EASE-BE-FIT: Elder-Friendly Approaches to the Surgical Environment Bedside Reconditioning for Functional Improvements

An Innovative Reconditioning Program for Elderly Emergency Abdominal Surgery Patients

by

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Abstract

Introduction: Elderly individuals who are hospitalized due to emergency abdominal surgery spend on average over 80% of their recovery time in bed, resulting in early and rapid muscle loss. As these elderly individuals have a lower physiological reserve, the impact of muscle wasting on function may be profound. Rehabilitation interventions have the potential to attenuate declines in muscle loss and optimize function. Current practices following emergency abdominal surgery, however, place little emphasis on post-surgical rehabilitation.

Objectives: To examine the post-operative functional status of elderly abdominal surgery patients and to assess whether an independently led reconditioning program could increase patient physical function on discharge.

Methods: A controlled before and after study using a prospective cohort of patients aged ≥65 years enrolled in the Elder-Friendly Approaches to the Surgical Environment (EASE) study. Patient function was assessed using the 30-second Sit-To-Stand (STS) on post-operative day 2 (POD2) and at discharge. On admission, patients were classified with the Rockwood Clinical Frailty Scale. Control participants were compared to intervention participants who performed the reconditioning program every day until discharge.

Results: 72 patients with a mean age of 76.2 participated in the study. No significant differences were found in patient complication rates between the groups. Patients in the intervention group (n = 36) improved significantly more ($p=0.04$) than control participants (n =36), with a mean change of an additional 1.4 stands. Patients in the intervention group also spent an average of 2.1 days less in hospital than their control counterparts ($p = 0.03$).

Conclusions: An independently led reconditioning program appears effective in improving the functional outcomes of elderly emergency abdominal surgery patients. Future studies are needed to better assess patient adherence to self-directed exercise. Strategies to enhance patient support and increased supervision of exercise are likely to result in even greater physical functioning outcomes and potentially reducing overall healthcare costs.

Preface

This thesis is an original work by Alyssa McComb. The research project, of which this thesis is a part, received research ethics approval from the Human Research Ethics Boards of the University of Alberta (Pro00047180) under the parent study application entitled “Elder-Friendly Approaches to the Surgical Environment”, May 6, 2015.

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I: CHAPTER ONE

INTRODUCTION

I-1. REVIEW OF EMERGENCY ABDOMINAL SURGERY

Acute Care Surgery (ACS) is a surgical specialty that encompasses trauma and acute surgical conditions (e.g. appendicitis, gallbladder inflammation, gastrointestinal obstruction, perforation, and emergency cancer surgery), with the goal of providing rapid surgical evaluation and care. Routine hospital care is designed to address acute illness with expediency [1-5], with the main focus on discharge planning and moving the patient out of the hospital setting.

Currently, more than half of all surgical procedures are performed on seniors (over 65 years)[14-16]. With the growing and aging population in Canada, there is a concomitant increase in the number of seniors undergoing emergency surgery. Older persons requiring emergency surgery often present with baseline vulnerabilities, including co-existing chronic medical conditions, functional impairment, limited support, and a lower physiological reserve (i.e., reduced ability to respond to physiological stressors due to increasing age[70]) than younger patients[6]. Unfortunately, current hospital procedures and critical care pathways best address the care of individuals with single, acute illnesses rather than those afflicted with multiple acute and/or chronic conditions.

I-1.2. Considerations with Older Adults

As the human body ages, chronic disease frequently results in loss of function and independence, which creates a large burden on our healthcare system. Hospitalized elderly patients – specifically the frail elderly with multiple comorbidities and functional impairment – are known to have higher rates of adverse events and a greater likelihood of acquiring infections while in hospital than their younger counterparts. Adverse outcomes in these patients develop due to their vulnerabilities and the precipitating insults associated with surgery such as medications, catheters and bed rest that occur during hospitalization. The occurrence of adverse events often leads to longer hospital stays, a greater need for intensive care, greater resource expenditure, and an increased risk of mortality[8-13]. This places these elders at particularly high risk for resource dependency, which then leads to higher costs to the health care system.

Functional abilities are those necessary for independent living, and these abilities are often lost as a result of the long periods of bed rest that accompanies hospitalization. Moreover, approximately one third of hospitalized elderly patients will exhibit a decline in their ability to carry out activities of daily living (ADLs)[24], resulting in discharge to an institutional care facility[14-16].

I-2. REVIEW OF ACTIVITY RESTRICTIONS POST-OPERATION

The traditional approach to post-operative care has largely centralized around the necessity for bed rest and activity restrictions post-operatively to promote tissue healing[17] and reduce pain. The general view is that bed rest reduces the stress on the surgical region post-operatively, thus minimizing inflammation in the area and avoiding disruption of the healing process[17]. Thus, bed rest is seen to decrease the likelihood of surgical failure. While minimizing potential risks associated with the healing of the surgical site, bed rest correspondingly results in loss of muscle mass and deconditioning. For elderly patients, especially those close to the threshold for independent living, this negative impact may compromise independence.

Activity restrictions are often used to minimize the risk of increasing intra-abdominal pressures (IAP)[18]. IAP is the pressure generated within the thoracic cavity when performing activities and mechanical tasks, and high IAP is cited as a major cause of wound dehiscence[18]. For example, healing of abdominal fascia is only at 51-80% of its original tensile strength at six weeks post-operatively[17], thus risks associated with wound dehiscence are significant. While IAP has been studied during lifting tasks and in relation to certain thoraco-lumbar disorders, it is not known at what level the IAP results in dehiscence, with surgical type and location, movement performed, breathing state and the individual's age and health, all potential factors. Despite the lack of evidence, common restrictions include no lifting over 10-20lbs, and avoidance of strenuous activities, housework, and stair climbing. These post-operative guidelines are generally based on surgeon intuition, experience and anecdotal evidence; and as restrictions are vague, there are large inconsistencies in practices among surgeons[19].

Thus this creates a conundrum for health care practitioners, as the balance of benefit from bed rest and activity restrictions for healing of the elderly patient may be offset by the negative impact on overall function.

I-2.1. Exercise for Older Adults

Exercise, specifically resistance training, is a key component of a healthy lifestyle and is recognized for its role in managing symptoms and reducing the functional decline seen with aging[20]. According to the Centres for Disease Control and Prevention[21], exercise and physical activity offer many benefits to the older adult population in terms of health and chronic disease prevention. Resistance training leads to significant increases in strength, which is associated with improvements in function across the spectrum of debility in older adults[47].

The American College of Sports' Medicine emphasizes that exercise programs for elderly patients should involve a gradual progression of exercise over time[48]. Therefore, exercise presents as a potential intervention for elderly patients to prevent as well as address the functional decline that occurs following surgery and hospitalization. Despite the evidence supporting exercise, exercise participation among seniors is less than optimal, with over 45% of seniors aged 65 to 74 years, and over 55% of seniors aged 75 and older, reporting no participation in physical activity[22].

I-2.2. Barriers to Exercise

Older adults are fearful of excess mobility[22], especially within hospital settings where ambulation is not always encouraged[24]. In a survey regarding the motivators and barriers to in-hospital exercise, elderly patients reported barriers such as symptoms and fear of injury, along with institutional barriers that limited their willingness to perform activity while still in hospital[24]. Institutional barriers included lack of support and encouragement, tethers, lack of assistive devices and unfamiliar surroundings. In the same survey, motivators for in-hospital exercise included avoiding the negative effects of bed rest, improved well-being, promotion of functional recovery and exercise encouragement[24]. Thus strategies to address barriers and facilitators of exercise in the hospital setting are needed for elderly patients to allow for greater patient uptake and exercise adherence.

I-3. STATEMENT OF THE PROBLEM:

Current in-hospital post-operative practices are based around cautious prescriptions for exercise, especially in the frail elderly population[17]. While activity restrictions are in place to optimize tissue healing and patient safety, there is currently no consensus on the level of restriction necessary or even the activities that should be restricted. In the case of elderly patients, bed rest is not a viable option as evidence strongly supports its detrimental effects on physical function and independence[17]. For these reasons, innovative rehabilitation strategies are needed to optimize functional outcomes in elders undergoing acute care surgery[7]. Thus, the aim of this thesis was to develop and test an exercise program that considered tissue healing, patient safety, promoted self-management, and was resource neutral in terms of the workload impact of already busy hospital staff.

Research Question

Will the implementation of an independent patient-led reconditioning program for elderly emergency abdominal surgery patients prove safe and effective in reducing the loss of functional decline, the new loss of independence in activities of daily living (ADLs)[32], due to hospitalization? And will it further reduce the overall length of stay and complication rate?

I-4. HYPOTHESIS:

The primary hypothesis was that a post-operative reconditioning program would be safe, well-tolerated and improve functional outcomes, such as the Sit-to-Stand (STS), in older emergency abdominal surgery patients.

The secondary hypothesis was that the post-operative reconditioning program would decrease length of stay and decrease surgical complications in older emergency abdominal surgery patients.

I-5. DEFINITIONS:

ACS…………………………………………………………....Acute Care Surgery

Acute Care Surgery is defined as the urgent assessment and treatment of non-trauma general surgical emergencies involving adults[28].

ADL…………………………………………………..Activities of Daily Living

A set of basic self-care tasks that are seen as necessary for independent living[32].

AIHS……………………………………………..Alberta Innovates Health Solutions

Dehiscence…………………………………………………………………………

A surgical complication in which the wound ruptures along the surgical incision.

EASE…………………....Elder-Friendly Approaches to the Surgical Environment

IAP……………………………………………………Intra-Abdominal Pressure

Pressures found within the closed anatomic volume of the abdominal cavity, which if increased, may lead to physiological changes and organ dysfunction[29].

MCID………………………………..….Minimal Clinically Important Difference

Physiological Reserve………………………………………………………………

The biological systems of the human body's ability to respond to environmental physiological stressors[70]

POD……………………………………………...……….Post-Operative Day

PRIHS………………….…..Partnership for Research and Innovation in Health System

STS…………………………………………………………………....Sit-To-Stand

A measurement used to assess functional lower extremity strength in older adults[30].

TUG…………………………………………………………Timed-Up-And-Go

A measurement test of basic mobility skills often used in frail elderly populations[31].

I-6. LIMITATIONS:

A limitation of this study was the inability to randomize individual participants to intervention and control groups; however, randomization based on the time of intake was used to minimize the risk of bias associated with non-random assignment. A further limitation was the patient self-directed program. The self-directed design of the exercise program was meant to negate any extra work needed by the hospital staff, thus exercise performance and adherence were uncontrolled. We aimed to minimize this effect by creating a self-reported logbook that allowed patients to record details about their exercise sessions.

The use of the 30-second STS test is also a limitation as normally a timed 5 repetition STS is used. However, as it was likely that some patients would be unable to complete the required 5 stands, the 30-second test was chosen to allow every patient to receive a score[33].

The TUG test is also not the gold criterion standard, and was used in place of the 6-minute walk test as it was deemed that not all patients would likely be able to walk for 6 minutes. Thus, the TUG allows for a broader range of abilities among patients and all were able to receive a standardized score[33].

I-7. ETHICAL CONSIDERATIONS:

The Human Research Ethics Boards of the University of Alberta granted ethics approval (Pro00047180) under the parent study application entitled “Elder-Friendly Approaches to the Surgical Environment” on May 6, 2016. Subjects were asked to sign a consent form, which outlined the right to withdraw, confidentiality, and the risks and benefits involved in the study [See Appendix A]. Non-participation in this study did not affect the accessibility to care and treatment at the University of Alberta Hospital in Edmonton. Medical personnel were present for testing. Tests were terminated if the subject reported dizziness, excessive fatigue, or pain. Patients were free to rest during the test if required. Tests were also not conducted if physician concerns were identified. Patients were free to withdraw from the study at any time; all personal and medical information were kept anonymous. Although, the exercises in the reconditioning program were designed to minimize risks, patients were not required to complete any exercise or study test component that made them feel uncomfortable or unsafe.

II: CHAPTER TWO

LITERATURE REVIEW

II-1. ACUTE ABDOMINAL SURGERY IN OLDER ADULTS

As the average life expectancy increases, the number of geriatric patients who need emergency abdominal surgery will also increase. Emergency abdominal surgery is also associated with increased morbidity and mortality when compared to elective surgery, especially in elderly patients[34] who may be at risk for severe and life-threatening conditions because of medical comorbidities, insufficient screening, unrecognized symptoms and inadequate access to health care[34]. Major surgery has been shown to produce a catabolic stress response that reduces protein synthesis and a reduction of lean tissue mass. As a result, functional performance after surgery in elderly patients declines, and a large proportion of these patients do not regain their previous level of function[35].

