at the Princess Margaret Cancer Centre are being recruited. All participants receive an individualized preoperative home-based exercise prescription, delivered via Registered Kinesiologist, focusing on aerobic exercise and upper quadrant-specific resistance and mobility training. Feasibility measures and estimates of intervention efficacy are collected at baseline, preoperatively, and at 6- and 12-weeks postoperatively and include: i) 6-minute walk distance (6MWD); ii) upper extremity strength via hand grip dynamometry; and iii) upper extremity range of motion via goniometry. Self-reported outcomes being collected include fatigue, pain, UQD, QOL, and physical activity levels.
Results: Our interim analysis is presented. Fourteen women have completed the prehabilitation program thus far. Over 12 months of recruitment, 36% of eligible patients have consented (n=20/55 approached).

A majority of patients underwent unilateral lumpectomy (64%) with a mean age of 55.5 ± 11.9 years. Average prehabilitation duration was 35 ± 20 days. 6MWD was 481.5 ± 67.2 metres at baseline and 520.7 ± 62.9 metres preoperatively (minimal clinically important diference for 6MWD is 20 to 25 meters). There were no intervention-related adverse events.
Conclusion: Preliminary results suggest that prehabilitation prior to BCa surgery is safe, feasible, and well accepted by patients. Early findings reveal that participants increase their functional capacity prior to surgery which is a known marker of surgical risk and outcomes.

O_08
Trimodal Prehabilitation Programme In Patients Awaiting Cardiac Transplantation: A Pilot Study
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Introduction: Heart transplantation (HT) is considered the only definite treatment for patients with terminal heart failure in whom conventional medical therapy has failed. Frailty and poor fitness powerfully predict morbidity, mortality, and healthcare utilization after transplantation. The limited exercise tolerance characteristic of these patients facilitates that many patients become frailer with diminished cardiorespiratory fitness while awaiting HT.
Prehabilitation programs that combine physical training, nutritional support and emotional reinforcement have been demonstrated effective in preventing postoperative complications in selected high risk surgical populations. Therefore, we proposed a pilot study to assess the feasibility and to evaluate the effects on the aerobic capacity and quality of life of a trimodal prehabilitation programme in patients listed for HT.
Methods: A multidisciplinary team approach was established with cardiologists, anaesthesiologists, anaesthetic nurses, cardiac surgeons, cardiorespiratory physiotherapists and psychologists. Patients recently listed for heart transplantation were proposed to join the programme.
The intervention consisted in: 1) An intensive 1 hourly 2 day/week of personalized supervised high-intensity interval training and strength training were performed for 8 weeks. 2) Promotion of physical activity and healthy lifestyles 3) Nutritional support 4) 1 weekly Mindfulness session. After the 8week programme, and while they were awaiting the HT, patients followed a mixed maintenance programme: ECG-monitorized home-based exercise and supervised 1 day/week until the heart transplantation. CPET (cardiopulmonary exercise testing), 6-MWT (six minute walking test), psychological and nutritional status evaluation were performed at baseline and after the 8 week programme was finalized.
Intraoperative and immediate post-operative outcomes (complications, hours of mechanical ventilation, length of stay in intensive care unit and in hospital) were recorded. A final assessment was performed after 3 months the transplantation.
Results: Five male patients were included from July 2017 to March 2018. Average age was 54 years (48-63) and average length of the prehabilitation programme was 241 days. Main results are shown in table 1. No adverse events were observed during the training (whether supervised or home-based). No significant arrhythmias were observed in the ECG monitoring device.
Conclusions: Patients showed a marked increase in cardiopulmonary function test and quality of life questionnaires. In fact, some of the patients could have been excluded from the waiting list due to improvement in oxygen consumption. Therefore, prehabilitation is feasible, safe and may be a promising tool to improve functional status in selected patients who could benefit from a delay in heart transplantation.
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	6-MWT (m) Baseline	**6-MWT (m) 8W**	$V0_{2\ peak}$ ($mL0_2$/Kg) Baseline	**$V0_{2\ peak}$ ($mL0_2$/Kg) 8W**	AT (mLO_2/Kg) Baseline	**AT (mLO_2/Kg) 8W**	MLHFQ Baseline	**MLHFQ 8w**
#1	410	**526**	14	**21**	NA	**14**	45	**35**
#2	440	**478**	10	**17**	NA	**10**	43	**21**
#3	494	**592**	17	**19**	11.2	**10.3**	28	**24**
#4	304	**NA**	7	**NA**	NA	**NA**	72	**NA**
#5	60	**370**	10.2	**9**	3.2	**6**	84	**85**

