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Screening Patients for Physical Frailty in the Preoperative Phase

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Screening Patients for Physical Frailty in the Preoperative Phase

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Date of Submission: April 3rd, 2023

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Abstract

Background: Frailty is a syndrome characterized by an increased burden of symptoms and higher susceptibility to adverse health, including higher functional decline rates, pressure ulcers, falls, delirium, extended hospital stay, and discharge to assisted living facilities. Screening patients for frailty before undergoing a surgical procedure is recommended to minimize postoperative complications. In the preoperative phase at a midwestern academic hospital, surgical patients are not screened for frailty using a validated screening tool.

Purpose: This project sought to calculate the Clinical Frailty Scale (CFS) score using a novel algorithm. After validating the novel algorithm, this research project predicted that clinicians would appropriately refer to the novel algorithm to identify frail patients. Other long-term goals included enhancing patient outcomes and influencing organization policies utilizing a frailty screening tool.

Theoretical/Conceptual Framework: The Johns Hopkins Nursing Evidence-Based Practice model was utilized to implement the frailty screening tool and evaluate its impact on frailty identification. The model uses a three-step process involving practice questions, evidence, and translation.

Method: This project utilized existing patient data from the patient's Electronic Medical Record (EMR) and identified physical frailty using a novel algorithm developed by the research team. The CFS, a validated screening tool, was used to validate the novel algorithm's ability to predict frailty.

Results: The correlation coefficient (r) between the novel algorithm and the CFS score from researcher #1 was 0.66835. The r value between the novel algorithm and the CFS score from

researcher #2 was 0.637808. The r value of the CFS scores between researcher #1 and researcher # 2 was 0.8122. These findings suggest that the novel algorithm is a reliable tool for assessing frailty, and that there is agreement between the two researchers in their assessment of CFS. **Conclusion:** In this project, the moderate positive relationship between the novel algorithm score and the CFS score suggest that the novel algorithm may be a useful tool for assessing the same construct as the CFS tool. However, further research is needed to determine the extent to

is more valid, reliable, or efficient than the other. Overall, the findings from this project suggests that the novel algorithm may have clinical significance as a potential alternative or complementary tool to the CFS tool for assessing the same construct.

which the novel algorithm and the CFS tool scores measure the same construct and whether one

Screening Patients for Frailty in the Preoperative Phase

With advances in medicine and equipment, more people, including frail patients, are classified as appropriate to safely undergo surgical procedures. An effective frailty screening tool is beneficial to identify frail patients, so providers can optimize patients' clinical state before they undergo a surgical procedure (Poh & Teo, 2020). In this project, the researchers worked with stakeholders to develop a novel screening tool and the aim was to make it easier to identify frail patients at a midwestern academic medical center.

Background

One in six people over the age of 60 years are frail (Nidadavolu et al., 2020). Frailty is an essential concept in the care of surgical patients, although controversy remains regarding its defining features and clinical utilization. Frailty is a common clinical syndrome in older adults that carries an increased risk for poor health outcomes including falls, incident disability, hospitalization, and mortality (Xue, 2011). An international physician consensus group defined physical frailty as "a medical syndrome with multiple causes and contributors that is characterized by diminished strength, endurance, and reduced physiological function that increases an individual's vulnerability for developing increased dependency and/or death" (Morley et al., 2013, p.4). Frailty decreases the function of multiple organ systems leading to increased vulnerability to minor external stressors, and it is a major concern for surgical patients (Dhesi et al., 2019). It is vital to note that frailty affects the physical aspect of the body and can also significantly affect patients in their functional, emotional, cognitive, and social domains.

Age is the primary factor that is associated with frailty (Tjeertes et al., 2020). Additional factors include smoking, female gender, Hispanic or African American ethnicity, depression, and lower education level (Bandeen-Roche et al., 2015). Since life expectancy continues to rise, the number of frail patients undergoing surgical treatment may increase. There is growing evidence documenting that preoperative frailty is a valid indicator of postoperative complications; therefore, it is vital to identify by screening this growing population for frailty effectively and efficiently so that individualized care is delivered appropriately (Tjeertes et al., 2020).

Problem Statement

At a large academic medical center, providers use screening tools such as the Metabolic equivalents (MET) (Appendix H) and Barthel Index (BI) (Appendix I) to evaluate patients' functional independence and activity level. The Metabolic equivalents are defined as "the caloric consumption of an active individual compared with the resting basal metabolic rate at rest" (Sanghvi, 2013, p.150). One MET is equivalent to 1 kilocalorie per kilogram per hour and is the caloric consumption of a person while at complete rest. Activities of two to four METs include light walking and doing household chores. Running and climbing is considered a MET score of greater than 10, and a higher MET score indicates a higher functional capacity for patients (Sanghvi, 2013). The BI (BI) is a tool used to measure basic activities of daily living (ADL), and it contains ten items with varying weights measuring basic ADL. The BI score is a cumulative score with a maximum score of 100 corresponding to complete independence and a minimum score of 0 corresponding to total dependence (Yi et al., 2020).

Even if these tools provide information that could be used to help to identify physically frail patients, they are not validated to evaluate patients for frailty. When individuals are not properly screened for frailty using validated tools, misguided clinical practices could lead to numerous complications that can worsen their outcomes, creating financial and emotional burdens on patients and society.

Purpose, Aims & Objectives

The main purpose of this research project was to use a validated frailty screening tool, the Clinical Frailty Scale (CFS), to score patients and compare the result with the score derived from a novel algorithm created by the project team utilizing the information from the BI, MET score, and number of comorbidities. After validating the novel algorithm created by the team, this project predicted that the novel algorithm could help to identify physical frailty. By adopting this practice, the long-term goal was for providers to deliver more individualized care to frail patients during the perioperative period. Other long-term goals included enhancing patient outcomes, promoting a holistic view of frailty, and influencing organization policies utilizing a validated frailty screening tool.

PICOT Question

In preoperative assessment providers at a midwestern academic hospital (P), can the use of a novel decision algorithm applied to a frailty screening tool (I) compared to using a validated frailty screening tool alone (C), demonstrate the potential for improved clinicians' ability in identifying frail patients (O)?

Significance/ Organizational Gap

Frailty has significant adverse effects on patients and the health care system. As individuals age, their risk of developing surgical complications increases (Nidadavolu et al., 2020). For instance, surgical patients over the age of 80 have a 20% chance of developing a postoperative complication such as cardiac arrest or pneumonia (Nidadavolu et al., 2020). Furthermore, frail patients have a higher risk of readmission and discharge to skilled care facilities. Notably, the risk of mortality is 4.19 times more likely in frail patients. If frail individuals are not effectively screened, they can have numerous postoperative complications that prolong their hospital length of stay which adds a high healthcare cost (Panayi et al., 2019).

With advancing technologies, one-third of all operating room procedures are done on individuals over 65 years old (Nidadavolu et al., 2020). Jung et al. (2015) demonstrated that frail patients were more likely than non-frail patients to experience postoperative complications such as deep venous thrombosis (DVT), acute renal failure, or the need for blood transfusions (Rothenberg et al., 2019). Frailty also results in a three to eight-fold increase in the risk of postoperative delirium (Jung et al., 2015).

Another study by Birkelbach et al. (2019) demonstrated that individuals identified as frail had twice the incidence of developing postoperative complications compared to non-frail individuals. The mean length of stay in the hospital increased from five days in non-frail individuals to eight days in frail individuals (Birkelbach et al., 2019). Identifying and appropriately using a reliable screening tool would allow frail individuals to consider other mechanisms to treat a disease state or optimize their health leading up to surgery to create a more favorable outcome. For instance, individuals who increased their hemoglobin levels to above 13 g/dl prior to surgery had fewer complications from the surgery (Cui et al., 2017).

This project was implemented at Barnes-Jewish Hospital (BJH) in the preoperative phase on the day of surgery. Currently, a validated frailty screening tool is not used preoperatively to screen patients for frailty. As a result, this provided an opportunity for this research project to implement a new frailty screening method that was validated, effective and user friendly.

Review of Literature

One of the most important aspects of conducting a quality improvement project is identifying reliable evidence based resources and tools (Moran et al., 2020). To answer this clinical question, a literature review of related terms was performed. Reliable databases were assessed during the literature review using databases from the Cumulative Index for Nursing and Allied Health Literature (CINAHL), National Library of Medicine, National Center for Biotechnology Information (NCBI), PubMed, and ProQuest. Published articles within seven years were analyzed to ensure the most relevant information was provided.

A search was formulated using key terms in the search engine of each database. Words and phrases that already existed in the project's PICOT question were used, and other relevant articles were searched using Medical Subject Headings (MeSH). Within CINAHL, search terms utilized included "frailty screening tools", "frailty screening tool and surgery", "frailty and anesthesia care" and "frailty screening tool" and "identification of frail surgical patients." Articles were excluded if they were over seven years of age, with preference given to articles published within the past five years. Other terms utilized within CINAHL were "frailty surgical outcomes" and "frailty effects on surgery". After utilizing the most pertinent articles in CINAHL, articles within PubMed and NCBI were analyzed. MeSH searching terms utilized within these databases included "functional impairment during surgery" and "frailty surgical complications". Boolean operators were used between keywords to narrow or broaden search results. Scholarly journals that were not peer-reviewed were excluded from the list.

Articles were evaluated using the John Hopkins Evidence-Based Practice Model (JHEBP) based on the relevance of information and the quality of the data (Appendix F). Levels of evidence are assigned one to five based (Appendix G) on the methodological quality of their design, validity, and applicability to patient care. For example, Level 1 evidence provides consistent results with robust sample sizes and recommendations. In contrast, Level III evidence provides inconsistent results that make it challenging to create conclusions (Dang & Dearholt, 2018). Within ProQuest, the search terms "frailty and anesthesia care" and "anesthesia effects on the elderly" were utilized. After analysis, a major theme throughout the articles was that the Clinical Frailty Scale (CFS) was identified as a reliable predictor of postoperative complications. Another theme presented throughout the article was that elderly individuals with comorbidities were classified as frail. A third theme was the degree of frailty was positively correlated with a worse outcome from surgery. The search strategies described above yielded numerous findings and are discussed thematically in the following sections.

Clinical Frailty Scale

The Clinical Frailty Scale (CFS) is a tool utilized to summarize the overall level of frailty and fitness of an elderly adult upon examination (Mendiratta & Latif, 2022). The nine-level scoring tool categorizes individuals into a different sub-specialty of frailty based upon their fitness level. Sze et al. (2019) evaluated six different frailty screening tools, and the CSF showed the strongest correlation for identifying frail individuals. Throughout the articles' evaluation, the CFS consistently ranked among the most reliable and user-friendly tools for providers. In these three cohort studies, groups of patients undergoing surgery were followed and evaluated before and after their procedure. The CFS consistently was the most accurate and time-efficient at predicting which patients would develop postoperative complications. The CFS had a correlation coefficient of 0.86 to 0.89 and a sensitivity of 87% with a specificity of 89% in identifying frail patients. Furthermore, the CFS had the lowest misclassification rate of 12% amongst the six frailty tools presented within the study, a p-value of less than 0.001, indicating the results of the CFS were highly statistically significant for identifying frailty (Sze et al., 2019).

Aucoin et al. (2020) provided level 1 evidence demonstrating that the CFS was the strongest assessment tool for identifying frailty. Within this systematic review, 35 different screening tools were analyzed. The CFS was the most sensitive in detecting mortality and nonfavorable discharge with an odds ratio of 4.89 (95% CI, 1.83 to 13.05). In comparison, the Edmonton Frail Scale and the Frailty Phenotype Screening tool had an odds ratio of 2.93 (95% CI, 4.00 to 9.94) and 3.79 (95% CI, 1.75 to 8.22), respectively. Additionally, the CFS had the highest reported measures of feasibility. In this study, the CFS had an odds ratio of 4.89, indicating strong reliability correlating frailty to postoperative complications. Furthermore, the CFS had the strongest capability in detecting mortality and patients being discharged to a site other than their home. Aucoin et al. (2020) also demonstrated that the CFS was easier to use (P< 0.0001), had fewer logistical barriers (P<0.0001) and was faster to conduct (P<0.0001). Additionally, Gregorevic et al. (2016) demonstrated the usability of the screening tool. Among the 35 different screening tools, the most evaluated tools within the systematic review of the studies were the Fried Phenotype, the CFS, the Frailty Index, the Edmonton Frail Scale, and the Katz Instrumental Activities of Daily Living. Amongst those studies, the CFS had the highest completion rate by providers (95%) compared to others. Moreover, the CFS was the most accurate predictor for 90-day mortality rate (Gregorevic et al. 2016).

Age & Comorbidities Associated with Frailty

Another important theme identified was that increasing age and increasing comorbidities were associated with frailty. Basic & Shanley (2015), demonstrated through a prospective cohort study that an increase in coexisting comorbid states was associated with frailty and thus a worse

outcome following surgery. Sze et al. (2019) and Lee et al. (2021), demonstrated through a randomized trial and a systematic review that aging was associated with an increase in comorbid conditions and worse outcome. Sze et al. (2020) demonstrated that frailty was higher in patients with CHF than in control patients (52% vs. 30%) and associated with worse surgical outcomes. Therefore, managing or optimizing the comorbidities before surgery could potentially reduce the risk of post-operative complications.

Lee et al. (2021) demonstrated that individuals with more comorbidities had a higher likelihood of being screened as frail, with a relative risk ratio of 2.35. Diabetes had a relative risk ratio of 1.35 for screening for frailty. Chronic obstructive pulmonary disease (COPD) and previous stroke had a relative risk ratio of 1.44 and 2.37, respectively. Peripheral vascular disease, chronic kidney disease, and congestive heart failure were all associated with an increased risk of frailty. Furthermore, dementia had the highest relative risk ratio for frailty, with a relative risk ratio of 7.51 (Lee et al., 2021).