Older adults admitted to hospital for acute medical conditions experience a deterioration of their functional status (ability to perform ADLs) even though their medical status improves[36]. The effects of hospitalization and bed rest are observed in a majority of patients; however, the effect on older adults is especially great due to decreased physiological and functional reserve that renders them vulnerable to the effects of bed rest. Loss of muscle strength during bed rest has been estimated to be 5% per day[36], and is seen particularly in the lower limbs and extensor muscle groups, which in turn, leads to a loss of aerobic power and endurance. Muscular power and endurance are both essential in the performance of ADL's, specifically tasks such as standing from a chair and mobilizing. Thus the medical treatments, such as surgery, used to resolve their illness or disease places them at risk of losing their functional independence[20].

In a multicenter study of older adults admitted to a hospital for medical illness, 59% of patients became dependent on others to walk across a room, with a further 15% of patients unable to walk across even a small room[37]. While walking is only one of the necessary activities of daily living (ADL), 65% of patients experience a decline in their ADLs (transferring, toileting, feeding, mobility and grooming) by the second day of hospitalization and a further 10% decline by discharge day[38]. Of older adults who were ambulatory prior to a major operation, 20-44% required discharge to a care facility before returning home[15], and even if declines were reversible, lengthy rehabilitation was often needed to regain their functional status[9]. de Morton[39] hypothesized that if older patients exercised more during their hospital stay, they may not lose as much function.

More than one-half of all operations performed in the United States are on patients 65 years of age and older. Frailty describes the physiologic vulnerability that is unique to the geriatric population and is defined as a state of reduced physiologic reserve associated with increased susceptibility to disability[15]. By definition, frailty suggests potential for poor health care outcomes. With an aging population, understanding the relationship of frailty to surgical outcomes is becoming increasingly important[15]. Physiological reserve is diminished in the elderly, with morbidity rates as high at 48% in those undergoing emergency surgery for intra-abdominal disorders[34]. The physiological decline is a feature of normal human aging and takes place in all organ systems at a rate of ~1% decline in function per year after 40 years of age[40]. This reduced organ reserve, limits the individual's physiological response to stressors, including acute illness, anaesthesia and surgery. The functional decline of the cardiovascular, respiratory, renal, central nervous, haematological/immunological and musculoskeletal systems is of greatest concern peri-operatively, and may influence outcome from elective or emergency surgery[40]. Further functional decline of older adults admitted for acute medical care has been noted, leading to extended lengths of hospital stay, more frequent hospital readmissions and the need for discharge to care facilities[15].

Aging is also characterized by a general decline in muscle volume and function, with the greatest declines occurring after 70 years of age, that combined with skeletal changes, increases the likelihood of fragility and impaired rehabilitation following surgery[40]. Surgery induces an inflammatory response in all individuals that is characterized by a rapid increase in inflammatory markers, which in turn, exacerbate the degree of muscle wasting[41]. For the elderly individual the muscle wasting leads to reduced muscle performance and increased fatigue up to one-month post-operatively[41]. Although elderly patients may recover from the illnesses that precipitated hospitalization, they are often less independent and require a higher level of care upon discharge[27].

II-2. POST-OPERATIVE ACTIVITY RESTRICTIONS

Traditional post-operative care is usually centralized around the necessity of bed rest to promote post-operative healing and decrease the likelihood of surgical failure, while this might be helpful in controlling pain and fatigue, the role of activity versus rest for optimizing healing has often been debated[17]. Historically, clinicians believed that bed rest was vital in that using the injured area too soon after surgery would increase inflammation and disrupt the repair process of the tissue, thus preventing healing[17]. Collagen begins to appear on the wound at the second day post-surgery, with maximum synthesis occurring on day five, but the fascia is slow to heal and only reaches 51-80% of its original tensile strength by six weeks post surgery[42]. This creates a dilemma for surgeons, as they know that the surgical wound is weak for a significant period of time after surgery, but the extent of forces that might compromise the wound in a given patient are not known. Therefore, in an attempt to minimize risk surgeons most often prescribed activity restrictions including bed rest[42].

Post-operative guidelines are based on surgical intuition and anecdotal evidence about which activities have the possibility of raising IAP to the extent of dehiscence. However, there are still large inconsistencies among surgical specialists, with physician-recommended activity restrictions ranging from 1-50 pounds and over a time period of between 1-104 weeks in duration[19]. Common restricted activities including lifting more than 10-20 pounds, exercise, strenuous activities, housework and stair climbing[18]. Nygaard et al[17] summarized the literature that measured the increases in IAP with specific activities. They noted that the range in pressures during specific activities is large (over 300mmHg between individuals) and vary among individuals, with little concordance across studies, and that the pressures measured in restricted and non-restricted activities often overlap considerably[17]. Simple adjustments in starting positions of activities were found to affect the overall pressure created[18], which may allow for modifications to improve safety in previously restricted activities. With this knowledge, Guttormson[18] recommended that patients may be able to resume normal activities as tolerated.

Most clinicians are aware that there is more than just physiology affecting the resistance to mobilize patients post-operatively[24]. Patients report perceived and real barriers to ambulation following surgery. Forty-three percent of patients in a study investigating barriers to ambulation mentioned institutional barriers to mobilization, including lack of support from nurses and doctors, feeling tethered to machinery, active discouragement, lacking mobility supports or feeling that the environment was unfamiliar[24]. Participants also feared the risk of injury, falling and myocardial infarction when asked about mobility barriers, but the largest impact was that often participants did not expect to be moving or exercising while in the hospital and only one quarter of patients were advised by their surgeon to exercise[24]. Therefore, to have any real impact on healthcare practices, strategies are needed to promote the benefits of movement and exercise to patients, and to better understand the barriers faced by healthcare practitioners caring for the patient.

II-3. EXERCISE BENEFITS

Though the effect of exercise interventions in virtually all medical fields has been noted, there is currently no research on the effects of exercise for elderly patients recovering from acute abdominal surgery. While exercise has been studied in the younger post-operative population, more often than not, older adults are often placed on bed rest as a precaution due to their reduced physical function. In-hospital physiotherapists and occupational therapists are responsible for mobilization of the patient with interventions such as bed exercises, ambulation, transfer and balance retraining[35]. There is growing evidence that among the elderly, exercise needs to be more specific and intensive to counteract the effects of immobilization and to attenuate the surgery-related decreases in muscle strength[35].

To date, there are very few studies that have investigated the effect of intensive strengthening in the early acute post-operative phase (none concerning the elderly population). Previous studies have initiated exercise training 2-weeks post-surgery and noted no complications, but knowing the detrimental effects of surgery on muscle tissues during the first weeks of immobilization, it is likely that the initiation of a training program as soon as possible post-operatively is ideal[31].

More recent research following orthopaedic and other surgeries has found that controlled, early resumption of activity promotes the restoration of function whereas prolonged bed rest delays the recovery process[17] and predisposes the individual to further complications[42]. Munin et al[43] also studied the effect of an exercise intervention 3 days post-operatively in elective knee and hip arthroplasty older adult patients. They found that transfers, ambulation, walking distance and stair climbing scores were all greater in the exercise group. As well, the exercise group was able to tolerate and benefit from the early, intensive rehabilitation without increasing their rate of complications[43]. In a review by Suetta et al[35] benefit was found from post-operative exercise training in attenuating the decline in function among elderly patients.

Early mobilization is widely practiced and is an important component of post-operative care following abdominal surgery, however, there is no standard definition of early mobilization and, as such, interventions may include moving in bed, sitting upright, standing, ambulating and low intensity exercise[44]. There is also a strong negative correlation between uptime (amount of time spent sitting or out of bed) during the first four post-operative days and length of stay[44], with early mobilization contributing to positive outcomes such as a reduction in post-operative loss of muscle mass[45].

Jones et al[46], created an exercise program for hospitalized elderly that was designed to be carried out in an acute care setting. The exercise intervention focused on strength, balance and functional exercises, whereas usual in-hospital care is weighted more heavily on discharge planning[46]. The program led to a reduced length of stay and reduced readmission rates. Jones stressed the need for patient education and the introduction of a nurse care programme that requires early mobilization of patients[46].

While performing the literature review prior to initiating this thesis research, the established clinically relevant fitness standards for maintaining physical independence in older adults were found[29]. These standards were created to predict the level of functional capacity needed for maintaining independence in the later years of life. As the goal of this study was to attempt to increase our patients' functionality upon leaving the hospital, we investigated whether our patients' were leaving the hospital having met this criterion level of functional fitness.

II-4. FRAILTY SCALES

Frailty is one of the greatest health burdens placed on our elderly population. Frailty is a condition of reduced resistance to stressors, due to age-associated declines in physiological reserves, which may lead to adverse health outcomes, such as mortality, hospitalization, and falls[72]. There are two widely used frailty measures, the Rockwood Clinical Frailty Scale[63] and the Fried Frailty Phenotype[71].

The Rockwood Clinical Frailty Scale is an effective measure of frailty and is used to assess the degree of fitness and frailty in an older patient. The scale integrates measures of function, morbidity and central nervous system impairments[72]. The Clinical Frailty Scale has been found to provide predictive information about the individuals' ability to perform ADLs[63]. The frailty scale is also easy to read and administer in a clinical setting, however it does require subjective assessment and judgement by the clinician[63], therefore there are significant inter-rater reliability issues in scoring.

The Fried Frailty Phenotype defines frailty as a distinct clinical syndrome that is synonymous with disability, comorbidity, or advanced old age[71]. Frailty markers were created based on observed individual clinical characteristics : 1) weight loss, 2) poor aerobic endurance, 3) slowness, 4) low levels of physical activity, and 5) muscular weakness[71-72], these markers were used to create a unified cycle of frailty. The elements of this cycle are defined as clinical symptoms of frailty, where declines and imbalance in some organ systems cause a loss in ability to withstand stressors to the physiological system[71].

II-5. SIT-TO-STAND

Transitional movements such as rising from sitting is among the most common functional movements that are carried out in daily living[49] and proficiency in performing this task has been found to be a determinant to functional independence in older adults. The Sit-To-Stand (STS) test was first introduced as an outcome measure for determining lower limb muscle strength[50] and has been widely adopted by health care professionals working with the older adults. While lower limb muscle strength is an important contributor to mobility[51], the STS reflects more than just strength, STS performance in older adults is also affected by and an indicator of balance, sensorimotor and psychological factors[52].

The STS is simple to administer and does not require specialized equipment or training[53]. The sole requirement for the test is dependent upon the influence of chair height, as the height of the chair greatly changes the effort required to rise from the chair. Therefore, a chair of constant height should be used with repeated testing of individuals and when comparing to reference values[51]. Standardized procedures include a chair seat height of 44cm tall, slightly padded and positioning of the back of the chair against the wall for stability[51]. Patients should also attempt to perform the test without the use of upper extremities to minimize use of the arms as compensation for inadequate leg strength.

The STS test has shown to be a good field predictor of lower-body strength in older adults, it is effective in detecting age-related declines in function and in detecting exercise effects in frail populations and those with special conditions, including hospital patients[33]; all of which support the criterion and construct validity of the STS. The STS has also shown excellent reliability and moderate responsiveness in an inpatient rehabilitation setting[54]. The current minimally clinically important difference in 2.1, which was found in geriatric hip osteoarthritis patients[30].

II-6. TIMED-UP-AND-GO

The Timed Up and Go (TUG) is a test of basic mobility and reflects the ability of the individual to transfer from sitting to standing and to walk a short distance[55], both vital components to independence. Recent studies have found that the TUG test can reflect multidimensional clinical deficits related to frailty in older patients, including cognitive function and mobility. These studies show a strong correlation between a greater TUG test score and poorer health, worse functional status, impaired cognition, and falls[55-56]. Compared with the standardized two-minute walk test (2MWT), the TUG is more applicable to the senior clinical population as it provides the clinician with information about a patient's ability to transfer from a chair and walk a short distance, which is important for decisions about the patients' safety for hospital discharge. The TUG test is also shorter in length to administer and less fatiguing then the 2MWT[55], making it more convenient and feasible for the elderly patient population.