Table 1: Data of patients at baseline and after 8 weeks of intensive training period (8W). Abbreviations: $VO_{2\ peak}$: peak of oxygen consumption; AT: anaerobic threshold; MLHFQ: minnesota living with heart failure questionnaire

O_09

PROADAPT pilot trial: Prehabilitation & Rehabilitation in Oncogeriatrics: Adaptation to Deconditioning risk and Accompaniment of Patients' Trajectories

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With the conjunction of increased life expectancy and the increasing incidence of cancer with aging, older patient represent an increasing proportion of cancer patients. Increasing age is also associated with increased risk of co-morbidities as well as a decline of functional reserve of multiple organ systems, eventually leading in the context of the disease-and/or the treatment-related stress to functional deconditioning or organ failure.

Surgery or complex medico-surgical procedures can be considered as one proof-of principle of such risks, since major cancer surgery the older population is at higher risk of morbi-mortality and unplanned hospitalization for geriatric events1. In order to reduce complications after surgery, prehabilitation has often been considered, and 71% of the surgeons would accept a 4 weeks delay before surgery to improve patients' outcomes if shown to be beneficial. However, the actual level of evidence depends on the interventions: high for pre-operative nutrition, but low for physical exercise, due to heterogeneous programs with often bad adherence. In addition, geriatric validated interventions, in order to prevent iatrogenic event, may be added in a multi-interventional model of intervention.

PROADAPT is a standardized geriatric intervention that was co-constructed during an exploratory phase on a multi-professional and multi-disciplinary basis after a systematic analysis of published data. It consists in: 1) before surgery: a prehabilitation of the patients including a nutritional, physical and educational preparation; 2) during the hospitalization for surgery: an optimisation of their treatments through a pharmaceutical conciliation, educational interventions, standardization of surgical procedures and enhanced rehabilitation after surgery; 3) bridging and post-discharge interventions for hospital-to-home transition.

This intervention is based on a logic change model, constructed with litterature data and validated by an expert group through a DELPHI method : the rehabilitation model.

This intervention was designed to be implemented pragmatically in the centers according local habits and is currently being evaluated in several distinct hospital contexts under the name of "PROADAPT pilot study".

The purpose of this work is to present the preliminary data on 80 patients included in the study from June 2017 to March 2018, including patients' satisfaction, adherence to the program, quality of life. Moreover, a Delphi questionnaire has been sent to surgeons and geriatricians, in order to evaluate the acceptability of the program by the investigators.

Conclusion: In order to be implemented on a multicentric basis, the program will be simplified and integrated into a eHealth device (tablet), to be used by trained nurses, physicians as well as patients

(longitudinal assessement of patients' reported outcomes).

O_10

Predicting adverse postoperative outcomes in elderly patients undergoing surgery for colorectal cancer using the Dutch VMS-frailty instrument

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Introduction: Over 13.000 new cases of colorectal cancer (CRC) are diagnosed annually in The Netherlands.[1] Surgical resection is the only curative treatment option, but especially frail elderly patients are at risk for adverse outcomes which may outweigh the benefits of surgery. The first step in preventing adverse outcomes is to identify patients at risk. The Dutch Safety Management System (VeiligheidsManagementsSysteem, [VMS]) is a questionnaire focusing on the risk of delirium, falls, malnutrition and physical impairment that is used to identify vulnerable elderly at hospital admission.[2] We aimed to study whether VMS-frailty can predict adverse outcomes in elderly patients undergoing surgery for CRC.