Basic & Shanley (2015) demonstrated that aging individuals with more comorbidities were more likely to be screened as frail and have higher postoperative complications. In particular, elderly patients had an increased risk of respiratory infection and acute renal failure postoperatively. Furthermore, elderly individuals had a higher risk for stroke and malnutrition. Other significant findings were that elderly individuals had an increased risk for developing urinary retention and seizure disorder, which increased their likelihood of being classified as frail (Basic & Shanley, 2015).

Severity of Frailty Associated with Worse Surgical Outcomes

Montgomery et al. (2021) demonstrated through a prospective cohort study that patients who had more severe levels of frailty experienced worse surgical outcomes. Lee et al., (2021) demonstrated through a systematic review and meta-analysis that elderly individuals with increasing severity of frailty had worse post-surgical outcomes. Four other studies utilizing a retrospective cohort review, a prospective cohort study review, and two retrospective cohort studies demonstrated that the severity of frailty is positively correlated with worse outcomes from the surgery. For example, the CFS is graded on a scale with increasing severity from 1 to 9. A CFS score of greater than or equal to 5 is associated with worse outcomes. Montgomery et al. (2021) demonstrated that the mortality rate for patients undergoing cardiac surgery with a CFS score of 5 or greater is 4% compared to 0.4% if the CFS score is 4 or less. Therefore, a frailty score that increases from <4 to 5, in this study, was correlated with a roughly ten times higher mortality rate. Patients classified as severely frail had a 17.6% chance of requiring 48 hours or more of mechanical ventilation following the procedure compared to only 3.3% of patients classified as mildly frail (Montgomery et al. 2021). Lin et al. (2016) demonstrated that patients classified as severely frail had a 21.7% chance of dying within the first thirty days of surgery compared to only 3.6% of patients classified as mildly frail (Lin et al., 2016). All six of the studies utilized screening tools such as the CFS tool and demonstrated that an increase in the severity of scoring on the screening tool was positively correlated with a worse post-surgical outcome.

Lee et al. (2021) demonstrated that after cardiac surgery, the readmission rate to the ICU was 9.8% in severely frail individuals and 3.3% in mildly frail individuals. Lee et al. (2021) demonstrated that patients screened as frail had an increased mortality rate with a relative risk ratio of 2.35. However, even patients screened as pre-frail were associated with an increased operative mortality rate with a relative risk ratio of 2.03 (Lee et al., 2021).

Curtis et al. (2018) demonstrated that the severity of frailty is positively correlated to increased mortality. Within the study, for every 1-unit increase in the patient's CFS score, the odds of dying increased by 23%. Furthermore, for every 1-unit increase in the patient's frailty score, the likelihood of being discharged to a skilled nursing facility (SNF) compared to home increased by 52%. Sadiq et al. (2018) found similar results for their study using a different model. They categorized patients as severely frail, moderately frail, or not frail using item response theory (IRT) to examine the ability of 32 heterogeneous markers capturing limitations in physical, functional, emotional, and social activity. The patients in severely or moderately frail categorized had higher odds of experiencing postoperative complications than patients categorized as not frail. Furthermore, the severely frail patients had a 10.7% risk of reporting a poorer quality of life after surgery than 9.2% of moderately frail individuals (Sadiq et al., 2018).

These studies demonstrate that the greater the severity in frailty, the higher likelihood of developing postoperative complications. Sze et al. (2019) demonstrated that the CFS had the highest sensitivity and specificity and was the most user-friendly screening tool for clinicians. One strength of the study was that it included a large sample size of 467 patients. Although many frailty screening tools exist, one of the study's limitations was that only three screening tools were evaluated within this study. Another strength of the Sze et al. (2019) study was that it evaluated level I evidence. The Aucoin et al. (2020) study demonstrated that the CFS tool is effective for screening for frailty. The strength of this study was that the odds ratio was more significant than 1, indicating an increase in the reliability of the study. The study demonstrated the CFS was the most effective and convenient screening tool with the highest provider response rate among these studies.

Sze et al. (2019) and Lee et al. (2021) demonstrated that patients with increased age and comorbidities are more likely to be screened as frail. Therefore, in patients undergoing surgery, improving their chronic conditions prior to the procedure can improve postoperative outcomes.

While frailty increases the risk of complications, the severity of frailty is also correlated with postoperative complications. Curtis et al. (2018) and Sadiq et al. (2018) demonstrated that severely frail individuals had worse postoperative outcomes than mildly frail or pre-frail individuals. However, even mildly or pre-frail individuals had worse outcomes compared to non-frail individuals. This demonstrates that improving a patient's fitness leading up to surgery may improve postoperative outcomes.

Patient Population and System Needs

The patient population for this project consisted of patients who were waiting to undergo surgery in the preoperative area of BJH. Since the CFS is approved for and validated on individuals over the age of 65, patients over this age were screened. The patients were tested and screened using a mobile app that screens patients for frailty. When selecting patients to screen for frailty, patients who were seen in the CPAP clinic within the last two weeks with a MET score and BI were intentionally selected.

Evidence for the DNP Project

A review of current literature highlighted the importance implementing and evaluating a practice model for identifying frailty preoperatively to avoid or anticipate and prepare for adverse outcomes after surgery. Based on the level of evidence, the number of supportive articles, and tool content inclusion, the CFS was identified for implementation (Basic & Shanley, 2015; Curtis et al., 2018; Gregorevic et al., 2019; Sze et al., 2017). Data collection, analysis, and

evaluation focused on validating the novel algorithm against the established CFS screening tool with the objective to determine what patient demographics most correlate with frailty.

Theoretical Framework or Evidence Based Practice Model

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was utilized to guide and implement the frailty screening tool and evaluate its impact on increasing frailty identification. The JHNEBP Model is a problem-solving approach to clinical decision-making to guide individual or group use. It is specifically designed to meet the needs of health care providers who are eager to enhance patient care. The model uses a three-step process called PET: practice question, evidence, and translation. The goal of the model is to ensure that the latest research findings and best practices are incorporated into patient care (Dang & Dearholt, 2018). Based on the JHNEBP model, this project's first step was exploring the problem with other healthcare professionals such as a physical therapist, anesthesia providers, clinical care expertise, biostatisticians, and preoperative assessment providers. Defining the clinical problem, background, its significance to patients and the healthcare system were established. The second step in the model entails internal and external searching for evidence related to frailty screening. In this phase, the project appraised, summarized, and synthesized the level and quality of evidence, and developed a recommendation for practice change. The project evaluated and determined the appropriateness of utilizing the novel algorithm as an improved practice model, report results to stakeholders, identify next steps, and disseminate findings.

Methodology

Project Design

Before the team started applying the CFS screening tool, both team members in the project took a free online module (Appendix B) provided by Dalhousie University on how to use the screening tool properly. The team also practiced using the CFS screening tool on case studies provided by the university. After completing education, both team members screened patients in the preoperative phase on the day of surgery utilizing the CFS tool. Each team member screened the same patient independently at different times using the CFS screening tool through the aid of the mobile application (Appendix C), which Dalhousie University provided, resulting in two CFS scores for each patient. The investigators determined potential candidates for the project on the day of surgery from the daily surgery schedules. The project team accessed the patient's name, age, and date of CPAP visit from the EMR before approaching the patient for consent. The Investigators visited patients whose eligibility had been confirmed in the preoperative area and asked them if they were willing to partake in the study. A consent form was provided to review and address any questions or concerns that they may have. Once informed consent was obtained, both investigators screened the patient for frailty using the CFS tool independently.

During the project's second phase, the project team conducted chart reviews on the same patients seen in the preoperative phase. The team accessed the patients' MET, comorbidities, and BI scores from their medical records to derive a CFS score using the novel algorithm. After data collection, the project compared the results of the frailty score between the CFS screening tool and the novel algorithm. To examine the interrater reliability, the project compared the CFS score between each team member. After results were generated from this research project, in an effort to validate the novel algorithm, the team disseminated information to the stakeholders, and future recommendations were proposed.

Health Promotion/Disease Prevention

Frailty in the perioperative phase is a major concern for surgical patients. Screening and optimizing patients before surgery is a significant intervention toward health promotion and disease prevention of frail patients. This project was focused on the development of a practice model for screening patients for physical frailty in the preoperative setting, and the long-term goal was to optimize these patients before surgery to prevent the postoperative complications associated with frailty. Optimizing interventions for frail patients include nutritional, education, low-intensity exercise intervention, and individually tailored geriatric care models before surgery. Possible strategies to prevent frailty include lifestyle/behavioral factors, proper nutrition, and cognitive health maintenance (Walston & Buta, 2018). Short and simple instruments are most feasible in clinical practice (Walston & Buta, 2018), and the project team predicted that screening surgical patients using the CFS helped promote health and prevent diseases.

Stakeholders

There is a need for frailty-related education programs for patients/caregivers and stakeholders to develop an integrated approach for screening and managing surgical patients with frailty (Liu et al., 2022). The project team disseminated the results from this project to provide educational presentations to the stakeholders, such as the project chair, committee member, mentor, CPAP clinic director, and Washington University anesthesia department.

Resources and Budget Assessment

One of the main strengths supporting this quality improvement research project was having access to resources from a major teaching hospital. Barnes-Jewish Hospital (BJC) is supportive and proactive in implementing evidence-based practice (EBP) in its institutions. In 2003, Barnes-Jewish Hospital was the first adult hospital in Missouri to achieve the American Nurses Credentialing Center (ANCC) Magnet Recognition. One of the ANCC's requirements to award Magnet Recognition is the application of existing and new evidence-based practices (American Nurses Credentialing Center, 2020). The staff members are accustomed to quality initiatives, and there is a cultural impetus for ongoing improvement in patient care.

The anesthesia department at Washington University is dedicated to ongoing projects to improve patient care. For instance, Washington University is providing groundbreaking data analyzing the effectiveness of intravenous anesthetic medications versus inhaled anesthetic medications in a new THRIVE study. Therefore, Barnes-Jewish Hospital and Washington University's department of Anesthesiology provide an excellent opportunity for creating and validating a novel algorithm. Another strength of this project was that BJC has 1,273 beds, 51,713 admissions, and 22,030 outpatient surgery visits per year. The hospital provides care services to a diverse population, primarily from the greater St. Louis, southern Illinois, and southeast Missouri regions. The hospital also serves a diverse population from around the world in over 100 different languages (Barnes Jewish Hospital, 2020). This allows the project team to implement the frailty screening tool for a large and diverse sample size.

The team believes that this project is cost-effective, and most of the cost for the QI project came from the personnel time. The project chair is an employee of the Washington University Department of Anesthesiology (WUDA). The project also has a faculty member from the Goldfarb School of Nursing and a mentor that also is employed by WUDA. Two statisticians

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consulted with the project team on data collection and analysis. The CFS screening tool's online education and mobile app were provided for free. Dalhousie University has provided online training modules on their website, providing the training for anyone interested in the subject. There was a total commute distance of four miles for the team members for each day they assess patients at the hospital, and the average gas price in Missouri is \$ 4.71. The project team spent approximately five dollars per day. The software (SPSS) required for data collection and analysis posed a high cost for the project team. The cost of utilizing the SPSS software was \$57 for each team member. The team estimates that the total cost for this QI project was between \$1,989.5 and \$2,715.00 (Appendix J).

Project Site

Barnes-Jewish Hospital (BJH) is a large academic teaching facility in an urban environment dedicated to optimizing surgical care. The project team screened BJH patients in the preoperative phase before they undergo a surgical procedure. The project team only screened patients over the age of 65 because the CFS tool has only been validated on patients over the age of 65. The patients must also have been seen in the Center for Preoperative Assessment and Planning (CPAP) clinic within two weeks before surgery and have their MET and BI score charted on EMR. The CPAP clinic has a clinician team, including ten physician anesthesiologists, thirty nurse practitioners, and thirty registered nurses who specialize in preparing patients for a surgical procedure (Washington University School of Medicine, 2022). **Population**

The project team screened patients over the age of 65 because the CFS tool has only been validated on patients over the age of 65. The inclusion criteria for the sample were patients seen in the CPAP within two weeks before the day of surgery. The patients also needed to have the

CPAP note, BI, and MET score in the EMR. Patients under the age of 65 were excluded from this project. Patients who experienced functional or activity level changes between their CPAP visit and the day of surgery were excluded from the sample. Patients seen in the CPAP clinic were evaluated for activity level (METs) and functional independence (Barthel Index). There was a time gap between patients' visits to the CPAP clinic and the day of surgery. If there was any activity level or functional status change in that period, the project team excluded those patients from the sample.

Ethical Considerations

When conducting a project of this magnitude, it was critical to consider several important ethical considerations. One such consideration was ensuring that patients fully understood the project's instructions and implications before agreeing to participate. To address this, patients were provided with clear information including risks and benefits about the project and signed a form indicating their informed consent. Additionally, the project team was respectful of all ethnicities and cultures, and provided professional translation services when necessary to ensure all participants fully understood the project. In summary, the project team took great care to ensure ethical considerations were addressed throughout the project, in order to protect the rights and wellbeing of all participants.

Recruitment/Sampling Strategy

Patients were not directly recruited for the project but were selected after undergoing a chart review and pre-screening process. A convenience sampling of 100 patient participants was employed. Specifically, the research team identified patients who were 65 or older and met the study's inclusion criteria from the EMR. The researchers then approached and interviewed these

patients in the preoperative holding area before their scheduled surgery. This approach was made possible due to the hospital's large patient population, which provided access to a broad range of participants.