In similar rehabilitation settings, the TUG has shown great responsiveness to rehabilitation interventions that occur between hospital admission and discharge[55]. Compared with the 2MWT and the functional reach test, the TUG had greater responsiveness to rehabilitation interventions[55]. Patients with slower TUG scores were found to have higher rates of post-operative complications and 30-day readmissions, increased incidence of discharge to an institutional care facility, and higher one-year post-operative mortality[56], regardless of the surgical procedure that was performed.

The TUG is related to the Berg Balance Scale, gait speed and Barthel Index of ADL's. Performance on the TUG can also discriminate between various functional categories in older adults and is responsive the changes in physical activity levels, supporting the validity of this test[33]. The TUG has also shown excellent reliability and discriminant validity in the older adults' population, proving to be one of the most suitable measures for evaluating functional balance and mobility in older adults[57].

III: CHAPTER THREE

METHODS AND PROCEDURES

III-1. SUBJECTS

Participants were consecutively enrolled elderly patients (> 65 years) who had been referred to Acute Care Surgery (ACS) services for emergency abdominal surgery at the University of Alberta Hospital in Edmonton. Every effort was made to consent patients during their hospital stay up to 2 days post-operatively, with the goal of consenting, if possible at the time of admission. The research coordinator obtained consent from the patients after explaining the study purpose. Patients were advised that they could withdraw from the study at any time. When a patient withdrew, research follow-up was discontinued. As the research team was not directly involved in patient care, there was no disruption to their clinical course.

III-2. INCLUSION/EXCLUSION CRITERIA

Participants were included if they: 1) were greater than 64 years old referred to the ACS for acute abdominal surgery; or 2) index admission (i.e. intra-hospital unit transfers excluded)

Participants were excluded if they: 1) underwent elective general surgery; 2) underwent non-abdominal emergency surgery (example: rectal prolapse); 3) received palliative surgery (surgery with the primary intention of improving quality of life or relieving symptoms caused by advancing non-curative disease); 4) experienced trauma; 5) were elderly patients residing in nursing home and requiring full nursing care (i.e. dependency in 3 or more ADLs); 6) were patients from out of province or transferred from another inpatient service; or 7) were re-admitted, and had already been approached for the study at a previous admission and refused, or were already a participant in the EASE (Elder-friendly Approaches to the Surgical Environment) study.

III-3. SAMPLE SIZE

The sample size was calculated based on the few normative values currently published in scientific literature, along with the established minimal clinically important difference scores (2.6 stands in the STS[58] and 3.5 seconds in the TUG[59]) (See Appendix D[57]). For a statistical significance of p=0.05, a power value of 0.80 and a standard deviation of 2.3, the necessary value for the STS tests was based on the mean and standard deviation values normalized by Jones et a1[3] on community dwelling older adults, suggesting a minimum sample size of 11. For the TUG, using mean and standard deviation scores normalized by Steffen et al[62], a sample size of 30 is suggested. We therefore enrolled 72 patients (36 pre-EASE and 36 post-EASE) to increase the power of our study.

III-4. STUDY DESIGN

This study was a prospective controlled before-after trial to determine the outcome and uptake of a post-operative reconditioning program on an older adult population. This study was incorporated into the ongoing EASE study – a prospective before-after study, currently supported by Alberta Innovates Health Solutions (AIHS)-Partnership for Research and Innovation in Health System (PRIHS) 3-year grant to assess the implementation of an elder-friendly surgical unit [See Appendix B]. The first 36 participants were allocated to the control intervention (standard care) with the subsequent 36 participants to the intervention group. All elderly patients (≥ 65 years old) referred to the Acute Care Surgery service were screened for eligibility, as part of the EASE Study.

The objective of EASE- Bedside Reconditioning for Functioning Improvements (EASE-BE-FIT) was to implement a specialized reconditioning program for elderly patients who have received acute abdominal surgery. A targeted, functional program that patients can perform independently at their bedside was implemented, beginning immediately post-operatively.

Functional tests (STS) were performed as soon as possible (day 2 post-operation) and immediately prior to discharge in our control group. The intervention group received the reconditioning program and performed the exercises between the two STS tests (POD2 and discharge). Delta change scores between the two groups were compared. As well, a TUG was performed at a 6-week follow up period to compare scores between the two groups and within groups.

III-5. INTERVENTION

The reconditioning program components are based on the American College of Sports Medicine's (ACSM) recommendations for training the frail elderly population[48], and was designed with input from the pre-existing hospital occupational and physical therapists [See Appendix H-J]. Patients were classified to a specific training program based on their ranking on the Rockwood Clinical Frailty Scale [See Appendix C].

There was a gradual progression of exercises, with the intention to increase physical activity across their inpatient stay. The exercises targeted strength, balance and functional exercises, a regimen considered to be more elder-friendly than the usual in-hospital physiotherapy, which weighs more heavily on discharge planning[46].

Several programs of varying difficulty were available and patients were assigned to a specific exercise level, based on their pre-existing frailty (assessed using the reliable and validated Rockwood Clinical Frailty Scale[63]). Patient frailty was classified upon admittance when the research coordinator met with the patient. Patients classified as level 1 or 2 (Very Fit or Well) performed Level 3 of our program, patients classified as level 3 or 4 (Managing Well or Vulnerable) performed Level 2, and patients classified as level 5 or 6 (Mildly Frail and Moderately Frail) performed Level 1 of our program.

A kinesiologist instructed patients in the exercises in the first session, to ensure the exercises were being done correctly and safely. After this single education session, the program was then completely patient self-directed. The kinesiologist monitored compliance, and if necessary, was available to re-teach to ensure safety.

Our study was based around the progressive use of multi-disciplinary teams within Alberta's Health Care system. The goal of the program was to provide a uniform transitional program that all members of the health care team would be knowledgeable about, and comfortable using. The program was designed with input from exercise physiologists, physical therapists, occupational therapists and surgeons, and the program was implemented with help from the health care team including hospital health care aides, nurses, and rehabilitation assistants. The primary outcome was physical functioning, as measured STS and TUG tests.

III-6. DATA COLLECTION

III-6.1. Variables

The primary dependent variable was the physical functioning ability of the patients. For the purpose of this study, functional ability was measured as the primary outcome measure using the STS and TUG. Patients were considered to have improved their level of function if they increased their STS scores between implementation of the reconditioning program and prior to discharge. Patients were also considered to have increased their level of function if the intervention group who received the reconditioning program had lower TUG scores then their control counterparts.

The independent variable in this study is the use of the reconditioning program. Current standard care includes some physical and occupational therapy; however, our program will be implemented in addition to usual care to promote self-management by patients. Patients were classified to either control or intervention group depending on the time they were admitted to the hospital (and at which stage of the study their surgical procedure was performed). Patients in the control group were enrolled between June 2015 and October 2015, while patients in the intervention group were admitted between November 2015 and June 2016.

III-6.2. Confounding Variables

The kinesiologist determined the patients' level of pre-surgical status based on the assigned frailty classification at the beginning of the study. Patient use of the program is self-determined. The kinesiologist was responsible for overseeing the patients' uptake of the program and the level of daily commitment by the patients.

III-6.3. Demographic Information

Type and time of surgery, gender, age, and frailty classification were recorded. Initial demographic and medical information was obtained from the hospital medical charts.

III-7. OUTCOME MEASURES

III-7.1. Feasibility

As this study is one of the first of its nature, the primary hypothesis was that a post-operative reconditioning program would be safe and well tolerated by our patients. We wanted to ensure patients were able to safely perform the testing and reconditioning program without adverse events, while maximizing the benefits of exercise.

III-7.2. Sit-To-Stand

The STS test is a measurement used to assess functional lower extremity strength in older adults[30]. The test was developed to overcome the floor effect of the 5 repetition STS in older adults, as many elderly patients were deemed unable to complete even 1 STS. The STS test is administered using a chair with armrests and a seat height of 17 inches (~44cm). The chair, with rubber tips on the legs, is placed against a wall to prevent it from sliding and affecting the patients' performance.

For the test, the participant is seated in the middle of the chair, back straight; feet approximately shoulder width apart and placed on the floor at an angle slightly back from the knees, with one foot slightly in front of the other to help maintain balance. Arms are crossed at the wrists and held against the chest, unless the patient is unable to stand without the use of arms, in which case the patient performs the test while using their arms and the score is calculated as number of stands without arms/number of total stands. Patients were able to hold a pillow/blanket against their incision to minimize the increase in intra-abdominal pressure if necessary. The tester demonstrated the task if the patient required further instruction. The patient was allowed to practice a repetition or two before completing the test.

At the signal "go," the participant rises to a full stand (body erect and straight) and then returns back to the initial seated position. The participant is encouraged to complete as many full stands as possible within 30 seconds. The participant is instructed to sit completely between each stand.

While monitoring the participant's performance to ensure proper form, the tester silently counts the completion of each correct stand. The score is the total number of stands within 30 seconds (more than halfway up at the end of 30 seconds counts as a full stand). Incorrectly executed stands are not counted. The 30-second chair stand involves recording the number of stands a person can complete in 30 seconds. That way, it is possible to assess a wide variety of ability levels with scores ranging from 0 for those who cannot complete even 1 sit-to-stand to greater then 20 for more fit individuals.

III-7.3. Secondary Outcomes

Secondary outcomes included pre-EASE versus post-EASE comparison of admission and discharge disposition (captured via prospective chart review and patient follow up as administered through the parent EASE study), complication rates, length of stay, TUG and monitoring of adverse events.

Gastrointestinal complications were defined as: 1) diarrhea, 2) high output ostomy, 3) ileus, 4) bowel obstruction, 5) vomiting, 6) anastomotic bleed, 7) abdominal compartment syndrome, 8) gastrointestinal bleeding, 9) hepatic dysfunction, or 10) pancreatitis.

Adverse events were also included in analysis, to assess whether the program was safe to perform in hospital. Adverse events were described as i) any falls at any time during the patient hospital stay and ii) wound dehiscence during the recovery period.

III-7.4. Timed-Up-And-Go

The TUG is a functional measure used to assess mobility, balance, walking ability and fall risk in older adults. It is commonly used to determine whether a patient is able to be functionally independent in everyday life as it encompasses the most crucial aspects of the activities of daily living[64].

The patient is instructed to sit in a standardized chair (seat height of 44cm) with their back against the back of the chair and hands on their thighs. At the command of "go", the patient rises from the chair, walks 3 meters at a comfortable and safe pace, turns around a marker/cone and walks back to the chair to sit down. Timing begins at the instruction to start and stops when the patient returns to the seated position. Patients were able to use a practice trial if needed and the patient used the same assistive device each time they were tested to allow for comparison of scores.

III-7.5. Logbooks

Logbooks were created (see APPENDIX K-N) in attempt to monitor exercise adherence and as a strategy to promote exercise uptake. We chose to create a visual logbook, in hopes to minimize any effects on patients with limited vision or those with a possible language barrier.

The logbook was explained to the patient during the initial POD2 assessment. To complete the logbook, patients were required to mark in their logbooks the number of times the exercise regimen was performed during each day. Additional questions were added at the bottom of the logbook for the knowledge of the investigator. These questions were focused on whether the exercises were too easy or too hard, if exercises were painful or if the patients had any further comments about the reconditioning program and its implementation.

III-8. PROCEDURES

The study was conducted at the University of Alberta Hospital in Edmonton. The research coordinator or surgeon approached the patients the day after their surgery if they met the inclusion/exclusion criteria. Patients were only admitted to the study after receiving detailed instructions about the study and what it entailed, and signing an informed consent form. On the second post-operative day, the kinesiologist met with the patient to perform their first STS test, following informed consent. Patients assigned to the control group were then seen again on their day of discharge to perform the STS once more.

For patients assigned to the intervention group, the kinesiologist would classified them based on the Rockwood Clinical Frailty Scale [See Appendix C] and assign the appropriate reconditioning program. The kinesiologist would then teach the exercises to the patient and ensure the exercise was being performed correctly and safely. The patient was then instructed to perform the exercises 3 times per day, when sitting up for meals. The kinesiologist would place a visual diagram version of the exercises with photos to demonstrate the exercises and notes to remind the patient of proper technique. Since the program was self-directed, no further contact was made by the kinesiologist. The medical student/ research assistant would speak with the patient regularly to determine compliance to the program and assess the need for the kinesiologist to re-teach the exercises or modify the program prescription. On the day of discharge, the kinesiologist and research assistant would return to perform the second STS test.

At 6-weeks post discharge, the patients were asked to return to the hospital for an additional assessment where the research assistant performed the TUG test on the patient. Both groups performed the same TUG at the same time point. The timeline is provided in the Appendix E.