Methods: All patients ≥70 years who underwent an elective resection for CRC between April 2015 and December 2017 in Gelre Hospitals Apeldoorn and Zutphen, The Netherlands, were retrospectively analysed. Patients with incomplete VMS data at hospital admission were excluded. Patients were considered frail if they were 70-79 years old with a VMS score≥3 or ≥80 years old with a score ≥1.[3] Preoperative risk factors including patient age, American Society of Anesthesiologists (ASA) classification (ASA III-IV vs. I-II), comorbidities (Charlson Comorbidity Index (CCI)≥2 vs. CCI 0-1), prevalence of anemia and location of tumor (colon vs. rectum), and postoperative outcomes were compared between frail and non-frail groups.

Results: 208 patients were included; 28 (13%) were frail. Frail patients were older (median age: 83 vs 75 years, p<0.001), had higher ASA-scores (ASA III-IV: 57% vs 26%, p<0.001), more comorbidities (CCI≥2: 36% vs 19%, p=0.043), and more pre-operative anemia (82% vs 43%, p<0.001). Colon cancer was more prevalent in the frail group (93% vs 58%, p=0.04). Frail patients had higher 30-day mortality (11% vs 2%, p=0.008), were more likely to be admitted for >2 weeks (28% vs 10%, p=0.011) and to be discharged to revalidation center, hospice or nursing home (16% vs 3%, p=0.006). Overall complications, serious complications, intensive care unit admissions, reoperations or 30-day and 3-month admissions did not differ between frail and non-frail groups. Patients who scored positive on the VMS-domain delirium more often developed postoperative delirium (17% vs 5%, p=0.008).

Conclusion: Frail patients operated for colorectal cancer have similar complication rates but a higher 30-day mortality, suggesting more failure-to-rescue. Functional decline, reflected by longer in-hospital admissions and more frequent discharge to other facilities than home, was more prevalent in the frail group. VMS has been developed to predict functional decline in elderly hospitalized patients, and our

results show that it can be of additional value in the preoperative risk assessment. Delirium screening can be used to predict increased risk of postoperative delirium. To what extent VMS-screening can be used for optimization of patient condition during admission and before surgery needs to be studied further.
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O_11

Effect of moderate versus high intensity exercise training on insulin sensitivity in colorectal cancer patients undergoing surgery