Measurement Instruments

Once consent was obtained from the patient, the project team screened the patient for physical frailty using a novel algorithm that utilized data collected in the CPAP clinic as proxy measures. Currently, the BI and MET score are measured when patients are evaluated in person at the CPAP clinic. The novel algorithm utilizes information from these sources after patients were consented, along with the number of comorbidities to assign each patient a score. Patients were also questioned directly using a validated frailty screening tool, Clinical Frailty Screening (Appendix A), provided by Dalhousie University. Dalhousie also provides a mobile application (Appendix C) as a supportive tool to calculate the CFS score efficiently. The mobile app has the same questions as the paper format, and it is used in this project to generate a CFS score for each patient quickly. Each project team member downloaded the mobile app, and it was only used to generate a CFS score efficiently. The mobile application did not store their answers for each question. The project team put in the answers from the patient's response in the mobile app, and the app generated a CFS score. In other words, the mobile app served as a CFS score "calculator."

A Barthel Index (BI) of 30 or less was a main factor in separating and assigning patients a CFS score. If the patient was terminally ill with a BI of 30 or less, they received a CFS score of 9 but if the BI was greater than 30, they received a CFS score of 8. If the patient required help with basic activities of daily living and had a BI of 30 or less, they received a CFS score of 7 but if the BI was greater than 30, they received a CFS score of 6. If the patient did not require help with basic activities of daily living, then their CFS score was determined by their MET score. The MET score determines the amount of activity and exercise the patient is capable of. A patient with a MET score of 1 received a CFS score of 6 while a MET score of 2 to 3 assigned patients a CFS score of 5.

If the patient did not require help with basic activities or instrumental activities of daily living, they were further subdivided based on their comorbidities. Patients with ten or more comorbidities received a CFS score of 4. Patients with less than ten comorbidities were assigned a score based on their MET score. A MET score of 4 with symptomatic comorbidities received a CFS score of 3. A MET score of 4 with asymptomatic comorbidities received a CFS score of 2 and a MET score of 10 received a CFS score of 1.

In contrast to the novel algorithm created by the researchers, the traditional and validated CFS screening tool (Appendix A) was performed in the preoperative phase on the day of surgery. First, the patients were asked if there were any changes in their activity level or functional status after their CPAP visit. If their answer was "yes", it was also likely that their BI and MET score had changed, so these patients were not further evaluated for frailty. If patients answered "no" to the first question, the project team screened them for frailty using the CFS screening tool. To screen for frailty, the first question is to determine if they are terminally ill with a life expectancy of less than six months to live. The next question examines whether the individual is completely dependent and approaching the end of their life. Moreover, by utilizing the established mobile app, the researchers determined whether the patient was completely dependent on personal care. As the patient is continually evaluated based on their independence level, they were assigned a CFS score. After the CFS score was determined by using the mobile app and the novel algorithm, the scores were compared to help validate the novel algorithm.

Data Collection Procedure

To collect the data, the project team evaluated patients in the preoperative phase through direct patient interviewing and from chart reviews once consent from the patient was secured. Given the time allotted for the project and the number of patients screened, the estimated goal for the number of participants was 100. During the initial period, the patients were screened by the researchers via direct patient interviews. The patients were screened using the validated CFS screening tool via the mobile app and the novel algorithm created by the students. Patients were evaluated in the preoperative area on the day of surgery before providers evaluated their patients and during downtimes. When patients were evaluated, their demographics such as age, sex, educational background, and ethnicity were collected. During the evaluation, the score obtained from the novel algorithm was compared to the score from the CFS screening tool. The data collected from each method was recorded in a data collection table format (Appendix D) and stored in a secure drive provided by the Washington University School of Medicine for data analysis. In addition, all the paper documents utilized in this project were kept secure behind two locked doors.

Data Analysis

Statistical analysis was performed and evaluated using Microsoft Excel with the assistance of statisticians from Washington University, Dr. Arbi Ben Abdallah, and Goldfarb School of Nursing, Dr. George Vineyard. The independent variables within the study were the demographics of the patient including age, sex, ethnicity, and educational background. The dependent variable was the CFS score obtained from performing the CFS screening tool via the mobile app and conducting the novel algorithm. The results were categorized as the project team screened patients for CFS. In one table, the absolute value of the CFS score was obtained and recorded, and this continuous level of measurement was analyzed by an intraclass correlation (ICC) measurement. To further analyze the demographics within the study the mean CFS score for each ethnicity and educational level was compared between researcher #1 and researcher #2.

Evaluation and Outcomes

Results/ Discussion of Findings/Outcomes

During the correlation analysis there were several features analyzed. The CFS score obtained by researcher #1 was compared to the CFS score obtained by researcher #2. By doing a correlation analysis between the data sets from each researcher, the data showed (Appendix L) that the researchers were interviewing the patients correctly and obtaining similar scores. The correlation coefficient (r) between the CFS score obtained from researcher #1 and the CFS score obtained from researcher #2 using the mobile app was 0.812. A r value of 0.8 or greater is associated with a very strong association indicating that the two researchers were receiving similar values when interviewing patients using the established CFS screening tool via the mobile app (Akoglu, 2018).

The second correlation analysis included comparing the CFS score obtained from researcher #1 with the CFS score from the novel algorithm. Furthermore, the CFS score obtained from researcher #2 was compared to the CFS score obtained from the novel algorithm. If the CFS scores obtained from the two researchers using the CFS screening tool were strongly associated and the CFS scores have a positive association with the novel algorithm, then in theory the novel algorithm could be used in the future to produce a frailty score for each patient without interviewing the patient. When comparing the CFS score obtained from researcher #1 with the CFS score from the novel algorithm, the correlation coefficient was 0.668 (Appendix J). When comparing the CFS score obtained from researcher #2 with the CFS score from the novel algorithm, the correlation coefficient was 0.638. A r value of 0.6 to 0.8 indicates a strong association between two values (Akoglu, 2018). Therefore, there is a strong association between the CFS score obtained using the validated CFS screening tool and the CFS score generated from the novel algorithm. Future research could potentially extrapolate this data to verify the use of the novel algorithm in the clinical setting.

The main goal of the statistical analysis was to identify an association between the CFS score generated from the mobile app and the CFS score generated from the novel algorithm. There was a strong association between the two.

Study data were further analyzed to evaluate any association between ethnicity, educational background, and gender to the CFS score. When the data was evaluated, the average CFS score for African American females for researcher #1 was 4.85 (Appendix L). The average CFS score for African American females for researcher #2 was 5.14 and the average from the novel algorithm was 4.43. In contrast, the average CFS score for white females by researcher #1 was 4.09, and the average CFS score for researcher #2 and the novel algorithm for white females was 4.09 and 4 respectively. From that data collection, the data suggests that African American females may be at a higher risk of frailty than white females. However, the sample size was not large enough to draw conclusions based on ethnicity and gender.

When evaluating the different ethnicities and CFS scores for males in the study, similar analysis was conducted. The average CFS score for Asian males obtained from researcher #1 was 4.5. The average CFS score for Asian males from researcher #2 and the novel algorithm was 4.5 and 5 respectively. In contrast, the average CFS score for white males obtained from researcher #1 was 3.51 and the average CFS score for white males obtained from researcher #2 and the novel algorithm was 3.69 and 3.92 respectively. Therefore, the average CFS score for Asian males was consistently higher than the average CFS score for white males. A further analysis between the level of education and the CFS score was conducted but there was no clear correlation or tend between the level of education of the patient and the severity of the frailty score in this data (Appendix L).

Strengths and limitations of Findings

One of the strengths of performing a correlation study is that it shows if two variables are related (Akoglu, 2018). The correlation study showed a strong association between the CFS score obtained from the mobile app and the CFS score from the novel algorithm. Another strength of the study is that correlation findings can serve as a starting point for future research. The data generated from this study can be used in the future to determine if the physical frailty score is correlated with the surgical and post-surgical outcome of patients. Another benefit of a correlation study is that it is easy to classify the results in a tangible manner. The correlation coefficient (r) is a statistical measure of the strength of the linear relationship. The closer the r value is to 1, the stronger the relationship and the closer the r value to negative 1, the stronger the negative correlation (Akoglu, 2018).

One of the limitations of the findings is that correlation does not prove causation. When two variables are correlated that does not indicate that one variable causes another variable (Akoglu, 2018). Furthermore, one of the limitations of the finding is that due to scheduling and delays in the preoperative setting, only 100 patients were included in the study. After reviewing the findings, the majority of patients were Caucasian making it difficult to generalize these results to all ethnicity types. The majority of patients either had four years of college or high school education. Very few of the patients interviewed Another potential limitation of the study was that all the patients were interviewed at the same hospital. Patients who go to a large academic hospital for surgery tend to have a higher acuity of illness and this may have caused the frailty score of the patients in the study to be increased. Another potential limitation of doing a correlation study is that it does not determine what is causing the differences within the study. For example, from our data collection, African Americans had a higher average frailty score than white Americans, but the data does not indicate what cause or factors lead African Americans to have a higher frailty score. Another potential limitation to the study is the impact of the researcher or observe while the patient is filling out the survey. For instance, when a patient is answering questions in the hospital in front of family and the surveyor, the patient might slightly alter their answers to prevent appearing weak or dependent on others. The patient may be embarrassed that they are not able to bathe themselves and therefore they answer questions to make it seem as though they are more independent and less frail than they actually are.

Evaluation of the Process & Outside Influences

The study was supported by Barnes Jewish Hospital, Goldfarb School of Nursing and the Department of Anesthesiology at Washington University in St. Louis. One of the main difficulties of the study was finding an area to interview preoperative patients without interfering with the flow of the hospital setting. Research can often be seen by staff as a distraction from performing their job or an extra chore to complete. Every effort was made to be as succinct and professional with the patients and staff. However, many patients were unable to answer questions for the survey due to other tasks that had to be completed during the preoperative setting to prepare the patient for surgery. While this did not lead to missing data for the patients that were interviewed, it decreased the potential sample size of the study. These outside influences limited the number of patients interviewed for the study and prolonged the results of the study.

System and Practice Impact

Implications for Organizational and Systems Change

The implications of this project are multifactorial. The correlational data obtained from this study can be used in future studies to identify if the CFS scores obtained from the patients correlates with the outcomes and complications from the surgery. Furthermore, the data within the study demonstrated that there is a positive association between the CFS score obtained from the established CFS scale in the mobile app to the CFS score in the novel algorithm. Therefore, with further validation, the novel algorithm could become an automated, established part of the preoperative EMR that aids clinicians in identifying physical frailty and how they manage patient care. In the meantime, clinicians can use the findings of this practice model evaluation to understand how the METs and BI can inform their assessment of physical frailty in the preoperative phase.

Recommendations for Nursing Practice/Sustainability

The recommendation for nursing and advanced nursing practice is that the evidence obtained from this project can be used in the clinical setting. For example, if a patient presents with more than ten comorbidities, they have a higher likelihood of being frail. Being able to identify frailty in the preoperative setting is important to influence and dictate the best possible care for patients. Since the novel algorithm shows a positive correlation to the established mobile app CFS score, the project has the potential to create sustainability in the future. The benefit of using the novel algorithm to score and track frailty is that it does not require staff members to physically interview the patient, saving valuable time in busy preoperative clinic. The algorithm can generate a CFS score based on existing data that already exists in the EMS. Therefore, in the future, quantifying a frailty score for each patient would be sustainable because it does not require additional staff or time to complete once the algorithm is developed and instituted.

Summary and Conclusion

Project Summary & Plans for Dissemination

Accurately identifying and quantifying the severity of frailty in preoperative patients is important because increasing frailty scores have been associated with worse post-surgical outcomes in other studies. Preoperative providers and staff are already busy with many tasks required to prepare the patient for surgery. While instituting a mandatory interview of each patient with the mobile app may not be feasible in the clinical setting, a novel algorithm can serve as a surrogate for interviewing the patient. The novel algorithm takes existing information from the EMR and computes it into a frailty score for each patient. The data depicted in this study show a strong correlation between the frailty score generated from the novel algorithm to the frailty score from the established mobile app. As a result, future studies could work on automatically generating a frailty score in every preoperative patient using the novel algorithm and determining how that correlate to the post-surgical outcomes. The plan for future dissemination is to present the findings at research day to share the results with the academic community. Once the poster and presentation were shared, the plan is to present the results with the staff at the CPAP clinic. Furthermore, results and plans for future implementation of the algorithm in the clinical setting were discussed with the CPAP director.

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Appendix A

The Clinical Frailty Scale Screening Tool

CLINICAL FRAILTY SCALE

ţ	1	VERY Fit	People who are robust, active, energetic and motivated. They tend to exercise regularly and are among the fittest for their age.
1	2	FIT	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.
t	3	MANAGING Well	People whose medical problems are well controlled, even if occasionally symptomatic, but often are not regularly active beyond routine walking.
)	4	LIVING WITH Very Mild Frailty	Previously "vulnerable," this category marks early transition from complete independence. 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.
A	5	LIVING With Mild Frailty	People who often have more evident slowing, and need help with high order instrumental activities of daily living (finances, transportation, heavy housework). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation, medications and begins to restrict light housework.

伯	6	LIVING WITH Moderate Frailty	People who 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.
揻	7	LIVING WITH Severe Frailty	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	LIVING WITH VERY Severe Frailty	Completely dependent for personal care and approaching end of life. Typically, they could not recover even from a minor illness.
4	9	TERMINALLY ILL	Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise living with severe frailty. (Many terminally ill people can still exercise until very close to death.)

SCORING FRAILTY IN PEOPLE WITH DEMENTIA

The degree of frailty generally 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.

In **very severe dementia** they are often bedfast. Many are virtually mute.

Clinical Frailty Scale ©2005-2020 Rockwood, Version 2.0 (EN). All rights reserved. For permission: www.geriatriomedicIneresearch.ca Rockwood K et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

Appendix B

Clinical Frailty Scale Training Modules

https://rise.articulate.com/share/deb4rT02lvONbq4AfcMNRUudcd6QMts3#/

(Dalhousie University, 2020)



TAKE THE MODULE ONLINE

Want to learn more about performing CFS assessments? Take the online *CFS Learning Module* by scanning the QR Code or by following this link: <u>http://www.ohri.ca/aims/cfs/</u>.