III-9. STATISTICAL ANALYSIS

An alpha level of 0.05 and a power of 0.80 were used for all statistical analysis. The demographic information consists of interval and nominal data, which will be reported as the mean and standard deviations and frequency/percentage respectively. Sit-to-stands were compared longitudinally within patients to assess differences over time using paired t-test between the two time points, as well as, between control group pre-EASE patients (of which none received the reconditioning intervention) with intervention post-EASE patients (of which received the reconditioning regimen) using a two-sample t-test. TUG tests will be compared between control pre-EASE and intervention post-EASE using a two-sample t-test.

III-10. TIMELINE

STS tests, a validated measure of functional lower limb strength and dynamic balance, was completed post-operative day two (prior to initiating the reconditioning program) and at the time of hospital discharge. The TUG test, a validated measure of global physical functioning and fall risk, was completed approximately 6 weeks after discharge when the patient returned to the clinic for post-discharge follow up with the surgeon. Patients in the control group were enrolled between June 2015 and October 2015, while patients in the intervention group were admitted between November 2015 and June 2016.

IV: CHAPTER FOUR

RESULTS

IV-1. RECRUITMENT

Patient recruitment for the control group began in May 2015. Patients were enrolled through the ongoing EASE study. Control group recruitment ended in October 2015 once the required sample of 36 patients was met. Intervention group enrolment then began in November 2015 and finished in May 2016, when the target 36 patients per group were met. There were no withdrawals from either group, as the patients were only met within the hospital, however, some patients were not able or did not wish to perform the prescribed exercises (see the exercise adherence section).

IV-2. BASELINE CHARACTERISTICS

At total of 72 patients were enrolled in the study with 36 patients in each group. In the control group there were 12 males and 24 females with a mean age of 76.4 ± 9.5. The intervention group comprised 14 males and 22 females with a mean age of 76 ± 8.3. Within the control group, as classified by the Rockwood Frailty Scale, 4 patients classified as a level 1, 8 patients as a level 2, 6 patients as level 3, 8 patients as level 4, 3 patients as level 5 and 7 patients as a level 6. The intervention group had 6 patients classified to level 1, 5 patients to level 2, 8 patients to level 3, 8 patients to level 4, 5 patients to level 5 and 4 patients to level

6. There was no difference between surgical procedure performed between groups (p=0.84), and no difference in ASA Class (p=0.08). There was also no difference in complication rates between the control and intervention groups (p=0.36). Significance was established using a paired t-test for interval data and with a chi-square test of independence for the nominal data. There were no significant differences in the demographic information between groups (see table IV-1).

Table IV-1. Baseline Characteristics

Characteristics	Control Group Mean (SD)(	Intervention Group Mean (SD)	P Value
Age (years)	76.4 ± 9.5	76.0 ± 8.3	0.43
Male gender, n (%)	12 (33)	14 (39)	0.31
Caucasian Ethnicity, n (%)	33 (92)	33 (92)	0.22
BMI	28.6 ± 8.5	26.5 ± 4.8	0.11
Frailty Score			
1	4	6	0.74
2	8	5	
3	6	8	
4	8	8	
5	3	5	
6	7	4	
Past Medical History			
Cancer	11	5	0.26
Cardiovascular	31	23	
Neurologic	13	4	
Psychiatric	6	4	
Endocrine	18	20	
Gastrointestinal	17	22	
Genitourinary	9	7	
Hematologic	2	2	
Infection	0	2	
Musculoskeletal	13	10	
Respiratory	9	9	

Other	1	5	
ASA Class			
1	2	3	0.08
2	5	10	
3	18	15	
4	11	8	
Procedure			
Abdominal	10	10	0.84
Appendix	1	1	
Colon	10	7	
Gall Bladder	4	8	
Hernia	4	3	
Small Bowel	7	7	
Post-Operative Complications			
Cardiovascular	4	1	0.36
Neurologic	12	6	
Gastrointestinal	10	0	
Genitourinary	2	1	
Hematologic	1	0	
ICU	2	1	
Infection	8	1	
Respiratory	7	2	
Shock	1	0	
Surgical Complication	1	2	
Unintentional Injury	1	0	
Other	1	2	

IV-3. PRIMARY OUTCOME

IV-3.1. Sit-To-Stand

Table IV-2 illustrates the results of the control group and the intervention group in regards to their age, LOS and STS. The improvement from POD2 to discharge STS was shown to be significantly greater in the reconditioning group ($p=0.03$). This resulted in an average of an additional 2.8 ±6.4 stands in the intervention group as opposed to the control group (Figure IV-1). Discharge STS was also separated by frailty level to assess whether individual group differences were made (see Figure IV-1).

Table IV-2. STS Results for Control and Intervention Groups

Frailty Level	n	Age Mean (SD)	LOS (days)	STS1 No. (SD)	STS2 No. (SD)	STS Change No. (SD)
Control Group						
1	4	74.5 ± 11.1	10.3 ± 3.4	9.5 ± 1.3	13.5 ± 0.6	4 ± 1.4
2	8	73.8 ± 9.1	7.3 ± 4.2	5.4 ± 4.2	8.5 ± 6.2	3.5 ± 3.3
3	6	80.5 ± 9.9	9.3 ± 2.1	2.5 ± 3.6	9.3 ± 1.9	6.3 ± 2.8
4	8	75.4 ± 7.4	9.1 ± 2.5	2 ± 3.3	5.1 ± 3.6	3.1 ± 2.4
5	3	68.3 ± 4.0	5.7 ± 2.1	2 ± 2.6	3.7 ± 1.5	1.7 ± 2.1
6	7	81.6 ± 10.9	12 ± 8.8	0.1 ± 0.4	0.4 ± 1.1	0.3 ± 0.8
Intervention Group						
1	6	73.7 ± 7.6	5.7 ± 2.3	6.2 ± 2.5	16.5 ± 3.8	10.3 ± 3.7
2	5	71.8 ± 9.3	5.4 ± 2.6	8.8 ± 9.9	12.4 ± 9.6	3.6 ± 3.5
3	8	72.1 ± 5.2	6.1 ± 5.2	5.6 ± 4.7	9 ± 5.9	3.4 ± 3.2
4	8	80.1 ± 8.6	9 ± 8.2	3 ± 3.7	7.4 ± 5.8	4.4 ± 3.1
5	5	75.8 ± 6.6	8.8 ± 5	4.4 ± 6.0	7.8 ± 6.6	4 ± 2.1
6	4	84.8 ± 8.4	7.5 ± 1.7	0 ± 0.8	0.5 ± 0.6	0.5 ± 0.6

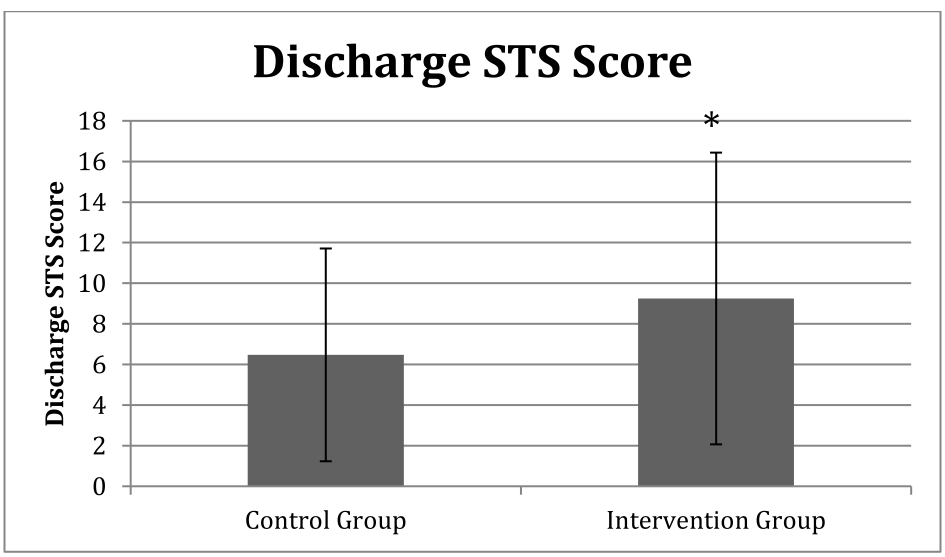

Figure IV-1. Discharge STS separated by groups

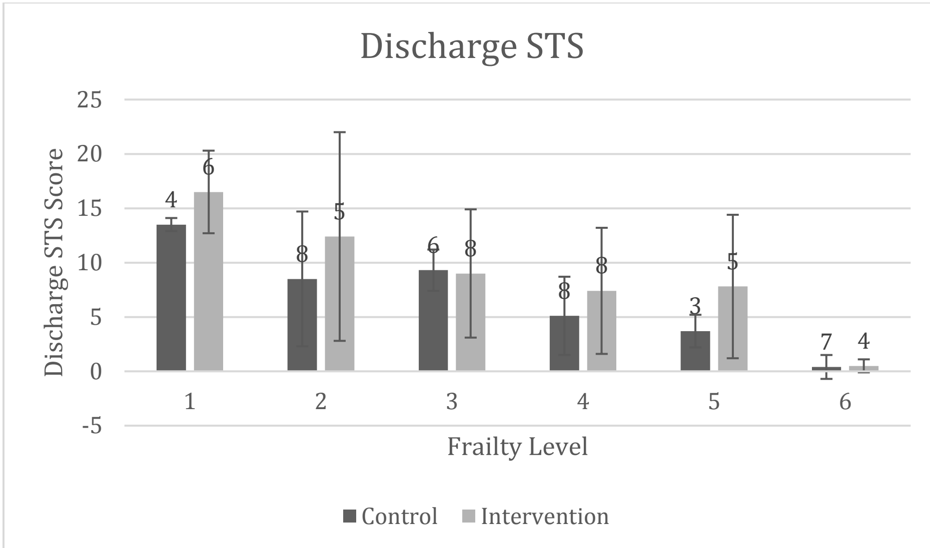

Figure IV-2. Discharge STS separated by frailty

It is expected that the STS should improve between POD2 and discharge in both the control and intervention groups. More importantly, the magnitude of change between the POD2 and discharge STS was significantly greater in our intervention group, with the mean change of an additional 1.4 stands ± 3.5 (p=0.04) (see Figure IV-3). Results were again separated by frailty level and numbers above the column show the sample size for that group (Figure IV-4).

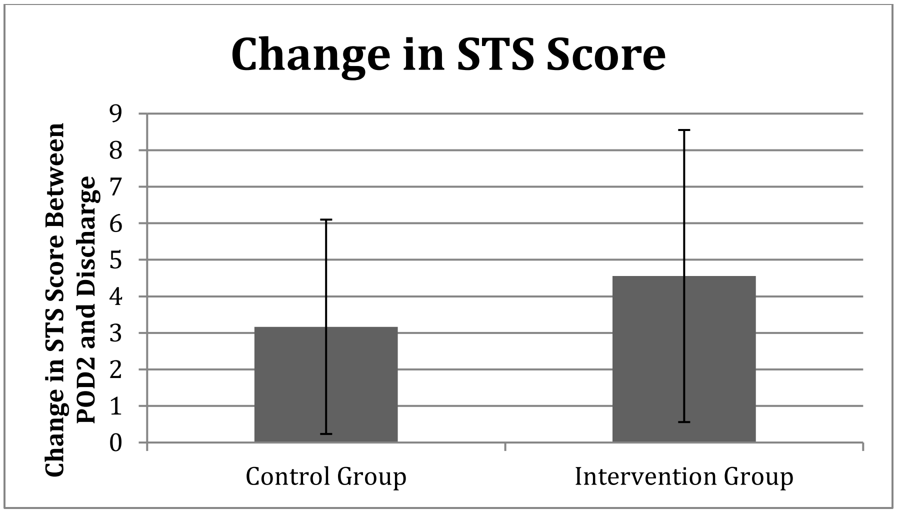

Figure IV-3. Change between POD2 and discharge STS in groups

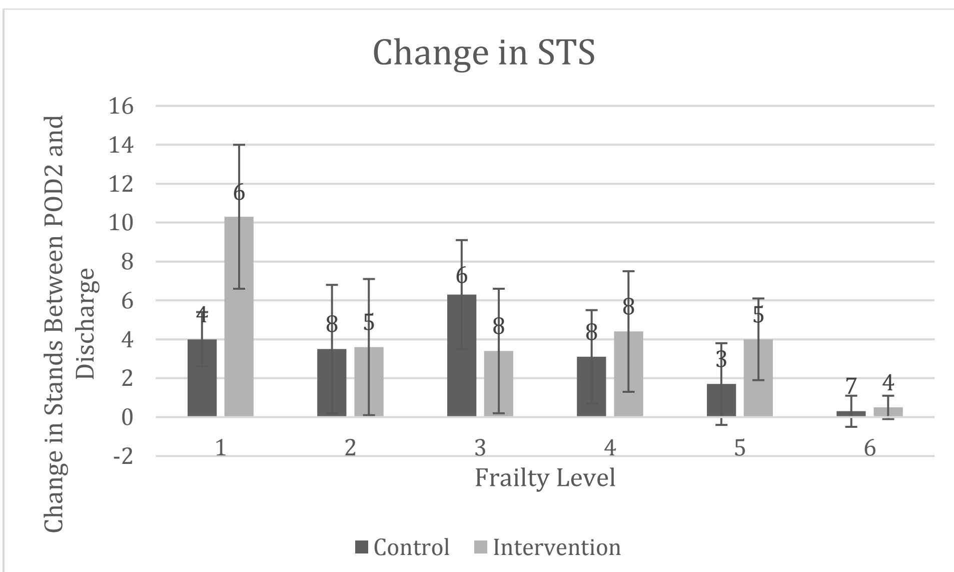

Figure IV-4. Change between POD2 and discharge STS separated by frailty

59% of our control group patients were discharged home without additional care, however, only 19% of these patients reached the threshold STS for independent living. In our intervention group 70% of patients were discharged home without additional care, but 48% of these patients did reach the necessary threshold.