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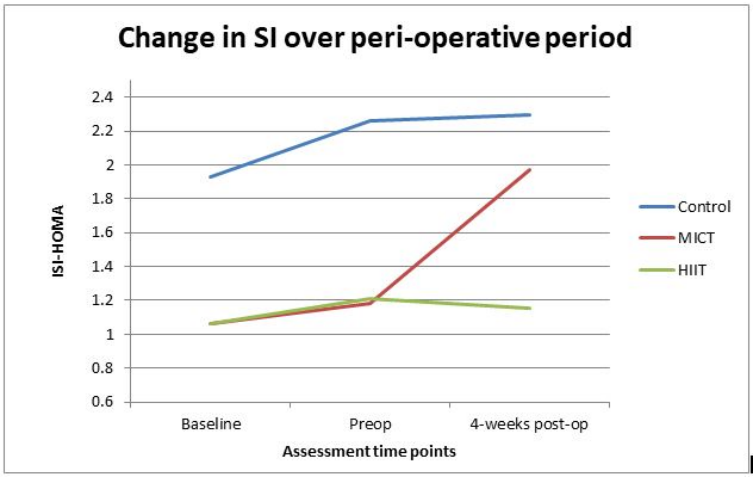
Background/Objective: Reduced insulin sensitivity (SI) and hyperglycemia are typical metabolic features associated with cancer itself and the surgical stress response. This phenomenon has a substantial impact on patients' recovery and outcome, where the degree of reduced SI is strongly associated with a greater risk for postoperative complications, increased length of hospital stay and an 18-fold increase in in-hospital mortality. Exercise has shown to be an effective strategy to improve SI in many clinical populations. Therefore, the goal is to determine whether a preoperative exercise program can improve SI prior to surgery and thus minimize the increase in postoperative insulin resistance (IR) in colorectal cancer patients. If so, what intensity of exercise elicits greater changes?
Methods: Forty-seven non-diabetic cancer patients scheduled for colorectal resection were recruited to participate in a preoperative multimodal program (prehabilitation) consisting of supervised exercise three times per week (aerobic and resistance training), nutritional counseling, protein supplementation and relaxation strategies. Patients were randomized to control (n=13), high-intensity interval training (HIIT) (n=17) or moderate intensity continuous training (MICT) (n=17). SI was measured at baseline, immediately prior to surgery and four weeks post-surgery by the homeostatic model assessment (ISI-HOMA) based on fasting insulin and glucose. Assessments also included anthropometric measurements and physical tests such as the six-minute walking test and cardiopulmonary exercise test.
Results: No significant changes were seen in mean pre-operative ISI-HOMA between each group, despite the performance of exercise. However, differences in ISI-HOMA were noted four-weeks post-operatively. The MICT group became 67% less SI 4-weeks post-surgery compared to the HIIT group that maintained pre-operative SI; MICT mean ISI-HOMA (SD) = 1.97 (2.07) vs. HIIT mean ISI-HOMA (SD) = 1.15 (0.44). The optimal cut-off score to define IR by HOMA was determined to be 1.22.
Conclusion: Surgery causes a dramatic decrease in SI, however, HIIT seems to have a protective effect on SI four weeks post-surgery. Patients in the MICT and control group were IR 4-weeks after surgery whereas patients in the HIIT group maintained their pre-operative SI levels.



O_12

Impact of an enhanced recovery program (ERP) on clinical outcomes and institutional costs in elective laparoscopic colorectal resections

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Introduction: To determine the impact on postoperative recovery and cost-effectiveness of a standardized enhanced recovery program (ERP) for colorectal surgery.

Methods:A prospective series of patients (N=100) undergoing elective colorectal resection completing a standardized ERP in 2013-2016 (ERP group) was compared to patients (N=100) operated on at the same academic hospital in 2009-2011 (Pre-ERP group), before the introduction of the ERP methodology. The exclusion criteria for both groups were: age>80 years old, ASA score IV, TNM stage IV, inflammatory bowel disease, and rectal cancer. The primary outcome was hospital length of stay which was used as a proxy of functional recovery. Secondary outcomes included: postoperative complications, 30-day readmission and mortality, nursing workload, cost-effectiveness, and factors predicting prolonged hospital stay. The ERP group patient satisfaction was also evaluated. Direct costs related to the preoperative phase and hospitalization, and implementation of the ERP were collected. Nursing workload was evaluated using the *Programme de Recherche en Nursing*(PRN). Data were analyzed by intention to treat, using chi-square, t-Student, Mann-Whitney, and log-rank tests. Cox regression analysis identified independent predictors of prolonged hospital length of stay.

Results: Age, gender, and BMI were comparable in-between groups. Outcome variables and institutional costs are shown in the table. Nursing workload was lower in the ERP group versus Pre-ERP group (P<0.001). After adjusting for potential confounders, following a conventional perioperative protocol was the only independent factor predicting a prolonged hospital LOS (P<0.001).

Conclusion: Implementing an ERP in elective colorectal surgery: 1) significantly reduced time to functional recovery and postoperative hospital length of stay; 2) did not increase morbidity, mortality, and 30-day readmissions; and 3) significantly decreased institutional costs and nursing workload.

Study funded by the Italian Ministry of Health.