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Appendix C

Clinical Frailty Scale Mobile App



(Dalhousie University, 2020)

Appendix D

Data Collection Table

Patient Initial	Age	Sex	MRN	Ethnicity	Educational Background	CFS Score resea rcher #1	CFS Score research er #2	CFS Score Novel Algorithm

Appendix E





Appendix F

JHNEBP EVIDENCE RATING SCALES

STRENGTH of the Evidence								
Level I	Experimental study/randomized controlled trial (RCT) or meta analysis of RCT							
Level II	Quasi-experimental study							
Level III	Non-experimental study, qualitative study, or meta-synthesis.							
Level IV	Opinion of nationally recognized experts based on research evidence or expert consensus panel (systematic review, clinical practice guidelines)							
Level V	Opinion of individual expert based on non-research evidence. (Includes case studies; literature review; organizational experience e.g., quality improvement and financial data; clinical expertise, or personal experience)							

			QUALITY of the Evidence
A	High	Research	consistent results with sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence.
		Summative reviews	well-defined, reproducible search strategies; consistent results with sufficient numbers of well defined studies; criteria-based evaluation of overall scientific strength and quality of included studies; definitive conclusions.
		Organizational	well-defined methods using a rigorous approach; consistent results with sufficient sample size; use of reliable and valid measures
		Expert Opinion	expertise is clearly evident
В	Good	Research	reasonably consistent results, sufficient sample size, some control, with fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence
		Summative reviews	reasonably thorough and appropriate search; reasonably consistent results with sufficient numbers of well defined studies; evaluation of strengths and limitations of included studies; fairly definitive conclusions.
		Organizational	Well-defined methods; reasonably consistent results with sufficient numbers; use of reliable and valid measures; reasonably consistent recommendations
		Expert Opinion	expertise appears to be credible.
С	Low quality	Research	little evidence with inconsistent results, insufficient sample size, conclusions cannot be drawn
	or major flaws	Summative reviews	undefined, poorly defined, or limited search strategies; insufficient evidence with inconsistent results; conclusions cannot be drawn
		Organizational	Undefined, or poorly defined methods; insufficient sample size; inconsistent results; undefined, poorly defined or measures that lack adequate reliability or validity
		Expert Opinion	expertise is not discernable or is dubious.

*A study rated an A would be of high quality, whereas, a study rated a C would have major flaws that raise serious questions about the believability of the findings and should be automatically eliminated from consideration.

Newhouse R, Dearholt S, Poe S, Pugh LC, White K. The Johns Hopkins Nursing Evidence-based Practice Rating Scale. 2005. Baltimore, MD, The Johns Hopkins Hospital; Johns Hopkins University School of Nursing.

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Appendix G

Literature Review

1	Article reference in APA format Type of Evidence: Level and quality of evidence:	Abstract	Study Variables (Demograp hics; IV, DV, or research concept)	Samplin g Method, Sample Size, Setting	Main Findings relevant to Problem or PICOT Question	Strengths	Limitations	Implications/ Recommendations relevant to Problem or PICOT Question
1 <u>Sze et</u> <u>al</u>	Sze, S., Pellicori. P., Zhang, J., Weston, J., & Clark A.L. (2019). Identification of frailty in chronic heart failure. <i>The</i> <i>American</i> <i>College of</i> <i>Cardiology</i> <i>Foundation</i> , 7(4), 291- 302. https://doi.org /10.1016/j.jch f.2018.11.017 Type: Randomized trial Level I, Quality B	OBJECTIVES: This study sought to report the prevalence of frailty, classification performance, and agreement among 3 frailty assessment tools and 3 screening tools in chronic heart failure (CHF) patients. BACKGROUND: Frailty is common in patients with CHF. There are many available frailty tools, but no standard method for evaluating frailty screening tools: the clinical frailty scale (CFS); the Derby frailty index; and the acute frailty network frailty criteria. We used the following frailty assessment tools: the Fried criteria; the Edmonton frailty score; and the Deficit Index. RESULTS: A total of 467 consecutive ambulatory CHF patients (67% male; median age: 76 years; interquartile range [IQR]: 69 to 82 years; median N- terminal pro-B-type natriuretic peptide: 1,156 ng/I [IQR: 469 to 2,463 ng/I]) and 87 control patients (79% male; median age: 73 years; IQR: 69 to 77 years) were studied. The prevalence of frailty using the different tools was higher in CHF patients than in control patients (30% to 52% vs. 2% to 15%, respectively). Frail patients tended to	Demographi cs: Age, Sex, Height, BMI Independent variable: -patients with chronic heart failure, -other comorbiditie s measured using the Carlson comorbidity index/score - medication taken -blood test Dependent: The prevalence of frailty in CHF patients using different screening tools. Measuring Sensitivity, specificity, and misclassifica tion of frailty screening tools.	Sample size: 467 Control subjects: 87 Ambulato ry patients with CHF attending a communit y heart clinic failure clinic dialure clinic enrolled between September 2016 and March 2017. CHF diagnosis was establishe d with reduced EF <40%. Control subjects > 65 years of age, with no previous or signs of CHF. All participant s and control patients were screened	Frailty is common in patients with CHF (54%). CFS is a short and easy to use frailty screening tool that has comparable effectiveness as length frailty assessment in identifying frailty. Overall, CFS has the highest sensitivity and specificity with the lowest misclassifica tion rate: Sensitivity 87%, Specificit	A measure of inter- rater agreement for categorical scales was applied. CFS (0.65), AFN (0.44), DFI (0.34). The authors took proper care of identifying cofounders The sample size was large, n = 467 participants. This large sample size increases the generalizability of the study findings. The same researcher applied the screening tool to all patients which minimizes variation in measurements.	The authors identified the study's limitation to applying the results to other populations with different health care and social system. The authors also acknowledged the existence of many frailties screening tools and only used three of the most used frailty screening tools.	This randomized trial showed that CFS is an efficient and effective frailty screening tool. Our change project is to implement an efficient and user- friendly frailty screening tool to improve clinicians' ability to identify frail patients and attitudes about frailty screening. This article is relevant to our PICOT as we search for the most effective and efficient screening tool to better screen frail patients.

		be older, have worse symptoms, higher N- terminal pro-B-type natriuretic peptide levels, and more comorbidities. Of the screening tools, CFS had the strongest		and assessed by the same researcher using	compared to AFN (K=0.44), and DFI (K= 0.34, p < 0.001). K 60-			
		correlation and agreement with the assessment tools (correlation coefficient: 0.86 to 0.89, kappa coefficient: 0.65 to 0.72, depending on the frailty assessment tools, all p < 0.001). CFS had the highest sensitivity (87%) and specificity (89%) among screening tools and the lowest misclassification rate (12%) among all 6 frailty tools in identifying frailty according to the standard combined frailty index. CONCLUSIONS: Frailty is common in CHF patients and is associated with increasing age, comorbidities, and severity of heart failure. CFS is a simple screening tool that identifies a similar group using more lengthy assessment tools. (J Am Coll Cardiol HF 2019;7:291–302) © 2019 by the American College of Cardiology Foundation.		three frailty screening tools, The Derby Frailty Index (DFI), The Acute Frailty Network Criteria (AFN) and The Clinical Frailty Scale (CFS).	80% is considered good.			
2. <u>Aucoin</u> et al	Aucoin, S.D., Hao, M., Sohi, R., Shaw, J., Bentov, I., Walker, D., & McIsaac. (2020). Accuracy and feasibility of clinically applied frailty instruments before surgery. <i>The</i> <i>American</i> <i>Society of</i> <i>Anesthesiolog</i> <i>ists</i> , <i>1</i> (133), 78-95. <u>https://doi.org</u> /10.1097/AL N.00000000 0003257 Type: A systematic	Background: A barrier to routine preoperative frailty assessment is the large number of frailty instruments described. Previous systematic reviews estimate the association of frailty with outcomes, but none have evaluated outcomes at the individual instrument level or specific to clinical assessment of frailty, which must combine accuracy with feasibility to support clinical practice. Methods: The authors conducted a preregistered systematic review (CRD42019107551) of studies prospectively applying a frailty instrument in a clinical setting before surgery.	Independent variable: Routine preoperative frailty assessment applying a frailty assessment. Dependent variables: Mortality, non- favorable discharge, complication s, delirium.	The study identified 985 titles and abstracts; reviewed 982. The authors assessed 338 full text articles and included 70 studies. Together, the included studies involved 42,954 participant s. All articles were published between 2009 and 2018,	 Based on limited but consistent data, the Clinical Frailty Scale had largest effect size when predicting postoperative mortality with a greater 4.5- fold increase in the odds of death (minimal data) Evidence supports the feasibility of the Clinical Frailty Scale over other frailty instruments 	The authors ensured a broad, peer- reviewed search strategy to medical and allied health databases to include the available literature The reliability of the study findings is increased since the odds ratio was > 1 Statistical heterogeneity (I ²) was reported to evaluate the expression of the inconsistency of studies' results Area Under the Curve (AUC) was reported on some of the studies to	Out of 70 studies, only 10 of them reported relevant function, quality of life or disability outcomes. Such data are key considerations for older people considering surgery	This article is relevant to our PICOT in the process of instituting an efficient and user- friendly frailty screening tool. The article helps to identify an efficient, effective, and user-friendly frailty screening tool.

review and meta-analysis	Medline, Excerpta Medica Database,	regions of origin	such as Fried Phenotype	evaluate discrimination	
	Cochrane Library, and	included			
Level I, Quality P	the Comprehensive	North	-Discussing		
Quality B	Allied Health	Europe	risk of		
	Literature, and	Australia,	nonhome		
	Cochrane databases	Asia, and	discharge is		
	were searched using a	South	relevant		
	peer-reviewed strategy.	America.	before		
	All stages of the review		surgery		
	duplicate. The primary		where the		
	outcome was mortality		strongest		
	and secondary		supports the		
	outcomes reflected		Clinical		
	nation-centered		Frailty Scale,		
	measures; feasibility		as it had the		
	measures were also		largest		
	collected. Effect		with		
	estimates were pooled		nonhome		
	models or narratively		discharge		
	synthesized. Risk of		and lower		
	bias was assessed.		v compared		
			to the Fried		
	results: Seventy studies		Phenotype		
	were included; 45		and Frailty		
	analyses Frailty was		index.		
	defined using 35				
	different instruments;				
	five were meta-				
	analyzed, with the				
	the largest number of				
	studies. Most strongly				
	associated with				
	mortality and				
	was the Clinical Frailty				
	Scale (odds ratio, 4.89;				
	95% CI, 1.83 to 13.05				
	and odds ratio, 6.31;				
	95% CI, 4.00 to 9.94,				
	complications was				
	associated with the				
	Edmonton Frail Scale				
	(odds ratio, 2.93 ; 95%				
	delirium was associ-				
	ated with the Frailty				
	Phenotype (odds ratio,				
	5./9; 95% CI, 1.75 to 8.22) The Clinical				
	Frailty Scale had the				
	highest reported				
	measures of feasibility.				
	conclusions: Clinicians				
	should consider				
	accuracy and feasibility				
	when choosing a frailty				
	evidence in both				
	domains support the				
	Clinical Frailty Scale,				