Figure IV-5 shows the percentage of patients within each frailty group to reach their necessary STS score for independent living (as established by Rikli[29]). Improvements were made within each frailty group, except for the level 1's and level 6's. This may be due to a ceiling effect by our level 1's and a floor effect by the level 6's. Some of our most frail patients were unable to perform any STS without the use of their hands, despite showing visible improvements in physical capabilities. As well, some of our most fit patients performed their first STS test so well that there was limited room in the 30-second allowance for improvement. The greatest improvement was seen in our frailty 4-5, which is the "Vulnerable" and "Mildly Frail" group.

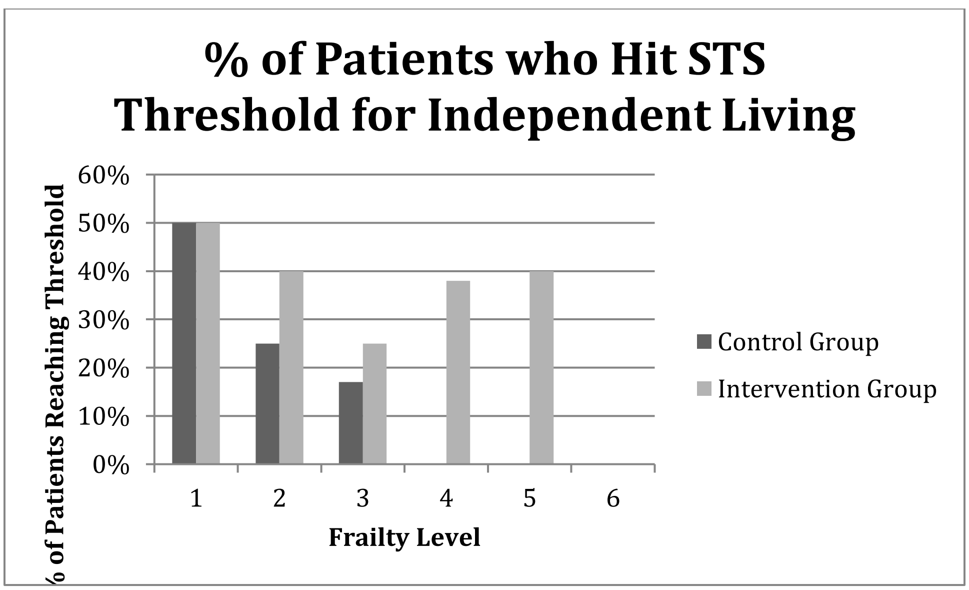

Figure IV-5. Percent of Patient to hit Threshold STS

IV-4. SECONDARY OUTCOMES

IV-4.1. Timed-Up-And-Go

The TUG measure was eliminated from the final data analysis, as the number of TUGs obtained was not sufficient. As the TUG was performed at the 6-week follow-up, only patients who came back to the hospital performed the TUG. Patients who performed the follow-up by phone or were lost to follow up therefore did not have their scores recorded, significantly dropping our results. 38% (14 patients) of pre-intervention group patients performed the TUG and 36% (13 patients) of the post-intervention group. Resulting in a sample size that would be too small for a thorough analysis.

IV-4.2. Length of Stay

There were two outliers (one in control frailty 2 and one in intervention frailty 5) whose data were excluded from the analysis as their length of stay extended the limit of two standard deviations from the mean. Prior to exclusion of these outliers, there was no significance in LOS between the two groups. Once the outliers were removed from the data analysis, there was a statistically significant decrease in the intervention group in regards to length of stay ($p=0.03$). The control group average was 9.2 days ± 4.8 spent in hospital, compared to the intervention groups mean of 7.1 days ± 5.2 in hospital (Figure IV-6).

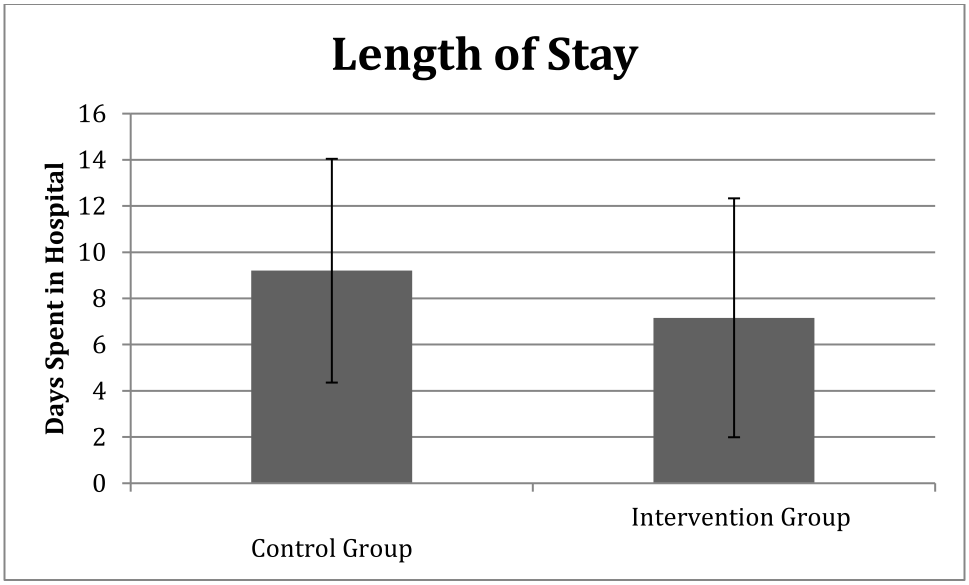

Figure IV-6. Length of stay

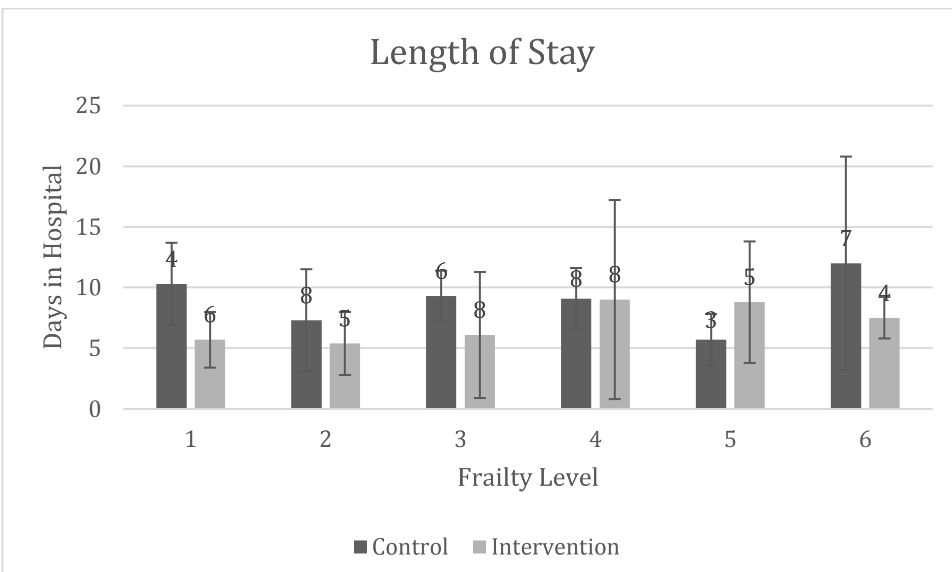

Figure IV-7. Length of stay separated by frailty

IV-5. ADHERENCE RATE

Exercise adherence was averaged based on the patients' self-reported activity levels during the length of their stay as noted through the provided logbooks.

Patients marked whether they performed the exercises the required 3 times. Patients who performed the exercises 3+ daily received a score of 3, patients who averaged 2x/day received a 2, patients who averaged 1x/day received a 1 and those who did not perform the exercises received a 0. Patients were also able to provide comments about the program and whether they found it useful during their hospital stay.

40 patients (55%) completed the logbook during their stay, with 18 patients recording exercise adherence of 3, 8 patients recording an adherence of 2 and 14 patients recording adherence of 1 (Figure IV-8).

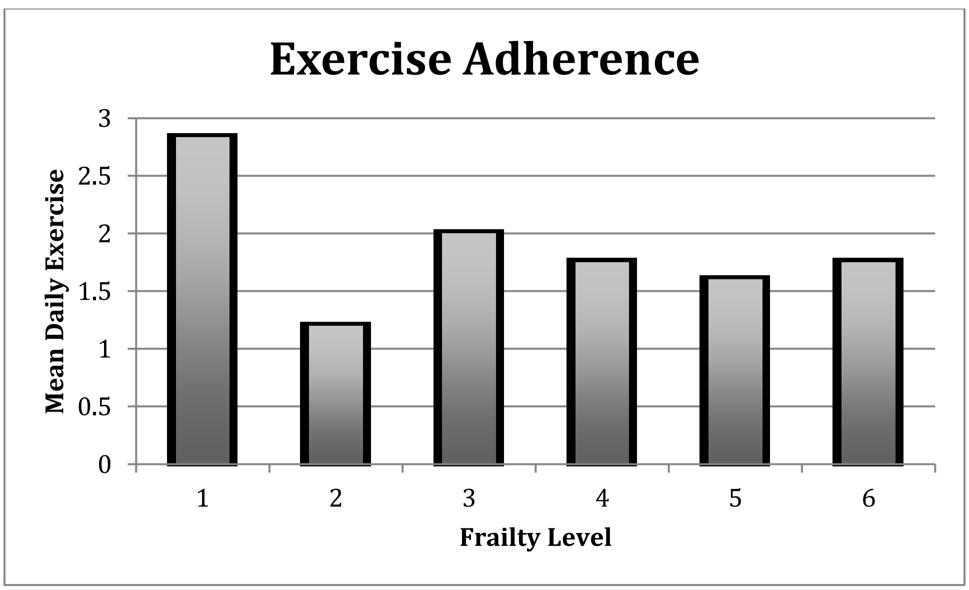

Figure IV-8. Daily Exercise Adherence

IV-6. ADVERSE EVENTS

There was one patient within the control group who did fall during recovery, however this was not due to the reconditioning program. No other adverse events were reported as a result of participation in this study.

V: CHAPTER FIVE

DISCUSSION

V-1. HYPOTHESIS

We hypothesized that the reconditioning program would be safe and feasible to perform in hospital.

The main significant finding of this study was that the reconditioning program was feasible within the hospital setting. The hospital staff were eager to participate and were willing to assist with patient program adherence, while the majority of patients were willing to perform the program in conjunction with in-hospital physical and occupational therapy.

There were no adverse events with this intervention; patients were able to perform the program safely with minimal in-hospital supervision. There were no falls or injuries when the STS and TUG measures were performed, though both tests were both supervised for patient safety.

We hypothesized that our post-operative reconditioning program would improve functional outcomes (STS) in older emergency abdominal surgery patients.

