EFFECTS OF EDUCATION AND INCREASED AVAILABILITY OF STANDARDIZED FRAILTY SCREEN ON IMPLEMENTATION OF FRAILTY SCREENING AND RISK REDUCTION INTERVENTIONS IN CERTIFIED REGISTERED NURSE ANESTHETISTS

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A Project Report Submitted to the Faculty of The School of Nursing at The University of North Carolina at Greensboro in Partial Fulfillment of the Requirements for the Doctorate in Nursing Practice

Greensboro
2023

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Abstract

Background: Despite a growing body of evidence supporting the use of frailty as an extremely sensitive predictor of perioperative morbidity and mortality, the adoption of standardized frailty assessments in anesthesia has been very limited. Postoperative cognitive dysfunction and delirium are strongly associated with frailty and represent a significant adverse reaction related to the physiologic stresses of anesthesia and surgery. These disorders can have significant long-term effects and may be a catalyst for permanent physical deterioration. High perioperative production pressure and the prevalence of inaccurate, subjective estimations of frailty contribute to the scarce unitization of objective frailty screening.

Purpose: Develop an educational module and reference material to improve the implementation of preoperative frailty screening and risk reduction interventions by CRNAs.

Methods: Our study utilized a quasi-experimental, pretest-posttest study design and was conducted at Duke Raleigh Hospital. We delivered an informative presentation addressing the efficacy of frailty screening, the strong association with perioperative mortality, and suggested risk-reduction interventions. In addition, we disseminated a quick reference guide that outlines the steps for conducting a 'FRAIL' scale assessment, a well-validated tool for assessing frailty in older adults." Pretest-posttest surveys, containing a mix of Likert style and multiple-choice questions, were collected digitally prior to and 30 days after our intervention.

Results: During our study period, we had 17 CRNAs respond to the pre-test and 9 CRNAs respond to our post-test. Respondents endorsed an increased utilization of a standardized method of assessing frailty (6% vs 25%) and increased implementation of risk-reduction interventions (43.6% vs 56.3%), though our analysis failed to find statistical significance.

Recommendations and Conclusion: Although a standardized method of frailty screening has shown to be an incredibly valuable tool for estimating perioperative risk, subjective/anecdotal estimation of patient frailty remains the prevailing means of preoperative assessment. More research is needed to determine the most effective means for incorporating frailty assessment into anesthesia practice, as adding an additional non-clinical/administrative task remains a significant roadblock.

Background & Significance

The ability to preoperatively differentiate between a robust patient who will easily tolerate a surgical procedure and more tenuous patients who will require significant support has remained a difficult prospect despite a number of tools currently being used in anesthesia practice. This process becomes even more difficult in the aging population, who represent an extremely wide spectrum of physiologic, psychosocial, socioeconomic, and pathologic states. Current tools used by anesthesia providers to assess perioperative risk, like the American Society of Anesthesiologists (ASA) Physical Status Classification, are commonly too subjective to predict the risk of adverse events or poor outcomes consistently. In recent years, frailty has emerged as an objective framework through which anesthesia providers can effectively assess a patient's preoperative vulnerability to the stresses of surgery and their potential for poor postoperative outcomes.

The ability to effectively predict how an individual patient will respond to a wide range of different surgical techniques is an essential skill for any anesthesia provider. This knowledge is used to determine what patient parameters should be monitored, the availability of equipment and resources, the patient's likely postoperative disposition, and, notably, if the planned surgical procedure is appropriate for the patient given their current physiologic state and health goals. Frailty is a complex syndrome associated with aging that is characterized by decreased physiologic reserve and a reduced capacity for responding to stressors (McIsaac et al., 2020). Gerontologists first described this conceptualization of frailty in an attempt to risk stratify elderly patients in the community and in long-term care facilities. This framework has since been expanded to other realms of healthcare, such as critical care and anesthesia (Lin et al., 2018).