		while the Fried Phenotype may require a trade-off of accuracy with lower feasibility.						
3. <u>Hui</u> <u>et al</u>	Lin, H., Watts, J.N., Peel, N.M & Hubbard, R.E. (2016). Frailty and post- operative outcomes in older surgical patients: A systematic review. <i>BMC</i> <i>Geriatrics,</i> <i>16</i> (157), 1- 12. doi: 10.1186/s12 877-016- 0329-8 Type: A systemic review Level 1, Quality B	Abstract Background: As the population ages, increasing numbers of older adults are undergoing surgery. Frailty is prevalent in older adults and may be a better predictor of post-operative morbidity and mortality than chronological age. The aim of this review was to examine the impact of frailty on adverse outcomes in the 'older old' and 'oldest old' surgical patients. Methods: A systematic review was undertaken. Electronic databases from 2010 to 2015 were searched to identify articles which evaluated the relationship between frailty and post- operative outcomes in surgical populations with a mean age of 75 and older. Articles were excluded if they were in non-English languages or if frailty was measured using a single marker only. Demographic data, type of surgery performed, frailty measure and impact of frailty on adverse outcomes were extracted from the selected studies. Quality of the studies and risk of bias was assessed by the Epidemiological Appraisal Instrument. Results: Twenty-three studies were selected for the review and they were assessed as medium to high quality. The mean age ranged from 75 to 87 years, and included patients undergoing cardiac, oncological, general,	Demographi cs: age, sex, study location Independent variables: Patient population who had a surgical procedure, frailty score Dependent variables: post- operative mortality or major morbidity, post- operative complicatio ns, prolonged length of stay and discharge to residential care facility	PUBMED , MEDLIN E, EMBASE and Cochrane online databases were searched using search terms of 'frail*' AND 'surg*' in combinati on with ('outcome ' OR 'mor- bidity' OR 'complicat ion'). The literature search identified 686 articles (187 from Pubmed, 169 from Medline, 300 from Embase and 28 from the Cochrane database). From these, 270 duplicate articles were removed. Articles were selected based on inclusion and exclusion criteria. The references of selected articles	There is evidence that frailty is associated with in- creased mortality and morbidity in the older surgical patients. As patients over 75 years old are presenting more commonly for surgery, frailty assessment may have considerable value as a tool for peri- operative assessment.	The reliability of the study findings was increased since the odds ratio (OR) was > 1 The strength of this review is that it is inclusive of all types of surgery, both elective and acute.	Quality of life post- surgery was assessed in only one out of the 23 studies; similarly, functional decline and discharge to a care facility were only evaluated in three and two studies respectively. These two factors are important to elderly patients when making informed decisions. This systemic study lacks to predict some important outcomes post- surgery.	This systemic study reviewed 23 articles and found strong evidence in the association with increased 30-day, 90 day and 1 year mortality, post- operative complications, and length of stay. This study is vital to support the significance of our change project in implementing efficient and user-friendly frailty screening tool.
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			fracture surgeries. There were 21 different instruments used to measure frailty. Regardless of how frailty was measured, the strongest evidence in terms of numbers of studies, consistency of results and study quality was for associations between frailty and increased mortality at 30 days, 90 days and one year follow-up, post- operative complications and length of stay. A small number of studies reported on discharge to institutional care, functional decline and lower quality of life after surgery, and also found a significant association with frailty. Conclusion: There was strong evidence that frailty in older-old and oldest-old surgical patients predicts post- operative mortality, complications, and prolonged length of stay. Frailty assessment may be a valuable tool in peri- operative assessment. It is possible that different frailty tools are best suited for different acuity and type of surgical patients. The association between frailty and return to pre-morbid function, discharge destination, and quality of life after surgery warrants further research.		for further eligible articles. There were 23 articles included in the final analysis.				
4. <u>et</u>	<u>Lee</u> al	Lee, J.A., Yanagawa, B., An, K.R., Arora, R.C., Verma, S., & Friedrich, J.O. (2021). Frailty and pre-frailty in cardiac surgery: a systematic review and meta-analysis of 66,448 patients.	Abstract Background: The burden of frailty on cardiac surgical outcomes is incompletely understood. Here we perform a systematic review and meta- analysis of studies comparing frail versus pre-frail versus non-	Demographi cs: Age, sex Independent variable: frailty Dependent variables: Mortality, prolonged hospital stays, risk of	This study systematic ally searched OVID versions of MEDLIN E and EMBASE. The initial search resulted in 1297. After	Patients that were classified as being frail were older (MD: +2.37, 95% CI [1.47-3.45], p<0.0001) and female (RR: 1.69, 95% CI [1.47-1.94]. Frail patients had lower hematocrit (the odds ratio (OR) and relative risk ratio (RR) was noted > 1 which shows increase in reliability of the study findings. Statistical heterogeneity was estimated using the Higgins Statistic (I ²). For some of the studies or	In some of the studies, the CI is wide and $p > 0.05$, which suggests the precision of the measurement is inadequate.	This is a strong systemic review and meta-analysis in defining frailty. It is also another study that supports the significance of assessing frailty clinically since frailty score regardless of the screening tool could predict some of the outcomes post- surgery. For our change project in instituting an efficient

Journal of	frail patients following	intermediate	duplicate	MD: 3.36%	subgroups, the 12	 and user-friendly
Cardiothorno	cording surgery	care facility	etudios	05% CI [woo > 500/	frailty corronning tool
Caraioinorac	cardiac surgery.	care facility	studies	93% CI [-	was > 30%	franty screening tool,
ic Surgery,		discharge	were	6.59, -0.80],		this study will show
16(184), 1-			removed	and low		support clinicians'
10.	Methods: we searched		and	albumin	the extent of	ability to identify frail
https://doi.o	MEDLINE and		inclusion	(MD: 1.93	variation among the	nationts and predict
ma /10.110(/	EMBASE databases			(MD. 1.55, 0.50)	effects observed in	patients and predict
rg/10.1186/	until July 2018 for		criteria	95% CI [-	different studies	outcomes.
s13019-021-	studies comparing		were	3.06, -0.80,	(between-study	
01541-8	sendice surgerry		applied,	p=0.01].	(between-study	
	cardiac surgery		19	Frail patients	variance) was	
	outcomes in "frail",		unmatche	had	expressed using tau-	
Type: A	"pre-frail" and "non-		d	significantly	squared (Tau ²).	
systematic	frail" patients. Data		u	significantiy		
review and	was extracted in		observatio	greater		
moto opolygic	duplicate Primary		nal studies	concurrent		
meta-analysis	aupheate. I finiary		with	comorbiditie		
	outcome was operative		66,448	s including		
Level 1	mortality.		natients	diabetes		
Develity D			were	COPD		
Quality B	D 1/ T1 10			COLD,		
	Results: There were 19		selected.	pulmonary		
	observational studies			disease and		
	with 66,448 patients.			previous		
	Frail patients were			stroke,		
	more likely female (risk			peripheral		
	ratio [RR]1 7.			vascular		
	0.50/CI.1.5 + 1.0 -14			disconse		
	95%CI:1.5-1.9), older			uisease,		
	(mean difference: 2.4;			chronic		
	95%CI:1.3–3.5 years			kidney		
	older) with greater			disease,		
	comorbidities and			congestive		
	higher STS PROM			heart failure		
	Emailtry (DD2 25)			domontio and		
	Franty (RR2.55;					
	95%CI:1.57–3.51; p <			other		
	0.0001) and pre-frailty			comorbiditie		
	(RR2.03; 95%CI:1.52-			s.		
	2.70: p < 0.00001) were					
	associated with					
	increased operative			Frail patients		
	increased operative			had higher		
	mortality compared			risk scores		
	with non-frail patients.			including		
	Frailty was also					
	associated with greater			Society of		
	risk of prolonged			Thoracic		
	hospital stay (DP 1 82)			Surgery-		
				Predicted		
	95%CI:1.61–2.08; p <			Risk of		
	0.0001) and			Mortality		
	intermediate care			(STS		
	facility discharge			DROM		
	(RR2.71: 95%CI:1.45-			PKOM)		
	$5.05 \cdot n = 0.002$) Frail					
	(Hazard Patio			Frailty on 4		
				r fainty and		
	[HK]3.2/;			pre-trailty		
	95%CI:1.93–5.55; p <			were		
	0.0001) and pre-frail			associated		
	patients (HR2.30;			with		
	95%CI:1.29–4.09: p =			increased		
	0.005) had worse mid-			operative		
	torm mortality (madian			mortality		
				monanty		
	follow-up I years			compared to		
	[range 0.5–4 years]).			non-frail		
	After adjustment for			patients.		
	baseline imbalances.			Frailty was		
	frailty was still			also		
	associated with greater			associated		
	associated with greater			associated		
	operative mortality			with greater		
	(odds ratio [OR]1.97;			risk of		
	95%CI:1.51–2.57; p <			perioperative		
	0.00001), intermediate			stroke and		
	care facility discharge			sternal would		
	(OR4 61: 95%CI:2 79			complication		
	(0, 1, 0, 3)/(0, 1, 2)/(0, 1, 0, 0, 0, 0, 0, 0, 1)			Em il		
	$1.00; p \le 0.00001$) and	1		. Frail		

		midterm mortality (HR1.37; 95%CI:1.03– 1.83; p = 0.03). Conclusion: In patients undergoing cardiac surgery, frailty and pre- frailty were associated with 2-fold and 1.5-fold greater adjusted operative mortality, respectively, greater adjusted perioperative complications and frailty was associated with almost 5-fold risk of non-home discharge.			patients experienced longer ICU length of stay, prolonged mechanical ventilation and higher risk for discharge to an intermediate care facility .			
5. <u>Gregor</u> <u>evic et</u> <u>al</u>	Gregorevic, K.J., Hubbard, R.E., Katz, B., & Lim, W.K. (2016). The clinical frailty scale predicts functional decline and mortality when used by junior medical staff: A prospective cohort study. <i>BMC</i> <i>Geriatrics</i> , <i>16</i> (117), 1-6. doi:10.1186/s 12877-016- 0292-4 Type: A prospective cohort study Level II, Quality B	Background: Increasing frailty is associated with risk of mortality and functional decline in hospitalized older adults, but there is no consensus on the best screening method for use by non- geriatricians. The objective of this study is to determine whether the clinical frailty scale (CFS) can be used to identify patient baseline frailty status in the acute general medical setting when used by junior medical staff using information obtained on routine clinical assessment. Methods: This was a prospective cohort study in an acute general medical unit. All patients aged 65 and over admitted to a general medical unit during August and September 2013 were eligible for the study. CFS score at baseline was documented by a member of the treating medical team. Demographic information and outcomes were functional decline and death within three months. Results: Frailty was assessed in 95 % of 179	Demographi cs: Age (65- 96), Sex (female and male), preferred language (English and non- English), residence Independent variable: Frailty score Dependent variables: Overall mortality, functional decline, length of hospital stay	Setting: a university associated tertiary hospital in general medical unit Sample: 179 eligible patients were admitted between august and September 2013. Doctors were asked to record a Clinical Frailty Screening (CFS) score based on the patient's functional status prior to admission Patients were divided into four groups based on their frailty scores. Patients who were scored at 1-3 on the CFS were	Patients who were more frail were less likely to live home alone ($p < 0.01$). Patients who were moderately to severely frail were most likely to live in residential care ($P < 0.01$). This study also shows that the CFS is highly acceptable to medical staff as there was a 95 % completion rate. There is a positive relationship between the degree of frailty and the risk of mortality and the risk of mortality and the risk of mortality and the risk of mortality. The OR for inpatient mortality was 1.6 (95 % CI 1.48 1.74), which was comparable to the three-	The level of statistical significance was set at 0.05. Baseline characteristics between the groups were compared using the chi squared statistic. The reliability of the study findings is increased since the odds ratio was > 1 Adequate sample size and a high proportion of eligible patients were included.	Bias in selection of subjects and definition bias were identified in the study. All patients aged 65 and over admitted to a general medical unit during August and September 2013 were eligible for the study. Patients who are younger than 65 could be frail based on their philological condition. Author identified that unvalidated tool was used to measure the functional decline of samples; Patients who were from residential care were excluded from the analysis of functional decline, as some of the criteria used to define functional decline were not applicable to this group; unable to include some potential con- founders in the multivariate analysis (nutrition, cognition, delirium)	This article is relevant to our project. The article showed positive attitude of clinicians towards CFS, reflected in a high completion rate (95%) by the medical staff.

		eligible patients, 45 %		defined as	month			
		of patients experienced		not frail	mortality rate			
		for sticked dealing and		(in ortunty fute			
		functional decline and		(group 1),	In our study			
		11 % died within three		patients	of 1.82, 95 %			
		months. 40 % of		who were	CI 1.14, 2.91			
		patients were classified		scored at				
		as vulnerable/mildly		4-5 (group				
		fuell and 41.0/ minuty		4-5 (group				
		Irall, and 41 % were		2) as				
		moderately to severely		vulnerable				
		frail. When patients in		-mildly				
		residential care were		frail.				
		excluded increasing		natients				
		Irality was associated		wno				
		with functional decline		scored 7-8				
		(p = 0.011). Increasing		(group 3)				
		frailty was associated		as				
		with increasing		moderatel				
		mortality within three		v to				
		months $(n = 0.012)$		y to				
		monuns (p $= 0.012$).		severely				
				frail and				
		Construction of A high		patients				
		Conclusions: A high		who				
		proportion of eligible		scored 9				
		patients had the frailty		were				
		measure completed,		were 11				
		demonstrating the		terminally				
		accentability of the		ill but not				
		acceptability of the		otherwise				
		CFS to clinicians.		frail				
		Despite lack of training		(Group 4)				
		for medical staff,		(Group 4)				
		increasing frailty was						
		correlated with						
		for the stand		TT ·				
		functional decline and		Uni-				
		mortality supporting		variate				
		the validity of the CFS		analysis				
		as a frailty screening		was				
		tool for clinicians		norformed				
		toor for ennicialis.						
				for all				
		Kauwarda: A god		variables.				
		Keywolds. Aged,		multivaria				
		Frailty, Hospitalization,		te analysis				
		Survival, Frail elderly,		was				
		Activities of daily		was				
		living		performed				
		inving		using two				
				models.				
				All				
				variables				
				which had				
				- D 1				
				a P value				
				of less				
				than 0.1				
				were				
				included				
				in the				
				in the				
				multivaria				
				te				
				analysis.				
				-				
6	Basic D &	Objective: To evaluate	i	-The study	The overall	-The odds ratio was	-The authors	This study showed that
0.	Sharlow C	the impost of frailer	Demographi	was	in hospital	reported >1 which	acknowladged that	CES is an officiation
Basic	(2015)	the impact of framy,	Demographi	was	m-nospital	reported >1, which	acknowledged that	
and	(2015).	measured using the	cs: Age, sex,	undertake	mortality	signifies the	the interrater	trailty screening tool
Shanlo	Frailty in an	Canadian Study of	language,	n at	was 10%.	reliability of the	reliability of CFS	in predicting outcomes
Sharle	older	Health and Aging	residence	Liverpool	Patients who	study's findings.	were not measured	in the hospital. It
⊻	inpatient	Clinical Frailty Scale		Hospital.	died were			supports our PICOT as
	nonulation	(CSHA-CES) on	Independent	a tertiary	more likely			this article indicates
	Lising the	outcomes of older	variable	referral	to be within	-Since the CI is	-Basic and Shaley	that CES is an
	Using the	outcomes of older	variable:			narrow and $p <$	also stated that the	
	clinical frailty		trailty,	hospital in	the higher	0.05, the precision	results of the study	effective screening
	scale to		measured		CSHA-CFS	stor, are precision		tool in identifying and

predict patient outcomes. Journal of Aging and Health, 27(4) 670-685. doi:10.1177// 8982643145: 8202 Type: A prospective cohort study Level II, Quality B	 people hospitalized with acute illness. Method: Consecutive patients were randomly allocated to a model development sample or a model validation sample. Multivariate analyses were used to model in-hospital mortality, new nursing home placement, and length of stay. Variables selected in the development samples were tested in the validation samples. Results: The mean age of all 2,125 patients was 82.9 years. Most (93.6%) were admitted through the emergency department. Frailty predicted in-hospital mortality (odds ratio [OR] = 2.97 [2.11, 4.17]), new nursing home placement (OR = 1.60 [1.14, 2.24]), and length of hospital stay (hazard ratio = 0.87 [0.81, 0.93]). Discussion: Frailty is a strong predictor of adverse outcomes in older people hospitalized with acute illness. An increased awareness of its impact may alert clinicians to screen for frailty. 	using the Canadian Study of Health and Aging Clinical Frailty Scale, total medical diagnosis (Diagnoses), malnutrition Dependent Variable: in hospital mortality, new nursing home placement, length of stay	Sydney, Australia -2125 participant s admitted between 2010 and 2014 were included in the study. - Geriatricia n determine d the level of frailty using CFS. The determinat ion was predomina ntly based on premorbid data collected and document ed by allied health staff.	categories ($(\chi 2 = 207, p < .0001;$ Mantel- Haenszel $\chi 2$ for trend = 112, p < .0001). The death rates for CFS score 5,6,7 was 3.4%, 6.5%, and 27.4%, respectively. Patients with CFS score 6 (9.2%) and 7 (9%) were newly placed in nursing homes directly from the hospital. The median length of stay (LOS) in the hospital among all 2135 patients was 10 days. Significant predictors of LOS were CFS score, delirium, dysphagia, malnutrition, deconditioni ng, comorbid diseases, and nursing home residence (refer table 5). Patients admitted from nursing home comprised 19.4% of the total sample, and were more likely to be within the higher CFS categories ($\chi 2 = 586$, p < 0.0001; Mantel- Haenszel $\chi 2$ for trend =	of the measurement is adequate, and the results are reliable -Confounders such as medical diagnoses and malnutrition were analyzed to identify variables correlated to the measured outcomes. - The sample size was large, n = 2125 participants. The large sample size increases the generalizability of the study findings to other populations.	can't be extrapolated to all older inpatients and generalized beyond older people.	predicting outcomes of frail patients.