The major new finding of this thesis was the significant STS improvement ($p=0.04$) found in the patients who performed the reconditioning program. Of the 36 patients enrolled in the intervention group of this study, only one patient was unable to improve their STS score between POD2 and discharge. Discharge STS was significantly greater in the intervention group, who averaged another 2.8

stands compared to their control counterparts, Thus a post-operative reconditioning program is a safe and effective intervention to improve functional performance, measured by STS, in elderly abdominal surgery patients. Based on the MCID provided[30], the patients within this study demonstrated a clinically important increase in STS ability.

As this study is the first of its nature, similar results are limited in the literature, however, improvement in STS scores due to early exercise interventions has been found in patients undergoing early inpatient rehabilitation[43], nursing home residents[69], elderly acute general medical patients[46, 66], sedentary older adults[68], and geriatric rehabilitation unit patients[67]. Most of the studies found in the literature do not use the STS test for measuring functionality, except for work done by Slaughter[69], but this unfortunately only states that residents who were performing STS more frequently maintained or improved mobility.

Patients were leaving the hospital in a better functional state after completing the reconditioning program, placing them at a reduced risk of injury, falls and loss of physical independence. Most patients were eager and willing to perform the exercises as often as they felt they could, however a small portion of patients (4) felt that they should not be performing exercises so soon after surgery and therefore did not complete the program (11%).

Our final hypothesis was that our post-operative reconditioning program would decrease length of stay and decrease surgical complications in older emergency abdominal surgery patients.

There was a significant decrease (p=0.03) in LOS for the patients who performed the reconditioning program, which confirms that the program would decrease the amount of time spent in hospital. Patients in the control group spent on average 1.9 more days in hospital than the intervention group. Not only does this decrease in LOS reduce costs for the health care centre, but it also places less strain on the patient, both physically and psychologically[24].

This is concurrent with research involving patients undergoing early inpatient rehabilitation[43] (shortened LOS by 2.8 days) and acute general medical patients[46] (shortened LOS by 2 days). While the LOS was reduced to a greater extent in both of the listed studies, the intervention used in these studies was supervised and progressive, which may prove to be more fruitful in achieving functional improvements in our elderly patients.

There was no difference between the rates of surgical complication between the two groups (p=0.36). Some surgical complications arise during the surgery or quite soon after operation, which may negate the effect of our program (if the complication arose before program implementation). There was a significant decrease in the rate of gastrointestinal complications (10 in the control group and 0 in the intervention group), which may be explained by the increase in physical activity by the patient improving gastrointestinal mobility. However, prehabilitation programs prior to the surgery may have a greater effect on the prevalence of surgical complications.

V-2. CLINICAL IMPLICATIONS

V-2.1. Sit-To-Stand

We observed that the 30-second STS was safe and feasible as an objective outcome for our post-operative patients in our pilot study. The test was simple to perform in the hospital setting without disrupting ongoing care. Nursing staff was eager and willing to assist with mobilization and researchers did not feel imposing on the care team while performing this short test.

As the 30-second STS test is not commonly used in clinical settings, there is no current minimal detectable change (difference that is not attributable to error), and the minimally clinically important difference (MCID) (difference that is meaningful to patients) is 2.1 but is based on elderly hip osteoarthritis patients. So within our study it is difficult to establish if the level of improvement was clinically meaningful at the level of the patient. Future studies may wish to investigate if patients have maintained their functional ability once having left the hospital.

V-2.2. Timed-Up-And-Go

The TUG was a simple and feasible measure to use within this frailty specific group, but the timing of the test was not ideal, as patients were asked to perform the test at their 6-week follow-up, to which most patients were lost. The TUG results for this study were not used due to their small numbers. However, future studies may want to assess TUG in a similar fashion to how we assessed STS, as both are valid and reliable measures of physical function.

V-2.3 Rockwood Clinical Frailty Scale

The Rockwood Clinical Frailty Scale proved to be a useful visual tool in educating the hospital staff about the program. The visual aids used in the scale helped to guide our staff through the administration of the program and establishing a valid baseline frailty. While the scale necessitates verbal communication about the daily life of the patients' it was a good initial source for frailty scores.

The scale also proved useful when translating knowledge to the nursing staff on the ward, as well as informing other health care providers about the program. The scale was meant to be an easy tool for all health care providers to use without the necessity of having any exercise background knowledge.

It was important to validate the scale within the study administration, and all members of the team were required to cross-validate a certain number of patients to ensure that the frailty being scored was consistent. As well, if any member was unsure of the frailty for the patient, another member of the team was brought in to confirm the frailty.

V-2.4. Logbooks

The logbooks were found to be adequate in measuring adherence by our patient group. 55% of patients completed the logbooks to some degree, with most patients completing the sections regarding daily exercise adherence.

The logbooks did contain a section for patients to comment, which proved to be a valuable source of information regarding the reconditioning program. Patients responded in this section with comments such as “More exercises”, “Enjoyed the program, wish I could take it home” and “Please provide this to other hospitals”. Although these comments were not planned for, future studies may wish to include a qualitative measure, as the pilot feedback proved to be largely positive.

12 patients who did complete the program did not complete the logbook, this may be due to barriers such as time, lack of understanding or writing/language inability (needing glasses). Unfortunately, patients who did not perform the program also did not complete the logbook, limiting our knowledge of what the barriers to exercise may be in this group. Alternatives were discussed after this study was completed, with ideas such as posting the program on the wall for nurses and family reminders.

We understand that the unsupervised aspect of this study may have limited the effect of our program, however, our main objective of this pilot study was to see if an independently led reconditioning program was feasible in the acute care setting. We identified the logbook as the best option to assess patient adherence and acceptance of the assigned exercises as it eliminated the need for staff monitoring.

V-2.5. Clinical Significance

The change between POD2 and discharge STS of an additional 1.4 stands in the intervention group, as well, discharge STS was shown to average another 2.8 stands compared to their control counterparts. Our study results exceeded the MCID of 2.1(established in elderly individuals with hip osteoarthritis) for discharge STS of our intervention group but not for change in STS. These findings are promising and suggest the need for further studies with a larger sample.

V-3. LIMITATIONS AND FUTURE DIRECTIONS

One limitation to this study is the small number of participants due to the pilot nature of our trial, as well, this study did not use a randomized controlled trial (RCT) design. While the RCT design is optimal for assessing differences between an exercise intervention and usual care, the implementation phase would have been difficult to randomized within the care setting. We needed the support from the physicians, nursing staff and geriatricians and felt that a RCT would not be feasible given the team nature of this trial. The true effect of our reconditioning program will need to be explored within a RCT with a greater sample size, possibly at multiple centres to increase the speed of participant recruitment.

A further limitation of this study was the multiple between group comparisons that were performed and the limited power to detect potential effects of interest. Although the findings could potentially represent false discovery by chance, positive trends were generally seen across all outcomes.

Another limitation was that the reconditioning program was not supervised. While the program was designed to be self-led and independent, we were unable to accurately monitor exercise performance and measure exercise variables such as intensity levels and adherence to the program. While the logbook was created in an attempt to address these limitations, the reliability of self-reported measures is not ideal[65], and we found completion rates were not ideal. Future studies should consider assessing patient adherence to the program with daily check-ups on patient exercise performance, as well as assessments to ensure the reconditioning program is being performed correctly.

As mentioned above, our patients may have achieved greater improvement of their STS scores if the program had been supervised by a professional and if the program was designed to be progressive as the patient recovered from surgery. While some patients were able to progress to a different level of exercises, they often did not have enough time in hospital to sufficiently realize benefits and it was difficult for the researchers to gauge the level of improvement without constant supervision of the program.

While the 5-repetition STS is the ideal measure for functional ability in older adults, we believed that most of our patients would not be able to achieve the necessary 5-repetitions, thus creating a floor effect on a large majority of our patients. We therefore enlisted the 30-second STS, as it allowed for each patient to receive a score on our test. The combination of the 30-second STS and TUG were found to be feasible for use while the patient was still in hospital.

V-3.1 Sources of Bias

As this sub-study was a component of a larger overall research project it is worth noting the effects of the larger project on our outcomes. The EASE project was a multi-component intervention where the reconditioning program was simply one portion of the intervention. Patients also received care on an elder-friendly ward, geriatrician visits, nutrition interventions and early discharge planning.

The team based care surrounding our patients may have increased the effect of our program through the increased level of elderly-specific care our patients received and team knowledge of the EASE-BE FIT objectives. The early discharge planning may have decreased our intervention group LOS, while the comfort rounds may have encouraged patients to exercise, therefore changing our reconditioning program from self-led to a more supervised program. However, our control group participants did receive similar care, so any bias would be minimal.

V-4. SUMMARY

Research has shown that bed rest post-operatively increases the rate of muscle loss and causes patients to leave the hospital in a reduced functional state. The purpose of this study was to assess whether an in-hospital, self-led reconditioning program would be effective in minimizing the physical decline normally found in elderly patients following emergency abdominal surgery.

Patients were prescribed a reconditioning program based on their admittance frailty level and were asked to perform the exercises 3x/day. 72 patients were enrolled in this study and 94% of patients completed the trial. The intervention group improved their discharge STS by 2.8 stands and improved their overall change in STS by 1.4 stands as compared to the control group.

Patients within the intervention group commented that the program was useful and asked for its expansion. Therefore, our reconditioning program results show promise in helping offset declines in physical function in elderly patients following emergency abdominal surgery.

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APPENDIX A:

CONSENT FORM

CONSENT

The Elder-friendly Approaches to the Surgical Environment (EASE) Study

Principal Investigators: Dr. Rachel Khadaroo Phone No.: 780-407-7728

Research Assistant: Ms. Lindsey Warkentin Phone No.: 780-492-1142
Dr. Saad Salim Phone No.: 780-492-3375

	Yes	No
1) Do you understand that you have been asked to be in a research study?	☐	☐
2) Have you received a copy and read the *Information Sheet*?	☐	☐
3) Do you understand the benefits and risks involved in taking part in this research study?	☐	☐
4) Have you had an opportunity to ask questions and discuss this study?	☐	☐
5) Do you understand that you are free to withdraw from the study at any time, without having to give a reason and without affecting your future medical care?	☐	☐
6) Has the issue of confidentiality been explained to you, and do you understand who will have access to your records, including identifiable health information?	☐	☐

STUDY COMPONENTS

1) Do you agree to a muscle biopsy?	☐	☐
2) Do you agree to have you blood, urine and stool collected?	☐	☐
3) Do you agree to have ultrasound performed on your thigh?	☐	☐
4) Do you agree to answer questionnaires once you've been discharged?	☐	☐

Who explained this study to you? ____

I agree to take part in this study: **YES** ☐ **NO** ☐

Signature of Research Participant: ____

(Printed Name) ____

Date/Time:_____________________________

Signature of Witness (if necessary):____

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

Signature of Investigator or Designee___________________________ Date/Time:_____________

THE INFORMATION SHEET MUST BE ATTACHED TO THIS CONSENT FORM AND A COPY GIVEN TO THE RESEARCH PARTICIPANT

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APPENDIX B:

EASE SUMMARY PAGE

Elder-friendly Approaches to the Surgical Environment (EASE) Study –
An Elder-Friendly Surgical Unit
AIHS - PRIHS Grant

Dr. Rachel Khadaroo (Principal Investigator, Surgeon-Scientist)
Dr. Adrian Wagg (Geriatrician, UofA Chair of Healthy Aging)
Dr. Raj Pawal (Internist, Epidemiologist)
Dr. Jayna Holroyd-Leduc (Geriatrician, SCN Scientific Director)
Dr. Fiona Clement (Health economist)

Objective: To examine the impact of a specialized interdisciplinary elder-friendly surgical unit on in-hospital morbidity and mortality in elders undergoing acute surgical care.

Hypothesis: We hypothesize that the EASE intervention will reduce in-hospital morbidity and mortality in a cost-effective manner in this high-risk patient population.

Relevance: Acute surgery performed in the frail elderly often results in clinical, cognitive and functional deterioration, compared to younger patients. A preliminary analysis of our EASE participants show a tripling in number of complications (57.1% vs 19.3%) and a doubling in length of stay (14.5 days vs 6.2 days) compared to their younger controls. While surgical units have evolved to the Acute Care Surgery team-based care model, clearly surgical care delivery is still not optimized to meet the unique care needs of elders. In contrast, care of elderly inpatients hospitalized on non-surgical wards has been revolutionized through the use of Acute Care for the Elderly units.

Importance: This approach has never been implemented in a general surgical setting. This proposed unit is relevant to the sustainability of the health care system and to improving outcomes in older surgical patients, helping them to maintain their functional autonomy and quality of life.