Variables	Pre-ERP Group* (N=100)	ERP Group* (N=100)	P
Time to solid food (days)	5 (5-7)	3 (2-3)	< 0.001
Time to bowel movements (days)	5 (4-6)	3 (2-4)	< 0.001
Pain control on oral analgesic (days)	4 (3-5)	3 (3-4)	< 0.001
Postoperative complications (Clavien-Dindo) (N, %)			0.663
Grade I	3	7	
Grade II	22	26	
Grade IIIa	1	1	
Grade IIIb	1	1	
30 days mortality	0	0	
Hospital length of stay (days)	8 (7-9)	4 (4-5)	< 0.001
30 days re-admission (N, %)	6	3	0.498
Total institutional costs per patient† (€)	6.796,76 ± 1.381,34	5.339,05 ± 1.909,24	< 0.001

*Median (Interquartile range 25-75); †Mean ± Standard Deviation;

O_13

The effect of a physiotherapy prehabilitation programme on postoperative outcomes in patients undergoing Cardiac or thoracic surgery

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Introduction: Prehabilitation can be defined as: "the process of enhancing the functional capacity of the individual to enable him or her to withstand a stressful event" (Ditmyer, Topp and Pifer 2002). There is literature to support physiotherapy prehabilitation programmes for most surgical specialties. While there is emerging evidence in cardiothoracic surgery, studies exploring the physical aspect of prehabilitation have small sample sizes and mainly class-based (Furze et al 2008, Sawatzky et al 2014). The Golden Jubilee National Hospital is a national centre therefore classes would not be feasible. The aim is to determine whether a home-based physiotherapy prehabilitation programme improves patients' functional capacity prior to surgery (measured by 6-minute walk test (6MWT)) and improves postoperative outcomes.
Methods: On acceptance for surgery participants will be consented for the study. Following completion of initial 6MWT participants will be randomised into prehabilitation or standard care (SC).
The prehabilitation group will be provided with instructions in the use of a patient diary, pedometer, incentive spirometer and a home-based exercise programme including walking and simple breathing exercises. SC will receive standard preoperative physiotherapy information. 6MWT will be repeated on admission, discharge from physiotherapy and follow-up (6-8 weeks). Patients report their perceived health via EQ-5D-5L questionnaire on discharge.
Results: Cardiac: SC median physiotherapy length of stay (LOS) 6 compared with 4.5 days for the prehabilitation group and total hospital LOS 10 and 6.5 days respectively.
Participants in the Prehabilitation group also showed a higher reported EQ-5D-5L score: 77.5 versus 75.
Both groups showed an improvement in functional capacity with SC showing a slightly higher percentage increase from baseline to admission (8.28% versus 5.9%). SC also showed a higher percentage increase overall at follow-up (11.45% versus 2.53%).
Thoracic: SC median physiotherapy LOS 4 compared with 3 days for the prehabilitation group and total hospital LOS 8 and 5.5 days respectively.
Participants in the Prehabilitation group also showed a higher reported EQ-5D-5L score: 77.5 versus 67.5.
Both groups showed comparable increase in functional capacity from baseline to admission (8.5% SC versus 8.2%). Similar to the cardiac group, the SC group had a higher percentage overall increase in functional capacity from baseline to follow-up (13.1% versus 6.3%).
Conclusion: Physiotherapy prehabilitation may be the next step in revolutionising Enhanced Recovery in cardiothoracic surgery for patients to optimise their physical state preoperatively to improve postoperative outcomes. Although a small sample size initial results are encouraging with prehabilitation groups for both cardiac and thoracic showing a reduced physiotherapy and hospital LOS and higher EQ-5D-5L score.
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Furze G, Dumville J, Miles J, Irvine K, Thompson D, Lewin R. "Prehabilitation" prior to CABG surgery improves physical functioning and depression. International Journal of Cardiology 2009; 132: 51-58.
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O_15

Predictors of health-related quality of life 3 months after abdominal aortic aneurysm repair