					365, p <			
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7. <u>Curtis</u> <u>et al</u>	Curtis, E., Romanowski, K., Sen, S., Hill, A., & Cocanour, C. (2018). Fraily score on admission predicts mortality and discharge disposition in elderly trauma patients over the age of 65 y. <i>Journal of</i> <i>Surgical</i> <i>Research</i> , 230(1), 13- 19. https://doi.org /10.1016/j.jss. 2018.04.017 Type: Retrospective review Level III, Quality B	AbstractBackgroundAlthough many frailty scalesexist, a single scale has not been agreed upon to define frailty. Herein, we determined whether the Canadian Study on Health and Aging Clinical Frailty Scale (CSHA CFS) can predict the risk of elderly patients for hospital mortality and discharge to skilled nursing facilities (SNFs) following traumatic injury.MethodsCharts from trauma patients aged ≥65 y admitted from December 1, 2011, to December 31, 2013, were retrospectively examined. Age, mechanism of injury, Glasgow coma score, systolic blood pressure and heart rate on arrival, injury severity score, hospital mortality, length of stay, and discharge disposition were recorded. Frailty scores were determined from admission data using the CSHA CFS. Univariate and multivariate analyses were performed.ResultsA total of 1403 patients were included. The mean age was 77.6 ± 8.6 y. Patients with falls presented higher frailty scores than patients who sustained injuries through other mechanisms (4.58 ± 1.2 versus 3.52 + 1 15. P < 0.00001)	Demographi cs: Age Independent variable: Frailty score using CFS. Dependent Score: Mortality, Discharge to SNF, types of injury	A total of 1635 patients aged 65 y and older who were admitted to the hospital for trauma were screened. After inclusion criteria were met, 1403 patients had their frailty score assessed.	Frailty significantly correlated with age (Pearson correlation coefficient: 0.24, P < 0.05) In the study, CFS was a significant predictor of both mortality and discharge to SNF. When comparing patients who died versus those who lived, for every 1- unit increase in frailty score, the odds of death increase in odds of death of 8%, an increase in odds of death of 23% for each one- point increase in frailty score is clinically meaningful. Similarly, when comparing patients discharge to home, for every 1-unit increase in frailty score is clinically meaningful. Similarly, when comparing patients discharge to home, for every 1-unit increase in frailty score	The reliability of the study findings was increased since the odds ratio (OR) was > 1 Narrow confidence intervals were noted which increases the study's precision	The author noted that the sample for this study has a high percentage of uninsured patients, thus the result may not be generalizable to every elderly patient	This study support why screening frailty is significant using CFS. Providers can easily predict the risk of death or discharge to SNF after traumatic experience. Even if the population in this study is not our project's focus, it shows how CFS has a wide acceptance in different settings.

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8 Nidaday	Nidadavolu, L. S. Ebrlich	and were significantly older $(79.5 \pm 8.6 \text{ versus } 73.4 \pm 7.4; P < 0.00001)$. Frailty scores of nonsurvivors were significantly higher than those of survivors $(4.6 \pm 1.3 \text{ versus } 4.2 \pm 1.2; P < 0.01)$. Age, Glasgow coma score, and CSHA CFS combined were associated with mortality (odds ratio: 1.52; confidence interval: $1.37-1.69$). A higher frailty score was associated with earlier death and increased mortality. Conclusions CSHA CFS is simple and provides frailty scores that can help identifying elderly patients at high risk for in-hospital mortality and discharge to SNF following traumatic injury. Background: Perioperative	Demographi cs: Patients	A total of 1869 titles	A higher rate	The reliability and validity of the	Limitations of this review include	This article is very relevant to our PICOT
olu et al.	A. L., Sieber, F. E., & Oh, E. S. (2020). Preoperativee valuation of the frail patient. <i>Anest</i> <i>hesia and</i> <i>Analgesia</i> , <i>13</i> <i>0</i> (6), 1493– 1503. https://doi.org /10.1213/AN E.000000000 0004735 Type: prospective cohort study Level II	management of older adults is a complex field that is heavily influenced by the clinical heterogeneity of older adults. Frailty—a geriatric syndrome in which a patient is more vulnerable to stressors due to decreases in physical function and reserve—has been indicative of adverse postoperative outcomes. Many tools have been developed to measure frailty that incorporate a variety of factors including physical and cognitive function, comorbidities, self-reported measures of health, and clinical judgment. Most of these frailty a subset of patients at risk of adverse outcomes including poctomerative	greater than or equal to the age of 65 who are undergoing surgery. The independent variable is the type of frailty score used. The dependent variable is the postoperativ e complication s, length of stay, postoperativ e mortality, 30-day readmission rates	were identified. The study identified 1510 titles and abstracts that were identified.	postoperative complication s were associated with frailty status. This is relevant to our PICOT project because it shows that by identifying patients who are frail we can reduce the amount of postoperative complication s. The odds ratio is 3.87. The 30-day readmission rate was higher in the frailty group with an odds ratio of 1.6.	findings within the study is increased due to the odds ratio being greater than 1. The strengths of this narrative review include a comprehensive evaluation of frailty assessment tools that were specifically validated in surgical populations as well as postoperative outcomes that have been examined among individuals who were identified as frail using these tools.	focusing on adults over age 65. There are studies examining frail patients who are <65, particularly in cancer, cardiac surgery, and transplant medicine fields that were excluded based on our criteria. An additional limitation is that studies looking at oncologic surgeries and those with concurrent or pre- ceding chemotherapy were also excluded. The presence of cancer and chemotherapy can be an additional stressor to older adults, and patients with a history of cancer have significantly higher rates of frailty and	question. It is important to know the relevance of postoperative complications in patients who are frail because we can intervene to reduce those postoperative complications with an effective frailty screening tool. The length of stay for individuals who are frail is longer. This is of significance importance because we can reduce the length of stay for the patient and improve the surgical outcomes. Post-operative mortality and 30-day readmission rates were increased in the frailty group showing that it is important to identify these factors and to intervene to prevent complications.

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		assessing different surgical techniques or approaches, studies focusing on the economic and financial impact of frailty, and conference abstracts. In addition, studies that did not utilize all components of previously validated frailty tools (eg, only using gait speed or handgrip strength) were excluded. We also reviewed reference lists in relevant review articles to identify additional studies. Articles were reviewed by L.S.N. and A.L.E., and consensus was reached for final inclusion of eligible studies. Of the 1869 articles initially identified, 32 articles met all inclusion and exclusion criteria						
9 <u>Panayi</u> <u>et al</u>	Panayi, A. C., Orkaby, A. R., Sakthivel, D., Endo, Y., Varon, D., Roh, D., Orgill, D. P., Neppl, R. L., Javedan, H., Bhasin, S., & Sinha, I. (2019). Impact of frailty on outcomes in surgical patients: A systematic review and meta- analysis. <i>Ame</i> <i>rican Journal</i> of <i>Surgery</i> , 218(2), 393–400. https://doi.org /10.1016/j.am jsurg.2018.11 .020 Type: Type: A systematic review and meta-analysis Level I	Age has historically been used to predict negative post-surgical outcomes. The concept of frailty was introduced to explain the discrepancies that exist between patients' chronological and physiological age. The efficacy of the modified frailty index (mFI) to predict surgical risk is not clear. Objective: We sought to synthesize the current literature to quantify the impact of frailty as a prognostic indicator across all surgical specialties. Data Sources: Pubmed and Cochrane databases were screened from inception to 1 January 2018.	Demographi cs: Elderly individuals over the age of 65 undergoing surgery. Independent variable is different frailty scores and the dependent variables are mortality, major complication s, wound complication s, reoperation, and re- admission rate.	Articles were included that were prospectiv e or retrospecti ve and included cohort studies, randomize d controlled trials and case- control studies were identified and analyzed. Articles were selected via a two- stage process. In the second stage the manuscrip t of eligible studies was assessed for inclusion.	Frail patients were more like to experience complication s, major complication s and wound complication s. The risk ratio was greater than 1 in all three outcomes indicating an increased risk for the patients identified as frail with a confidence interval of 95%. Frailty patients were more likely to be discharged to a non-home facility such as a skilled nursing facility. Notably, the risk of mortality was 4.19 times more likely in frail	There was an adequate sampling size with 683,487 patients and 444,885 of those were deemed frail. The relative risk ratio was greater than 1 in the results of complications, wound infection and readmission rates. The higher the relative risk ratio the stronger the association between frailty and the development of complications.	This study carries limitations commonly seen with systematic reviews and meta- analyses. First, the quality of this meta- analysis is dependent on the quality of the studies it analyzes, all of which are non-randomized. Non-randomized studies carry inherent biases, including selection bias. All included studies are case series which tend to be perceived as lighter surgical research evidence because of several short- comings including having vague objectives and exaggerated conclusions. However, they carry relevance to a certain degree as proof of a potential cause-effect relationship. ⁵⁶ Acce pting the limitations	This study is a valuable resource for our study. It is important to identify patients that are at risk for frailty. This study demonstrates with a high risk ratio that patients screened as frail are more likely to have wound infections and readmission rates. Furthermore patients identified as frail were more likely to have another operation to improve their illness. A mortality rate that is 4.19 times the rate of non-frail patients clearly indicates the importance of an effective frailty screening tool.

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		risk of readmission (RR 1.61, 95%CI 1.44–1.80; p<0.001) and discharge to skilled care (RR 2.15, 95%CI 1.92–2.40; p<0.001). Notably, the risk of mortality was 4.19 times more likely in frail patients (95% CI 2.96–5.92; p< 0.001).						
10 Robinso n et al.	Robinson, T. N., Walston, J. D., Brummel, N. E., Deiner, S., Brown, C. H., 4th, Kennedy, M., & Hurria, A. (2015). Frailty for Surgeons: Review of a National Institute on Aging Conference on Frailty for Specialists. <i>J</i> ournal of the American College of Surgeons, 22 I(6), 1083– 1092. https://doi.org /10.1016/j.ja mcollsurg.20 15.08.428 Type: A Systematic Review Level II	Frailty represents one of the most critical issues facing health care due to its inherent relationship with poor health care outcomes. Frailty is present in 10% to $20%$ of individuals 65 years and older ^{1,2} and increases with advancing age. Currently, 15% of the United States population is 65 years and older; a number that is forecast to increase to 21% by the year 2030. ³ Older adults make up a large portion of surgical practice in the United States. In 2010, 37% of all inpatient operations performed in the United States were in patients 65 years and older, ⁴ and this percentage will rise in the coming decades. ⁵ Given the inevitable rise of the aging population, it is vital that surgeons understand the concept of frailty and how it may affect surgical decisions and outcomes. To address this gap in knowledge, the National Institute on Aging and the American Geriatrics Society sponsored a 2- day conference held March 2 and 3, 2015, specifically addressing the topic of frailty for specialists. Global leaders in frailty management and research served as faculty. The purpose of this manuscript is to summarize the key	Demographi cs- Older adults over the age of 65 undergoing surgery. The independent variable was the different definitions of frailty and different frailty screening tools. The dependent variable is surgical outcomes.	3 studies were examined to identify the relationshi p between frailty and poor surgical outcomes. Dasgupta and colleagues measured frailty preoperati vely with the Edmonton Frail Scale. Robinson and colleagues found that an accumulat ion of a high number of frailty characteri stics were related to an increased risk of 6- month mortality. Makary and colleagues examinate d frailty after surgery and discharge to an institution al care facility.	From this analysis, it was identified that there was an increased risk of postoperative complication s with an odds ratio of 5.02 for individuals who were frail. Dasgupta and colleagues ² measured frailty preoperativel y with the Edmonton Frail Scale and found that high frailty scores were associated with increased postoperative complication s (odds ratio [OR] 5.02; 95% CI 1.55 to 16.25) and a lower chance of being discharged home (40%; p = 0.02). Robinson and colleagues ¹⁰ found that accumulation of a high number of frailty characteristic s was related to an increased	The strengths of this study was that there were a lot of different screening tools identified that can help us sort out which ones are the most beneficial. Multiple factors that contribute to frailty were investigated including phenotypic frailty, deficit accumulation frailty index, resilience and frailty, frailty and social vulnerability, CHF, ESRD, and other factors. The reliability of the study findings is strong because there was an increased risk of postoperative complications with an odds ratio of 5.02. An odds ratio greater than 1 increases the strength of the relationship between frailty and complications.	One of the limitations of the study was that the systematic review relied on a relatively limited number of databases when identifying the eligible studies. Another limitation is that search strategies are not provided in detail.	One of the benefits of this article and how it applies to our project is that it breaks down the criteria from different frailty evaluation tools. For example, it looks in detail at the different criteria that make up the different tools. This will allow us to best choose the most appropriate frailty screening tool. For example certain aspects such as walking speed, history of dementia, and the presence of social support are identified and evaluated in detail with regards to the frailty screening tool.