Design: A prospective before-after study design that will include a concurrent control group will be used. Specific EASE interventions include:

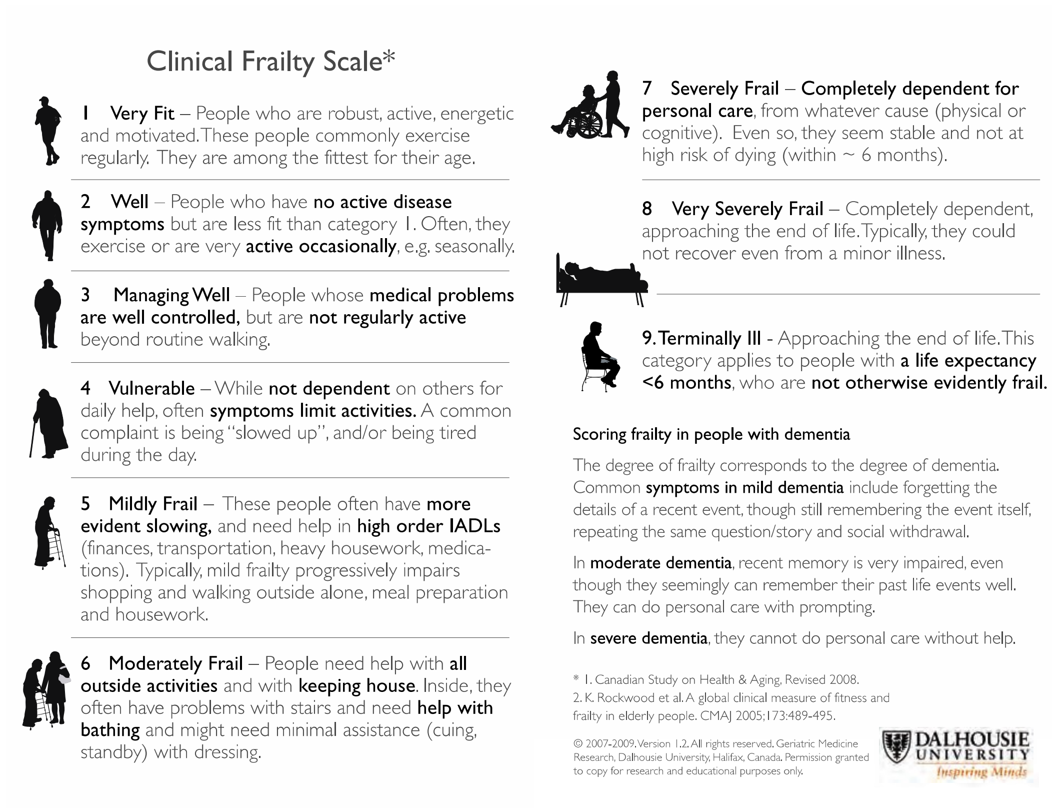
1) Capacity re-alignment to locate all elderly surgical patients on one nursing unit
2) Interdisciplinary team-based care for the elderly surgical patient including a geriatrician
3) Elder-friendly evidence-informed practices including comfort rounds with early mobilization, delirium prevention/management, optimal nutrition and prevention of post-operative complications
4) Early discharge planning which includes family, social worker, care coordinator and surgical team

Timeline:

Project Preparation	Data collection (Current Unit)	EASE Implementation	Data Collection (EASE Unit)	Project Translation and Transition
Jan-Mar 14	Mar 14- Jul 15	Jul 15 – Aug 15	Sep 15 – Dec 16	Dec 16 – Mar 17

APPENDIX C:

ROCKWOOD CLINICAL FRAILTY SCALE



Clinical Frailty Scale*

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

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

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

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

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

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

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

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

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

Scoring frailty in people with dementia

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

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

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

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

DALHOUSIE UNIVERSITY *Inspiring Minds*

APPENDIX D:

SAMPLE SIZE CALCULATION

Inference for Means: Comparing Two Independent Samples

(To use this page, your browser must recognize JavaScript.)

Choose which calculation you desire, enter the relevant population values for mu1 (mean of population 1), mu2 (mean of population 2), and sigma (common standard deviation) and, if calculating power, a sample size (assumed the same for each sample). You may also modify α (type I error rate) and the power, if relevant. After making your entries, hit the calculate button at the bottom.

- Calculate Sample Size (for specified Power)
- Calculate Power (for specified Sample Size)

Enter a value for mu1: 9

Enter a value for mu2: 7.6

Enter a value for sigma: 2.3

- 1 Sided Test
- 2 Sided Test

Enter a value for α (default is .05): .05

Enter a value for desired power (default is .80): .80

The sample size (for each sample separately) is: 34

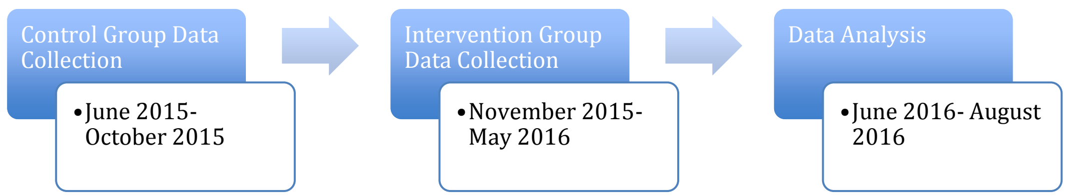
Calculate

Reference: The calculations are the customary ones based on normal distributions. See for example *Hypothesis Testing: Two-Sample Inference - Estimation of Sample Size and Power for Comparing Two Means* in Bernard Rosner's **Fundamentals of Biostatistics**.

Due to the innovative nature of this study, sample size was calculated using the known population mean of 9 stands in 30 seconds (Jones et al 1999), as well as the calculated mean using the MCID of 1.4 stands (Wright et al, 2011). As well, the known population standard deviation of 2.3, the α of 0.05, the desired power was set at 0.80, which gives us a required sample size of 34 when using a 1-sided test, which was then increased to 36 patients to make up for potential withdrawals (Rosner, 2000).

APPENDIX E:

STUDY TIMELINE



APPENDIX F:

SIT-TO-STAND INSTRUCTIONS

30 sec Chair Stand Test (30sec-CST) *Performance Measure*

Also known as Sit-To-Stand and Repeated Stands Test

Considerations	
Which type of TJA is it appropriate for?	THA and TKA
What part of the TJA continuum is it appropriate for?	Pre-op Post-acute Active Living
What domain(s) does it measure within the ICF?	Body function, Activity
Who completes it?	Patient and clinician
What does it measure?	Functional lower limb strength and dynamic balance through repeated sit-to-stand activity [1,2]
What equipment is required?	Straight back chair with a 43 – 46 cm seat height and no arm rests backed against wall to prevent slipping [1-3] and stopwatch/timer Note: The same chair should be used for re-testing.
How long does it take?	~2 mins to complete and score
How do I do it?	Instructions available at: www.oarsi.org/sites/default/files/docs/2013/manual.pdf Video available at: vimeo.com/74649743 [4]
How good is it?	**Validity***:* Construct – good, correlates with the 50 ft. walk test in patients awaiting THA and TKA[5] **Reliability***:* Excellent inter-rater and test-retest reliability in patients with hip/knee OA or awaiting TJA.[1,6] **Responsiveness***:* Acceptable responsiveness in patients with hip OA after 9 PT exercise sessions[1]. Able to distinguish patients who did not walk with gait aid from those who did.[5] Appears to be more responsive than TUG or 40 m self-paced walk test in patients with hip OA. [7] **Floor/ceiling effects***:* Not established in TJA
How is it scored?	Record the number of complete stands performed in 30 seconds. Use of arms to push off or incomplete stands do not count.[3] If a patient cannot stand even once then the score for the test is zero.[1]
What do the results mean?	More repetitions in 30 seconds = better performance. MDC_{90} is 1.6 repetitions in patient with hip OA[7] and in those awaiting TJA of hip or knee.[6] MCII: In patients with hip OA, ranged from 2.0 – 2.6 stands in 30 secs [7]

Developed by the BC Physical Therapy Total Joint Arthroplasty and Outcome Measures Knowledge Translation Task Force: Dr. Marie Westby, Ronda Field, Maureen Duggan, Dolores Langford, Robyn Laytham, Steven Longstaff, Lauren Welch, Alison Hoens. March 2014.
A Physical Therapy Knowledge Broker project supported by: UBC Department of Physical Therapy, Physiotherapy Association of BC, Vancouver Coastal Research Institute and Providence Healthcare Research Institute.

APPENDIX G:

TIMED-UP-AND-GO INSTRUCTIONS

Alberta Health Services

TIMED-UP-AND-GO (TUG) TEST

The Calgary Zone Fall Prevention Initiative recommends the Timed Up & Go (TUG) test as a screen to identify falls risk, and for identification of gait and balance abnormalities.

We recommend a cut-off score of ≥ 15 seconds as predictive of falls risk (referenced from the Canadian Fall Prevention Curriculum, 2007).

It is recommended that this score and/or any noted abnormalities in gait, balance or difficulty rising from the chair requires further assessment of falls risk factors, with appropriate facilitation of intervention(s) and referral(s).

Time to Complete:
- 1-2 minutes

Equipment Required:
- Armchair – approximate seat height = 43-46 cm and approximate arm height = 65 cm
- Measuring tape to measure 3 meter distance referred to below
- Line on the floor 3 meters away from chair
- Walking aid, if required
- Stopwatch

Client Start Position:
- Wears regular footwear
- Seated in arm chair
- Back against the chair, arms resting on chair arms
- Uses customary walking aid

Test:
- Client: From start position, client stands, walks a distance of 3 meters (there must not be any obstructions), turns, walks back to the chair, and sits down
- Assessor: Start timer on the word "go"; Stop timer when the client sits down i.e. client's buttocks contact the chair

Practice:
- One practice walk is allowed - Record test result on 2nd trial

Instructions:
- 'On the word "go", get up, walk at a comfortable, safe pace to the line on the floor, turn, return to the chair and sit down'

Record:
- Note difficulties in getting out of the chair, walking, turning and/or sitting down

* A score of ≥15 seconds indicates client has increased falls risk

Date	Time in Seconds to Complete (TUG) Test	Gait Aid Used	Difficulties Identified
		❒ Cane ❒ Two canes ❒ 4-Wheeled walker ❒ 2-Wheeled walker ❒ Solid walker ❒ No mobility aid	

Reference: J Am Geriatr Soc 1991, 39:142-48; Phys Ther 2000, 80:896-903

APPENDIX H:

RECONDITIONING PROGRAM LEVEL 1

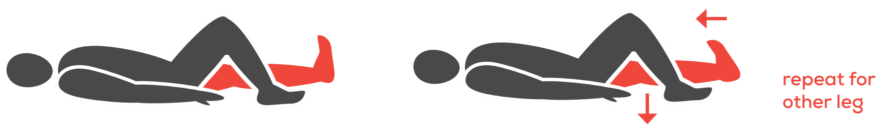
Level 1 Reconditioning Program:

BED BASED 3X PER DAY

Breathe out while performing the movement (on exertion).
A pillow can be used to hold your incision to reduce pressure.

1 QUAD EXTENSIONS — REPEAT 10 TIMES IF POSSIBLE

Squeeze thigh muscle of straight leg, while pointing toes towards your head.

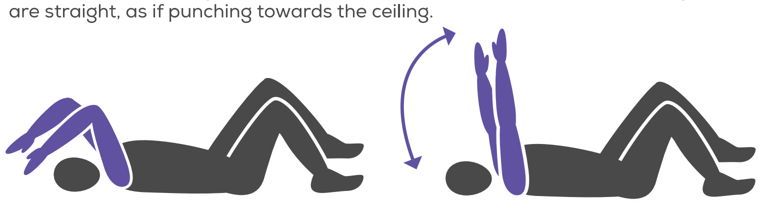


2 BUTT SQUEEZES — REPEAT 10 TIMES IF POSSIBLE

If it is uncomfortable for you to press your heels into the mattress, then simply straighten your legs and squeeze your butt muscles tightly and hold for 5-10 seconds.

3 TRICEPS EXTENSIONS — REPEAT 10 TIMES IF POSSIBLE

If you cannot lift your arms above your head, rest your arms beside you on the bed with your elbows bent to 90 degrees. Reach your hands upwards towards the ceiling until your elbows are straight, as if punching towards the ceiling.