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Introduction: Little is known about the determinants of health-related quality of life after abdominal aortic aneurysm (AAA) repair. This secondary analysis of trial data investigated predictors of physical, mental and general health status 3 months after the operation.
Methods: We evaluated 48 patients enrolled in a randomised controlled prehabilitation trial who completed preoperative and 3-month postoperative Short Form-36 (SF-36v2) and EuroQol-5D-5L (EQ-5D) health status surveys. Multiple linear regression was used to identify the significant independent predictors of the 3-month SF-36 physical and mental component summary (PCS and MCS, respectively)

and EQ-5D utility scores. Candidate predictors were age, comorbidity (yes/no), procedure (endovascular/open), length of hospital stay, preoperative anaerobic threshold, and exercise-based prehabilitation (yes/no). Prehabilitation consisted of thrice-weekly sessions of cycle-based interval training for 4 weeks.
Results: The mean age was 74 years (SD 6) and 94% were male. Twenty-seven participants (56%) underwent endovascular AAA repair, and 21 open AAA repair. The mean postoperative PCS score was 48.0 (SD 9.8), giving a mean decrease of 2.5 points from baseline (95% CI, -1.1 to 6.1; p=0.164). In multivariable analyses adjusting for preoperative PCS score, significant predictors of postoperative physical health status were length of hospital stay and prehabilitation (R^2=0.527, p<0.001). Participation in prehabilitation was associated with a 7.0-point higher PCS score at 3 months (95% CI, 1.4 to 12.5). The mean postoperative MCS score was 57.6 (SD 6.3); a mean increase of 1.7 points (95% CI, -0.4 to 3.7; p=0.114). There were no significant predictors of postoperative mental health status (besides preoperative MCS score). The mean postoperative EQ-5D utility score was 0.798 (SD 0.197); a mean decrease of 0.047 (95% CI, -0.004 to 0.098; p=0.068). Adjusting for preoperative EQ-5D utility score, the only independent predictor of postoperative general health status was length of hospital stay (R^2=0.368, p<0.001).
Conclusion: Participation in exercise-based prehabilitation was associated with a clinically meaningful improvement in physical health status 3 months after AAA repair.

O_16
In-hospital supervised and personalized exercise training leads to earlier functional recovery following colorectal resection for cancer
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Abstract: Multimodal prehabilitation has been shown to significantly improve preoperative and postoperative functional capacity in patients scheduled for colorectal cancer surgery.
Purpose
The purpose of this study was to determine whether qualified supervision, added to the usually prescribed home-based exercise program, accelerated the return to baseline functional capacity.
Methods: Data from two randomized control trials comparing prehabilitation with the rehabilitation of cancer patients scheduled for colorectal surgery were pooled for analysis. The intervention included a combination of exercise training, nutritional counseling, and protein supplementation together with relaxation techniques to be administered either before surgery (prehabilitation) or after surgery (rehabilitation). In both RCTs, patients received home-based exercise training, but patients of the second RCT received additional supervised exercise sessions either before or after surgery. Functional capacity was assessed with the 6-minute walk test (6MWT) at baseline, before surgery and at 4 and 8 weeks after surgery. Also, the number of patients returning to baseline functional capacity was calculated. Logistic regression was used to determine the role of improvement of the 6MWT.
Results: Perioperative supervised exercise training enhanced further functional capacity and muscle strength when compared with non supervised training (p<0.01). At 8-weeks postoperative follow-up the patients in the supervised group walked on average 30 meters more than baseline average. Irrespective of whether patients received prehabilitation or rehabilitation programs, those receiving exercise supervision had 2.3 times higher chance to return to baseline at 4 weeks after surgery. Exercise control together with prehabilitation was the best possible combination to return to the baseline levels of physical activity (4 weeks OR=5.06, and at 8 weeks OR=4.02).
Conclusion: Supervised exercise training as part of multimodal prehabilitation and rehabilitation programs in patients undergoing scheduled colorectal surgery leads to meaningful changes in functional capacity thus accelerating the postoperative return to baseline activities.