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Scheier, L. M., Avidan, M. S., & Ben Addallah, A. (2018). Frailty. Phenotypes and Relations With Surgical Outcomes: A. Ralsein, 12 T(4), 1017- 1027. https://doi.org (7(4), 1017- 1027. https://doi.orgpatient is can eff cass fired dependent. hospital relationspatient is cassified into and frail, markers and linical approaches cast frailty a a "burden" without markers and their release and their relatives and elinical approaches cast frailty analgesia, 12 relatives hospitalpatient is calinical approaches cast frailty a aburden" without relatives haspital relatives haspital compositionpatient is calinical approaches cast frailty a aburden" without post- operative hospital relatives haspital complication analgesia, 12 reliable assessment of frail or analgesia, 12 reliable assessment of frail that can validly predict postoperative health outcomes.patient is calinical calinical approaches cast fraility as "burden" without markers and their relevant to complication frail that can validly predict postoperative health outcomes.patient is calinical complication rate.patient is calinical patients is complication post- complication severely frail the surgery, and the ath outcomes.patient is calinical completed portpatient is calinical markers and linical as "burden" without post- operative completed proportion of the surgery, and relative the surgery, and the surgery, and the surgery, and the ath outcomes.patient is calinical contraition relative the surgery, and the surgery, and the surgery, and relativepatient is	11 <u>Sadiq e</u> <u>al.</u>	Sadiq, F., Kronzer, V. L., Wildes, T. S., McKinnon, S. L., Sharma, A., Helsten,	Abstract BACKGROUND:	Demographi c is elderly individuals undergoing surgery. The independent variable is	Patients were consented to participate in the project during their	Severely Frail (OR =1.89, 95% CI =1.42 to 2.50) and Moderately Frail patients	One of the strengths of this study is that it broke down the characteristics of each group based on the severity of frailty. Rather than	There are several important limitations associated with this study. The surgical patients originated from a single center	This study is beneficial to our study for a number of reasons. One of the unique features of this study is that it was conducted at Barnes-Jewish
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M. S., & Ben Abdallah, A. (2018). Frailty With Surgical Outcomes: A Latent Class Analysis. Ane sthesia and parced trees. (2017). TiO2.7. https://doi.org (10.1213/AN E.000000000 0003695older adults although controversy remains frail.other beneficial at the granding its defining frail.at the at the granding its defining frail.at the sunding frail.at the sunding frail.out of sunding its dudit.M. S., & Ben visitionM. S., & Ben dependent variables are post- operative squality of frail.at the granding its defining frail.at the granding its defining granding its defi	11 <u>Sadiq e</u> <u>al.</u>	Sadiq, F., Kronzer, V. L., Wildes, T. S., McKinnon, S. L., Sharma, A., Helsten, D. L., Scheier, I.	Abstract BACKGROUND: Frailty is an important	Demographi c is elderly individuals undergoing surgery. The independent variable is whether the patient is	Patients were consented to participate in the project during their preoperativ e clinical	Severely Frail (OR =1.89, 95% CI =1.42 to 2.50) and Moderately Frail patients (OR =1.31, 95% CI	One of the strengths of this study is that it broke down the characteristics of each group based on the severity of frailty. Rather than grouping all frail patients together	There are several important limitations associated with this study. The surgical patients originated from a single center reflecting the demographic	This study is beneficial to our study for a number of reasons. One of the unique features of this study is that it was conducted at Barnes-Jewish Hospital and is especially relevant to
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(2018). Frailty Phenotypes and Relations With Surgical Outcomes: A Latent Class Analysis. Ane sthesia and analgesia, 12 7(4), 1017- 1027. https://doi.org /10.1213/AN E.00000000 0003695regarting is detining frail or subtrance fail or subtrance frail or severely frail. or severely frail. or preoperative severely frail. or severely frail. or severely frail. or severely prost- operative severely frail. or severely frail. or severely frail. or severely frail. or severely preoperative severely frail. or severely frail. or severely frail. or severely frail. or severely frail. or severely frail. or severely frail. or severely frail. or severely frail. This allows us to identify to identify the severencing frail. This allows us to identify the severence or markers back down frailty into the severencing poet complication severely frail.broke down frailty into addition, most of the severencing to identify the severence or the current findings with different and more heterogeneous confirm that frailty subtypes exist independent of environmental completed information frailty that can validly predict postoperative health outcomes.frail or fraile severely frail 	11 <u>Sadiq e</u> <u>al.</u>	Sadiq, F., Kronzer, V. L., Wildes, T. S., McKinnon, S. L., Sharma, A., Helsten, D. L., Scheier, L. M., Avidan, M. S., & Ben	Abstract BACKGROUND: Frailty is an important concept in the care of older adults although controversy remains	Demographi c is elderly individuals undergoing surgery. The independent variable is whether the patient is classified into not frail,	Patients were consented to participate in the project during their preoperativ e clinical evaluation at the Barnes-	Severely Frail (OR =1.89, 95% CI =1.42 to 2.50) and Moderately Frail patients (OR =1.31, 95% CI =1.03 to 1.67) both	One of the strengths of this study is that it broke down the characteristics of each group based on the severity of frailty. Rather than grouping all frail patients together, there were separate groups that were	There are several important limitations associated with this study. The surgical patients originated from a single center reflecting the demographic composition of this particular hospital	This study is beneficial to our study for a number of reasons. One of the unique features of this study is that it was conducted at Barnes-Jewish Hospital and is especially relevant to our study and data. Another beneficial
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	Type: A		time of	quality of	more severe the	mentioned within	
	Retrospective	METHODS	consent,	life after	frailty, the higher	the study are	
	Cohort Study	METHODS:	and data	surgery	the odds ratio and	potential missing	
	conort Study	.	from	compared to	the stronger the	information from	
	L aval III	In a retrospective study	follow-up	Moderately	association between	the detabase but	
	Level III	of 2,828 unselected	surveys		association between		
		surgical patients, we	completed	Frail (9.2%)	the severity of	70% of the original	
		used item response	by the same	and Not Frail	frailty and	database maintained	
		theory to examine the	patients	(8.3%)	postoperative	complete data.	
		ability of 32	approximat	patients (p	complications.		
		heterogeneous markers	ely 30 days	<0.001).			
		capturing limitations in	and one	There was no			
		physical functional	postoperati	significant			
		physical, functional,	vely Data	difference			
		emotional, and social	available	among these			
		activity domains to	for this	groups in			
		indicate severity of	study	proportions			
		frailty as a latent	covered	reporting			
		continuum. Eighteen	seven	hospital			
		markers efficiently	months in	nospitai			
		indicated frailty	2014. At	readmission			
		severity and were then	that time,	(5.6%, 5.1%,			
		subject to latent class	the total	and 3.8%,			
		analysis to derive	number of	respectively;			
		discrete phenotypes.	surgical	p =0.067).			
		Next, we validated the	patients				
		obtained frailty	wno were				
		nhenotypes against	preoperativ				
		patient reported 20 days	elv at the				
		patient-reported 50-day	CPAP and				
		postoperative outcomes	had surgery				
		using multivariable	was 18,735				
		logistic regression.	of which				
		Models were adjusted	12,877				
		for demographics,	consented				
		comorbidity, type and	over the				
		duration of surgery, and	entire 2014				
		cigarette and alcohol	period. The				
		consumption	number of				
		•ensumption:	actual				
			surgeries				
			performed				
		RESULTS:	in the /-				
			month				
		The 18 markers	salaatad far				
		provided psychometric	this study				
		evidence of a single	involved				
		reliable continuum of	10.491				
		frailty severity. Latent	patients of				
		class analyses produced	which				
		three distinct subtypes	7,043				
		hased on natients'	(67%)				
		andorsement	consented				
		probabilition of the	to have				
		frailty indicators: N-t	their data				
		France indicators: Not	included in				
		Frail (49.7%),	the				
		Moderately Frail	SATISFY-				
		(33.5%), and Severely	SOS				
		Frail (16.7%). Unlike	registry and				
		the Moderate class,	4,042 (3/%) of those				
		Severely Frail endorsed	consented)				
		emotional health	actually				
		problems in addition to	completed				
		physical burdens and	both				
		functional limitations	baseline				
		Models adjusting for	and 30-day				
		age sex tups of	surveys, as				
		age, sex, type of	of the				
		anestnesia, as well as	beginning				
		intra-operative factors	of this				
		indicated that Severely	investigatio				
		Frail (OR =1.89, 95%	n. We then				
		CI =1.42 to 2.50) and	excluded				
		Moderately Frail	patients				
1			WIUI	1	1	1	

		patients (OR =1.31, 95% CI =1.03 to 1.67) both had higher odds of experiencing postoperative complications compared to Not Frail patients. In a three-way comparison, a higher proportion of Severely Frail patients (10.7%) reported poorer quality of life after surgery compared to Moderately Frail (9.2%) and Not Frail (8.3%) patients (p <0.001). There was no significant difference among these groups in proportions reporting hospital readmission (5.6%, 5.1%, and 3.8%, respectively; p =0.067). CONCLUSIONS: Self-report frailty items can accurately discern three distinct phenotypes differing in composition and their relations with surgical outcomes. Systematically assessing a wider set of domains including limitations in functional, emotional and social activities can inform clinicians on what precipitates loss of physiological reserve and profoundly influences patients' lives. This information can help guide the current discussion on frailty and add meaningful clinical tools to the surgical practice.		missing data in any of the selected data fields (demograph ic variables, frailty items, and patient- reported outcomes), yielding an analysis sample of 2,828 patients with complete information An extensive literature review produced 52 common frailty measures across different assessment strategies. A total of 32 of these matched up against our medical institution's preoperativ e anesthesia electronic medical records.				
12 Rothen Borg et J. F ed E. I Tric Tric al W., A. I Joh Joh M., T., S. (c) Ass of I	thenberg, A., Stern, A., George, L., ckey, A. , Morris, M., Hall, E., banning, J. , Hawn, M. & Arya, (2019). sociation Frailty and	Importance Ambulatory surgery in geriatric populations is increasingly prevalent. Prior studies have demonstrated the association between frailty and readmissions in the inpatient setting. However, few data exist regarding the	The demographic s were geriatric population that was undergoing elective surgeries in an ambulatory outpatient setting.	The sampling size and sampling method consisted of 417,840 patients undergoin g elective outpatient surgical	Table 2 breaks down the complication s within 30 days amongst frail individuals and non-frail individuals. Certain complication s were much more	One of the strengths of a retrospective cohort study is that it can analyze multiple outcomes. There were a lot of parameters related to frailty assessed during this study. In particular this study focused on the 30- day readmission rate which is an important aspect for	One of the limitations of this study is that it is difficult to follow a 30-day readmission rate. For example, if the patient is readmitted to a different hospital within 30 days those records might not coincide with the original hospitals	30-day readmission rate is a particularly important aspect in caring for post- operative patients. 30- day readmission rates can be harmful for the patient and can lead to further complications. Identifying the aspects of a frailty screening that screen out frail patients can be utilized

	Postoperative Complication s With Unplanned Readmissions After Elective Outpatient Surgery. JAM A network open, 2(5), e194330. https://doi.org /10.1001/jam anetworkopen .2019.4330 Type: A Retrospective Cohort Study Level III	association between frailty and readmissions after outpatient procedures. Objective To examine the association between frailty and 30-day unplanned readmissions after elective outpatient surgical procedures as well as the potential mediation of surgical complications. Design, Setting, and Participants In this retrospective cohort study of elective outpatient procedures from 2012 and 2013 in the National Surgical Quality Improvement Program (NSQIP) database, 417 840 patients who underwent elective outpatient procedures were stratified into cohorts of individuals with a length of stay (LOS) of 0 days (LOS = 0) and those with a LOS of 1 or more days (LOS \geq 1). Statistical analysis was performed from June 1, 2018, to March 31, 2019. Exposure Frailty, as measured by the Risk Analysis Index. The main outcome was 30-day unplanned readmission.	The independent variable was the level of frailty and frailty screening tool used and the dependent variable was the length of stay, complication s from surgery, and the main outcome was 30-day unplanned readmission.	procedure s.	pronounced than others. For example, urinary tract infections were 1.6% in frail individuals compared to 0.4% in the non-frail individuals. This demonstrates that frail individuals are more suspectable to urinary traction infections and renal insufficiency . Frail individuals were 10 times as likely to develop renal insufficiency compared to non-frail individuals.	surgical patients. We can use this information to reduce the 30-day readmission rate in future patients. In multivariate analysis, frailty doubled the risk of unplanned readmission (LOS = 0: adjusted relative risk [RR], 2.1; 95% CI, 2.0- 2.3; LOS \geq 1: adjusted RR, 1.8; 95% CI, 1.6-2.1). A relative risk ratio greater than 1 strengthens the association between frailty and unplanned readmission rate.	conducting the study. Another limitation is this study primarily evaluated outpatient surgical procedures in a ambulatory surgical setting and therefore might not translate to other surgery centers or hospital systems. Therefore, the results might not be generalizable.	to reduce the 30 day readmission rate.
13 <u>Montgo</u> <u>mery et</u> <u>al</u>	Montgomery, C., Stelfox, H., Norris, C., Rolfson, D., Meyer, S., Zibdawi, M., & Bagshaw,	Background: The identification of frailty before complex and invasive	demographic s were patients who were 50 years old or older	nis was a prospectiv e observatio nal cohort study. Patients	or the available data, some of the data that is more pertinent to our PICOT	some of the strengths of this particular study that it has a comprehensive collection of preoperative	One of the limitations of the study is that the clinical frailty scale (CFS) was derived and validated in an older ambulatory	Clinical Frailty Scale (CFS) was specifically used to assess for frailty in patients. By studying frailty in cardiac surgery