EASE
Elder-friendly Approaches to the Surgical Environment

BED BASED RECONDITIONING PROGRAM

EASE is Elder-friendly Approaches to the Surgical Environment – a new way of supporting our elderly surgical population while in hospital. For the first time ever, there are now more people in Canada over the age of 65 than there are under the age of 15. We are seeing an increase in older patients requiring surgery, and needing more resources to support them through their post-operative treatment.

EASE is now introducing new elder-friendly practices on our surgical wards to help reduce the risk of complications after surgery so that patients can go home sooner and stronger. These new practices include our bedside reconditioning program to prevent the ill-effects of bed rest.

Detailed Instructions

1. QUAD EXTENSIONS

a. Lie on your back with one knee bent and one straight, hold your arms at your side for extra stability.

b. Squeeze the thigh muscle of your straight leg and gently push the back of your knee into the bed, then pull your toes upwards towards your head.

c. Breathe out as you squeeze your straight legs' thigh.

d. Relax after holding the squeeze for 10 seconds.

2. BUTT SQUEEZES

a. Lie on your back with both of your knees bent and your arms at your side for extra stability.

b. Begin to squeeze your butt while simultaneously pushing with your heels gently into the bed.

c. Breathe out as you squeeze your butt, try to hold the squeeze for 10 seconds.

MODIFICATION TO MAKE IT HARDER: While squeezing your butt muscles, alternate between pushing your heels gently into the bed and pushing your toes into the bed.

MODIFICATION TO MAKE IT EASIER: If it is uncomfortable for you to press your heels into the mattress for this movement, then simply straighten your legs so that you are lying flat. Squeeze your butt muscles tightly and hold for 5-10 seconds.

3. TRICEPS EXTENSIONS

a. Lie down on your back and bend your arms in front of your face so your hands rest beside your ears.

b. Gently straighten your arms at the elbow so your arms end up in the air in front of your face.

c. Breathe out as you extend your arms.

MODIFICATION TO MAKE IT EASIER: If you cannot lift your arms above your head, rest your arms beside you on the bed with your elbows bent to 90 degrees. Reach your hands upwards towards the ceiling until your elbows are straight, as if punching towards the ceiling.

EASE

Program led by Dr. Khadaroo. For more information please visit www.drkhadaroo.com

Elder-friendly Approaches to the Surgical Environment

APPENDIX I:

RECONDITIONING PROGRAM LEVEL 2

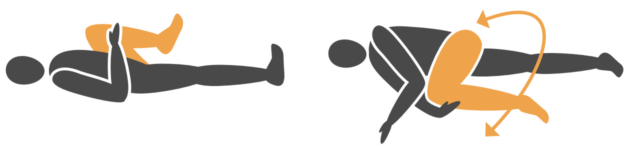
Level 2 Reconditioning Program:

CHAIR BASED 3X PER DAY

Breathe out while performing the movement (on exertion).
A pillow can be used to hold your incision to reduce pressure.

1 BED ROLLS — REPEAT 10 TIMES IF POSSIBLE

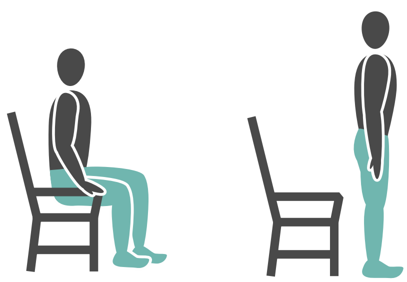
If rolling is not possible, try to change positions in bed every 20 minutes.



repeat on other side

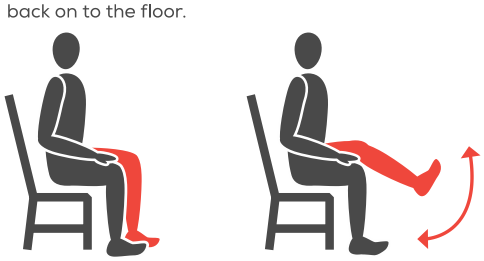
2 SIT TO STAND WITH ASSIST — REPEAT 10 TIMES IF POSSIBLE

If needed, you can use your arms to push off the arm rests as you raise yourself out of the chair.



3 LEG EXTENSIONS — REPEAT 10 TIMES IF POSSIBLE

To make this harder, make three ankle circles while your leg is lifted before setting your foot back on to the floor.



repeat for other leg

EASE
Elder-friendly Approaches to the Surgical Environment

CHAIR BASED RECONDITIONING PROGRAM

EASE is Elder-friendly Approaches to the Surgical Environment – a new way of supporting our elderly surgical population while in hospital. For the first time ever, there are now more people in Canada over the age of 65 than there are under the age of 15. We are seeing an increase in older patients requiring surgery, and needing more resources to support them through their post-operative treatment.

EASE is now introducing new elder-friendly practices on our surgical wards to help reduce the risk of complications after surgery so that patients can go home sooner and stronger. These new practices include our bedside reconditioning program to prevent the ill-effects of bed rest.

Detailed Instructions

1. BED ROLLS

a. While lying on your back, bend one knee up towards your chest and hold on to it with the opposite arm.

b. With your free arm, reach across your body to grasp a stable support. (ie. bedside rail)

c. Begin to turn your body onto your side while pulling on the support.

d. Breathe out as you turn.

e. Relax your body and roll back into your original position.

f. Alternate by rolling on to both sides.

MODIFICATION TO MAKE IT EASIER: If rolling is not possible, try to change positions in bed every 20 minutes.

2. SIT TO STAND WITH ASSIST

a. While seated, move your hips forward in the chair so that your feet are placed firmly on the floor with your knees over top of your toes.

b. Make sure you have a stable support in front of you. (ie. use bed rail, wall or counter)

c. Lean forward and slowly begin to rise out of the chair, using the armrests for support or to assist if needed.

d. You may need to hold a pillow over your incision if your have discomfort in your incision area.

e. Breathe out as you rise up, then slowly lower yourself back into the chair.

3. LEG EXTENSIONS

a. While seated in a stable chair, plant both your feet on the ground in front of you.

b. Keep one leg rested on the floor and lift the other leg up until it is pointing straight out in front of you.

c. Only lift the leg as far is comfortable and hold for 5 seconds in the air.

d. Then relax the leg and bring it back to the floor.

e. Alternate legs.

MODIFICATION TO MAKE IT HARDER: When leg is lifted, make three ankle circles before setting your foot back on to the floor.

EASE

Program led by Dr. Khadaroo. For more information please visit www.drkhadaroo.com

Elder-friendly Approaches to the Surgical Environment

APPENDIX J:

RECONDITIONING PROGRAM LEVEL 3

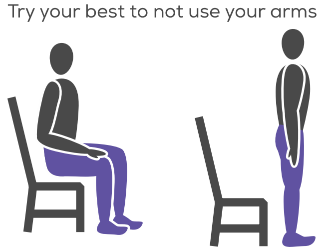
Level 3 Reconditioning Program:

STANDING BASED 3X PER DAY

Breathe out while performing the movement (on exertion).
A pillow can be used to hold your incision to reduce pressure.

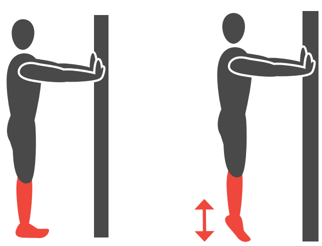
1 SIT TO STAND NO ASSIST — REPEAT 10 TIMES IF POSSIBLE

Try your best to not use your arms to help raise yourself out of the seat.



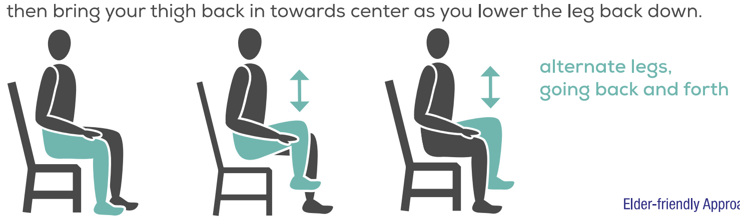
2 CALF RAISES WITH WALL ASSIST — REPEAT 10 TIMES IF POSSIBLE

To make this harder, after lifting up on to your tip-toes, step out to the side while keeping your heels off the floor and then step back before lowering back down on to your heels.



3 HIP MARCHING WHILE SEATED — REPEAT 10 TIMES IF POSSIBLE

To make this harder, lift your thigh slightly out to the side as go into the marching position, then bring your thigh back in towards center as you lower the leg back down.



EASE
Elder-friendly Approaches to the Surgical Environment

STANDING BASED RECONDITIONING PROGRAM

EASE is Elder-friendly Approaches to the Surgical Environment – a new way of supporting our elderly surgical population while in hospital. For the first time ever, there are now more people in Canada over the age of 65 than there are under the age of 15. We are seeing an increase in older patients requiring surgery, and needing more resources to support them through their post-operative treatment.

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Detailed Instructions

1. SIT TO STAND NO ASSIST

a. While seated in a sturdy chair, firmly plant your feet in front of you with your knees over your toes.

b. Lean forward and slowly begin to rise out of the chair.

c. You may hold a pillow over your incision if this helps with any discomfort.

d. Breathe out as you rise up, then slowly lower yourself back into the chair.

e. Try to avoid using your arms to help you rise off of the chair.

2. CALF RAISES WITH WALL ASSIST

a. Stand in front of a stable support (ie. bed rail, counter top or a wall) with your feet firmly planted.

b. Place your hands onto the support for balance and slowly lift yourself on to your tip-toes.

c. Breathe out as you rise up.

d. Hold for 5 seconds then lower yourself back on to your heels.

MODIFICATION TO MAKE IT HARDER: After lifting on to your tip-toes, step out to side keeping your heels off the floor and then step back before lowering back down. Alternate stepping to each side.

3. HIP MARCHING WHILE SEATED

a. Seat yourself in a stable high-backed chair and plant your feet in front of you.

b. While keeping your knees bent at 90 degrees, start by lifting your right leg up at the hip. (ie. creating the "marching" movement)

c. Only lift as high as feels comfortable.

d. Return the right leg back on to the floor and begin to alternate legs.

MODIFICATION TO MAKE IT HARDER: Lift your thigh slightly out to the side as go into the marching position, then bring your thigh back in towards center as you lower the leg back down.

APPENDIX K:

LOGBOOK INFORMATION PAGE

My Exercise Log Book

This log book belongs to: ______________________________

EASE-BE FIT is an exercise program to help keep you strong after surgery.

Depending on your strength after surgery, you will be assigned one of three exercise routines: Level 1, 2 or 3.

The exercises are self-directed and should be done every day before breakfast, lunch and dinner. If you feel strong enough you are encouraged to do the exercises at other times throughout the day as well.

Use this logbook to keep track of your exercises and to motivate yourself by setting goals for the next day. Write down the number of times you do each exercise in the log book chart.

If any exercises are not done you can write the reason why.

Please don't take the log book home with you. Hand it in to the front desk when you're discharged.

APPENDIX L:

LOGBOOK LEVEL 1

Start Date: Patient ID:

Level 1: Reconditioning Program

Please indicate if you did the exercise 1, 2, or 3 times each day:

Exercise	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
Did you meet with OT/PT today ?							

Reason for not doing exercise each day (check as many that apply):

Forgot							
Too weak							
Told not to do							
Exercise too painful							

If other please specify: ____
____

What are your future goals? ______________________________________
____
____
____

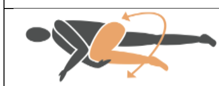
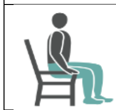
APPENDIX M:

LOGBOOK LEVEL 2

Start Date: Patient ID:

Level 2: Reconditioning Program

Please indicate if you did the exercise 1, 2, or 3 times each day:

Exercise	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
Did you meet with OT/PT today ?							

Reason for not doing exercise each day (check as many that apply):

Forgot							
Too weak							
Told not to do							
Exercise too painful							

If other please specify: ____
____

What are your future goals? ____
____
____
____

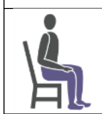
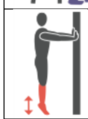
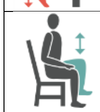
APPENDIX N:

LOGBOOK LEVEL 3

Start Date: Patient ID:

Level 3: Reconditioning Program

Please indicate if you did the exercise 1, 2, or 3 times each day:

Exercise	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
	/3	/3	/3	/3	/3	/3	/3
Did you meet with OT/PT today ?							

Reason for not doing exercise each day (check as many that apply):

Forgot							
Too weak							
Told not to do							
Exercise too painful							

If other please specify: ____
____

What are your future goals? ______________________________________
____
____
____