O_17
From waiting towards preparing: A qualitative feasibility study on cancer patients' perspectives on prehabilitation
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Introduction: Multimodal prehabilitation programs have the power to improve patients' functional capacity and make them fit for surgery. Currently, knowledge on patients' perspectives on prehabilitation is lacking. The patients' perspectives could contribute to the development of a patient-centered prehabilitation program that not only enhances functional capacity, but also is experienced as meaningful for the patients. Also, a patient-centered program could be beneficial in avoiding non-adherence. Thus, the aim of the present study was to investigate patients' perspectives on a predefined home-based multimodal prehabilitation program.
Methods: The feasibility study was developed in accordance with Medical Research Council's framework for complex interventions. 15 severely ill patients with peritoneal carcinomatosis from colorectal or ovarian origin undergoing cytoreductive surgery (CRS) +/- hyperthermic intraperitoneal chemotherapy (HIPEC) participated in a semi-structured interview in order to get an in-depth understanding of their perspectives. First, patients were asked about their experience of the preoperative period, as this gave an immediate indication of the feasibility of preparation in this period. Next, patients were presented to the first draft of a multimodal prehabilitation program to get their opinions. Malterud's principles of systematic text condensation were used to analyse data.
Results: The preoperative period was found feasible for preparation even though the period was partly characterized by fear. Actually, patients already seemed to be familiar with some kind of practical and physical preparation, though this was neither deliberate nor systematic. In general, patients had a positive attitude towards the idea of preparing, primarily because of the possibility to have an influence on recovery. Yet, they would not follow a prehabilitation program unconditionally, and barriers to completion were identified. These included *lack of influence, enjoyment, restrictions* and *everyday life.* Everyday life was of significant importance, as patients perceived it as meaningful to maintain everyday life activities during the preoperative period. If possible, patients continued to work, to do housekeeping, to see friends and family and to maintain leisure interests. This was also used as a strategy to avoid thinking too much of the upcoming surgery. A too structured and comprehensive prehabilitation program could affect patients' everyday lives and therefore challenge completion.
Conclusion: Patients' perspectives provided information of great value, especially as several barriers to a predefined program were identified. These barriers need to be taken into consideration when aiming to develop a patient-centered program that is experienced as meaningful and to maximise adherence. The findings demonstrate the complexity of developing a prehabilitation program that not only enhances the functional capacity, but also is experienced as meaningful for the patients and aligns with patients' everyday lives.

O_18
Fit4SurgeryTV: at-home prehabilitation for frail elderly undergoing colorectal cancer surgery
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Introduction: The preoperative period is a potential window of opportunity to optimise a patient's condition. Although frail elderly are known to be more prone to postoperative complications, they are often excluded or not capable of accomplishing a full prehabilitation program. The aim of this study was to assess the feasibility of an at home prehabilitation program specifically designed for frail elderly undergoing surgery for colorectal cancer.
Methods: The Fit4SurgeryTV program consisted of a daily elderly-adapted strength training workout (10 min), two protein-rich meals (2x40g) and a daily encouragement to get a reward in the end (visit to Zoo with grandchildren). Frail elderly patients (>70yrs, VMS>1 and/or ISAR-HP >2) scheduled for colorectal cancer were included. At baseline and one day prior to operation a physical assessment (hand grip strength, gait speed, short physical performance battery) was performed and quality of life was measured (EORTC-QLQ-C29/30). The program was defined feasible of 80% of the patients would be able to complete 70% of the program.
Results: Fourteen patients (median age 79, IQR 74-86) participated. The program (median duration 26, days, IQR 19-31) was defined feasible as patients followed the exercise program on average for 6/7 (86%) days and prepared the recipes 5/7 (71%) days. All of the patients preferred at home exercise and graded the overall program 8/10 (IQR 7-8). Physical performance trends were overall positive: the level of Fried

Frailty Score (+20%), Clinical Frailty Score (+0%), Hand Grip Strength (-1%), Gait Speed (+6%), Short Physical Performance Battery (+25%) and overall Quality of Life (+17%).

Discussion: This study illustrates that at home prehabilitation in frail elderly undergoing surgery for colorectal cancer is feasible. A simple digital program developed in collaboration with other parties and patients combined with positive enhancement can enhance a patient's own confidence and motivation to complete a prehabilitation program. As such, surgery can serve as a pivotal point in reverting frailty-inducing habits.