14	S. (2021). Association between preoperative frailty and outcomes among adults undergoing cardiac surgery: a prospective cohort study. <i>CMAJ</i> <i>open</i> , 9(3), E777–E787. https://doi.org /10.9778/cma jo.20200034 Prospective Cohort Study Level II	procedures may have relevance for prognostic and recovery purposes, to optimally inform patients, caregivers and clinicians about perioperative risk and postoperative care needs. The aim of this study was to estimate the prevalence of frailty and describe the associated clinical course and outcomes of patients referred for nonemergent cardiac surgery. Methods: A prospective cohort of patients aged 50 years and older referred for nonemergent cardiac surgery in Alberta, Canada, from November 2011 to March 2014 were screened preoperatively for frailty, defined as a Clinical Frailty Scale (CFS) score of 5 or greater. Postoperatively, patients were followed by telephone to assess CFS score, health services use and vital status. The primary outcome was all-cause hospital mortality. Secondary outcomes included health services use, hospital discharge disposition, 1-year health-related quality of life and all-cause 5-year mortality.	referred for non- emergent cardiac surgery in Alberta, Canada. The independent variable was whether the patients were classified as frail and the dependent variables were post- operative surgical outcomes such as hospital mortality rate and length of stay.	aged 50 years and older referred to the adult $(\geq 18 \text{ yr})$ cardiac surgery programs at the Foothills Medical Centre in Calgary and the Mazanko wski Alberta Heart Institute in Edmonton , Alberta, Canada, for nonemerg ent surgery between November 2011 and March 2014 were eligible for enrolment. The 2 adult cardiac surgery programs perform an average of 2800 adult surgical procedure s annually. Frailty was assessed using the validated 9-point ordinal Clinical Frailty Scale (CFS), a subjective global assessmen t of fitness	question is that frail patients were more likely to experience postoperative bleeding, as well as an acute kidney injury. This coincides with previous studies that demonstrated an increased risk of acute kidney injury. Frail individuals also experienced a higher rate of bleeding, blood transfusion, and renal replacement therapy compared to non-frail individuals. Hospital mortality was almost 10 times higher in frail individuals (9.8%) compared to nonfrail patients (1.0%).	validated frailty measures. Throughout our project, we can use this study to identify pertinent aspects of the frailty screening process. Furthermore, this study did a remarkable job at following the patients on a long- term objective outcome for patients living with frailty.	population and has not been specifically evaluated against a gold standard such as a comprehensive geriatric assessment in the cardiac surgery setting. Another limitation is that the study was somewhat small and therefore was predisposed to selection bias because it was not able to compare to patients not enrolled or patients not enrolled or patients counselled not to undergo surgery. Furthermore, the generalizability of the study might be limited to other health jurisdictions. Another limitation is that it might be subject to recall bias when individuals describe their quality of life. Another strength of the study is the p value. The lower the p value the greater the statistical significance of the observed difference. Frail patients were more likely to experience postoperative bleeding 15.7% compared to 4.8% with a p value of 0.002 and acute kidney injury had a P value of 0.007. The low p value indicates a strong relationship between frailty and bleeding and kidney injury.	I chose this study because it evaluated
<u>Tjeertes</u> et al.	J., Mattace- Raso, F., Hoofwijk	predictor of adverse postoperative events than chronological age	s were elderly individuals	literature was	comparison of postoperative	that it included eleven frailty assessments and	heterogeneity of the study, and another limitation is the	eleven different frailty screening tools. Many of the studies used the
	11001wIJK, A.,	man emonological age.	murviduals	performed	posioperative	assessments and	miniation is the	or the studies used the

Stolker, R. J., & Hoeks, S. E. (2020). Influence of Frailty on Outcome in Older Patients Undergoing Non-Cardiac Surgery - A Systematic Review and Meta- Analysis. <i>Agi</i> <i>ng and</i> <i>disease</i> , <i>11</i> (5) , 1276–1290. https://doi.org /10.14336/A D.2019.1024 A Systematic Review and Meta- Analysis Level II	The objective of this review was to systematically evaluate the effect of frailty on postoperative morbidity and mortality. Studies were included if patients underwent non-cardiac surgery and if frailty was measured by a validated instrument using physical, cognitive and functional domains. A systematic search was performed using EMBASE, MEDLINE, Web of Science, CENTRAL and PubMed from 1990 - 2017. Methodological quality was assessed using an assessment tool for prognosis studies. Outcomes were 30-day mortality and complications, one-year mortality, postoperative delirium and discharge location. Meta-analyses using random effect models were performed and presented as pooled risk ratios with confidence intervals and prediction intervals. We included 56 studies involving 1.106.653 patients. Eleven frailty assessment tools were used. Frailty increases risk of 30-day mortality (31 studies, 673.387 patients, risk ratio 3.71 [95% CI 2.89-4.77] (PI 1.38-9.97; I2=95%) and 30-day complications (37 studies, 627.991 patients, RR 2.39 [95% CI 2.02-2.83). Risk of L-year mortality was	undergoing surgery. Eleven different frailty assessment tools were used. The independent variable was the type of frailty screening tool used and the dependent variable was postoperativ e complication s, delirium and mortality rates amongst patients undergoing surgery.	and reported according to the Preferred Reporting Items for Systemati c Reviews and Meta- analyses (PRISMA) statement and MOOSE criteria. Initial literature search identified 2117 manuscrip ts as potentially relevant. Of these, 1904 were excluded due to unrelated research questions or study type. Full text was not available in one study; therefore 212 full text articles were thoroughl y screened for eligibility. A total of 56 studies were	complication s and the frailty assessment tool. 30-day complication s with a relative risk ratio of 2.39 was seen regardless of the frailty score used. Figure 4 compared frailty and one-year mortality rate. Frailty increased the risk of one- year mortality with a relative risk ratio of 3.40, increasing the reliability of the study.	compared the outcomes based on the frailty assessment tool used. Our main focus for our project is to find an applicable frailty screening tool and this allows us to compare the different frailty screening tools. Furthermore, the systematic reviews include a comprehensive search and access to a wise arrange of evidence. The strength of the study was it showed a high relative risk ratio with a RR value of 2.75 for 30-day mortality and a RR value of 4.79 for high-risk surgeries. The benefit is you can see the risk ratio between frailty and surgery.	variation among the discharge location. Even though the meta-analysis has a large scope of literature search, the broad scope of the research question may have omitted some studies. Many studies in this systematic review and meta-analysis are observational registry studies, but several studies have derived their outcomes from clinical trials.	Modified Frailty Index (mFI). From looking over each of these studies we can pinpoint what aspects make a successful frailty screening tool and what methods to take in identifying these screening tools. In each of the figures, the number of complications or outcomes were identified using the different screening tools. This lets us understand what screening tools are more accurate in identifying deleterious consequences in postoperative frail individuals.
	risk ratios with confidence intervals and prediction intervals. We included 56 studies involving 1.106.653 patients. Eleven frailty assessment tools were used. Frailty increases risk of 30-day mortality (31 studies, 673.387 patients, risk ratio 3.71 [95% CI 2.89-4.77] (PI 1.38-9.97; I2=95%) and 30-day complications (37 studies, 627.991 patients, RR 2.39 [95% CI 2.02-2.83). Risk of 1-year mortality was threefold higher (six studies, 341.769 patients, RR 3.40 [95% CI 2.42-4.77]). Four studies (N=438) reported on postoperative delirium. Meta-analysis showed a significant increased risk (RR 2.13 [95% CI 1.23-3.67). Finally, frail patients had a higher risk of institutionalization (10 studies, RR 2.30 [95%		type. Full text was not available in one study; therefore 212 full text articles were thoroughl y screened for eligibility. A total of 56 studies were found suitable for this systematic review.				
	is strongly associated						

with risk of postoperativ complication delirium, institutional mortality. Pr assessment can be used for patients to decide wh from surger doesn't.	re ns, ization, and reoperative of frailty as a tool and doctors ho benefits y and who				
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Appendix H

The Metabolic equivalents (MET)

reading, watching television		
eating, getting dressed		
walking on level ground at 3-4 km/h		
light housework		
climbing a few stairs		
walking on level ground at ca. 6 km/h		
running (short distances)		
heavy household chores		
moderately strenuous sports (golf, dancing)		
highly strenous sports (tennis, soccer)		

Appendix I

The Barthel Index

Activity		Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	_	
BATHING 0 = dependent 5 = independent (or in shower)	_	
GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	_	
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.) BOWELS	-	
0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	-	
BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	-	
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	_	
TRANSFERS (BED TO CHAIR AND BACK) 0 = unable, no sitting balance 5 = major help (one or two people, physical), can sit 10 = minor help (verbal or physical) 15 = independent	_	
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, including corners, > 50 yards 10 = walks with help of one person (verbal or physical) > 50 yards 15 = independent (but may use any aid; for example, stick) > 50 yards		
STAIRS 0 = unable 5 = needs bein (verbal, physical, carrying aid)	-	
10 = independent	-	
	TOTAL (0-100): _	

Appendix J

Budget Table

Table 1.

Budget Table

Nature of	Cost per Unit	# Units	Total
Expenditure/Item			Estimated Cost
Direct Costs			
Personnel			
Project leader	\$0.00/hour	100+ hours	\$0
Project chair	\$95.00/hour	15-20 hours	\$1425.00-1900.00
Project team member	\$51.00/ hour	1-2 hours	\$51.00-102.00
Project team member	159.00/ hour	0.5-1 hour	\$79.5-159.00
#2 (mentor)			
Statistician	\$60.00/ hour	4-6 hours	\$240-\$360
Technology			
Hardware/Software			
Mobile App	\$0	2	0
Online Educational	\$0	2	0
Module			
SPSS software	\$57	2	\$114.00
Other			
Transportation	\$5	16 days	\$80.00
TOTAL			\$1989.5 - \$2715.00

Appendix K

Demographic Data

N = Number within sample

Age Range (N)	Sex (N)	Ethnicity (N)	Educational Background (N)
60-70 (37)	Female (43)	Caucasian (91)	Highschool Diploma (35)
71-80 (45)	Male (57)	Asian (2)	Some College (20)
81-90 (16)		African American (7)	Four Year Degree (35)
91-100 (2)			Postgraduate (10)

Appendix L

Correlation Coefficient (r) Values for CFS Score

	CFS Score researcher #1	CFS Score researcher #2
CFS Score researcher #1	1	
CFS Score researcher #2	0.812243596	1

	Novel Algorithm
Novel Algorithm	1
CFS Score researcher #1	0.66835

	CFS Score researcher #2	Novel Algorithm
CFS Score researcher #2	1	
Novel Algorithm	0.637807675	1

Appendix M

Average of CFS Count of score researcher Average of CFS score Average of Novel **Row Labels** MRN researcher #2 Algorithm #1 Asian Black/African American 7 4.857142857 5.142857143 4.428571429 White 36 4.085714286 4.085714286 4 Grand Total (F) 43 4.214285714 4.261904762 4.071428571

Average CFS Score for Different Ethnicities & Gender

Count o MRN	of	Average of CFS score researcher #1	Average of CFS score researcher #2	Average of Novel Algorithm
	Asian			
	2	4.5	4.5	5
white	55	3.509090909	3.690909091	3.927272727
Grand	Total (M)	2 542950640	2 740208246	2 06401 2291
	57	3.543859649	3./19298246	3.964912281

Total Count of MRN	Total Average of CFS score researcher #1	Total Average of CFS score researcher #2	Total Average of Novel Algorithm
Asian 2 Black/African	4.5	4.5	5
American 7	4.857142857	5.142857143	4.428571429
White 91	3.733333333	3.84444444	3.955555556
Grand Total			
100	3.828282828	3.949494949	4.01010101
Appendix N

Average CFS Score based Upon Educational Level

Row Labels	Count of MRN	Average of CFS score researcher #1	Average of CFS score researcher #2	Average of Novel Algorithm
Four years college High School	14	4.285714286	3.785714286	3.928571429
Diploma	18	4.176470588	4.764705882	4.235294118
Post graduate	5	5	4.6	4
Some college	6	3.5	3.666666667	4
Grand Total (F)	43	4.214285714	4.261904762	4.071428571

Count of MRN	Average of CFS score researcher #1	Average of CFS score researcher #2	Average of Novel Algorithm
Four years			
college 21	3.476190476	3.523809524	3.857142857
High School			
Diploma 17	4	4.352941176	4.588235294
Post			
graduate 5	3.4	3.2	3.6
Some college			
14	3.142857143	3.428571429	3.5
57	3.543859649	3.719298246	3.964912281

Total Count of MRN	Total Average of CFS score researcher #1	Total Average of CFS score researcher #2	Total Average of Novel Algorithm
Four years college35 High School	3.8	3.628571429	3.885714286
Diploma 35 Post graduate	4.088235294	4.558823529	4.411764706
10 Some college	4.2	3.9	3.8
20	3.25	3.5	3.65
100	3.828282828	3.949494949	4.01010101