Though researchers seem to generally agree that frailty is "…a state of increased vulnerability, a syndrome of decreased physiologic reserve and resistance to stressors" (McIsaac et al., 2020). Experts on the topic have failed to reach a consensus on how best to model frailty and organize the key features that seem to characterize the pathological state. There are two major schools of thought on the topic, the first of which is the phenotypic model, first described by Fried et al. (2001). From a phenotypic perspective, frailty is described by the recognition of specific, objective, pathophysiologic markers that are manifestations of the complex underlying syndrome. Rockwood and Mitnitski (2007) introduced the "Accumulation of Deficits" model, which suggests that frailty can be better understood by examining the proportion of numerous specific deficits. The evidence in the literature seems to suggest that both frameworks are similarly effective at identifying clinically significant frailty.

Benefits of Preoperative Frailty Assessment

A common theme across healthcare is the increasing burden of the aging population on resources. Advanced age carries a significantly increased risk of perioperative adverse outcomes and 45% of patients 65 and older will require a continued high level of care in the form of a skilled nursing facility, inpatient rehabilitation, or home health (Donoghue, 2019). Currently, over 50% of people having major surgery are >65 years old, and as elderly patients increasingly present for surgical intervention, the anesthesia providers' ability to quickly and precisely risk stratify preoperative patients becomes ever more important (McIsaac et al., 2020).

The literature often describes frailty as a continuum, as opposed to a binary state where all individuals exist on a spectrum, from extremely robust with a large reserve of compensatory mechanisms to the most frail who are struggling to maintain functional and homeostatic equilibrium at baseline (Ko, 2019). According to Lin and colleagues (2018), more frail

individuals may be more susceptible to adverse events caused by a lesser degree of insult, whereas those who are less frail may require a greater degree of insult to experience similar adverse outcomes. This concept is extremely valuable in clinical practice when assessing the risks vs. rewards of surgery for a given patient, especially when elective surgery is being considered. For example, a moderately frail person might greatly benefit from a total joint replacement, particularly if their frailty is the result of a lack of mobility or function in that joint. In contrast, an extremely frail person is likely at such a high risk of decompensation related to a surgical and anesthetic insult that they will never see the benefit the procedure may offer (Brown et al., 2016). This is one area where consistency is described in the literature with a "dose-response" relationship emerging where higher frailty scores are associated with a greater risk of mortality, regardless of the instrument used (McIsaac et al., 2020).

DNP Project Purpose and Objectives

As anesthesia providers, our ability to objectively determine a patient's capacity to tolerate surgical intervention is one of the most critical and, unfortunately, most difficult tasks we face. Frailty is an extremely complex and interdependent syndrome of psychological, cognitive, and social underpinnings that describe an individual's capacity for maintaining homeostatic function in response to an insult (McIsaac et al., 2020). Recognition of frailty is another tool that allows CRNAs to risk stratify surgical patients and appropriately disperse perioperative resources, as well as representing a marker for a patient who requires increased vigilance for early recognition of and intervention in the event of an adverse event.

While emergency cases prioritize prolonging life, despite the risk of postoperative disability, Duke Raleigh Hospital (DRH) performs a substantial number of non-emergent

procedures, such as orthopedic joint and spine surgeries. However, for patients who are stable at baseline and undergoing preoperative screening for elective surgery, careful patient selection becomes even more critical due to the potential risks of anesthetic or surgical complications leading to a net worsening in quality of life. Additionally, CRNAs at DRH have a very short window between surgical cases to complete a preoperative assessment, which makes optimizing the efficiency and brevity of any screening increasingly important. The 5-item FRAIL scale seems to be an appropriate addition to their workflow and has the potential to aid in patient selection for elective surgery.

The purpose of this project is to determine if education and improved access to reference materials would improve acceptance, knowledge, and utilization of perioperative frailty assessment, as well as increase implementation of risk reduction interventions in a population of Certified Registered Nurse Anesthetists.

The objectives of this study were to evaluate the impact of providing educational materials, which includes information on frailty assessment and risk reduction strategies, as well as a quick-reference tool, on:

CRNAs implementation of interventions aimed at reducing frailty-associated risk.

CRNAs knowledge related to frailty and risk of postoperative delirium.

CRNAs implementation of a standardized preoperative frailty assessment.

Review of Current Evidence

A systematic review of the literature was conducted to examine current evidence related to frailty, implementation of screening tools, and interventions for the prevention of postoperative delirium. This search was conducted using CINAHL, Google Scholar, and

PubMed. This review utilized varying combinations of the terms: “anesthesia”, “operating room”, “FRAIL Scale”, “frailty”, “geriatric”, “Awareness-to-Adherence”, etc. The selected studies were chosen based on three criteria.

1. They addressed the general validity of frailty and its assessment for predicting adverse patient outcomes.
2. Studies that evaluated the validity of the FRAIL scale and its implementation specifically.
3. Studies that discussed the ability of the Awareness-to-Adherence model to describe the adoption of guidelines by clinical providers.

Approximately 50 journal articles were examined, and with the intention of examining the latest research, studies published prior to 2016 were excluded. The decision was also made to include relevant seminal studies that were cited by nearly every subsequent article reviewed. The key points that will be examined in this review include a general discussion of the benefits of preoperative frailty assessment, a more detailed assessment of the ability of the FRAIL Scale to appropriately identify frailty, current guidelines on interventions, and an analysis of the Awareness-to-Adherence model.

Implications of Frailty on Perioperative Outcomes

Currently, there is not a widely accepted, comprehensive tool for identifying perioperative patients who are at higher risk for poor outcomes (Donoghue, 2019). Frailty has been consistently found to be associated with significantly higher incidences of delirium, disability, morbidity, and mortality (Lin et al., 2018 & Susano et al., 2020). In a large study (n = 202,811), McIsaac et al. (2016) found, controlling for age, sex, socioeconomic status, and

procedure, that frail patients had a risk ratio of 2.23 for mortality at 1-year and were 35 times more likely to die in the 3-day postop period compared to non-frail patients. APACHE II is a commonly utilized ICU screening tool that overwhelmingly utilizes current physiologic data, such as lab values and vital signs, to predict illness severity and mortality (Godinjak et al., 2016). Remarkably, frailty screening tools that often do not directly account for acute illness, have been found to have a similar ability to predict morbidity in hospitalized patients. This suggests that in these patients, detrimental outcomes are more often the result of underlying chronic health than the severity of their presenting illness (Darvall et al., 2020).

Phenotype vs. Accumulated Deficits Models of Frailty

The available research on frailty is split between two different models that each have a unique view on how best to model frailty and organize the key features that characterize the pathological state. There are two major schools of thought, the first of which is the phenotypic model, described by Fried et al. (2001). From a phenotypic perspective, frailty is described by the recognition of specific, objective pathophysiologic markers. Assessments based on the Phenotypic Model are generally short, often 5-item, in-person exams that require patient participation in grip strength and ambulation evaluation (Fried et al., 2001). Birkelbach et al. (2019) performed Fried's 5-Point Assessment on 1,186 preoperative patients and found that patients determined to be pre-frail and frail had a significantly higher incidence of complications and longer length of stay compared to their non-frail counterparts. The most common criticism of Fried's Phenotypic Model is that assessment requires physical performance-based tests, which are difficult, if not impossible, in a variety of situations since it requires patient participation (Lin et al., 2018).

First described by Rockwood & Mitnitski (2007) the "Accumulation of Deficits" model proposes that the presence of frailty can best be described by the accumulation of any of a large number of predefined indicators of general health, including activities of daily living (ADLs), mobility, social support, financial resources, lab values, disease diagnoses, presence of polypharmacy, etc. Tools based on this model of frailty can be completed as a questionnaire, but many are designed to utilize data already accumulated in the patient's medical record (Darvall et al., 2020; Wahl et al., 2017; Hall et al., 2017). Because of cognitive or physical disability, it is not uncommon that surgical patients are unable to perform the physical actions required for phenotype-modeled assessments. This makes the ability to complete assessments without any patient participation the most important advantage of scales based on the "Accumulation of Deficits" model.

Self-reported FRAIL Scale

A major barrier to the implementation of routine frailty assessment is the increased burden it represents on already overextended anesthesia and preoperative staff. Attempts have been made to substantially reduce the number of questions on the "Accumulation of Deficits" style of assessment tools, which often have greater than 50 items. Recently, researchers developed the 14-point Risk Analysis Index and validated it as an effective tool with comparable predictive ability to more in-depth assessments (Hall et al., 2017). The FRAIL scale, developed and initially validated by Abellan van Kan et al. (2008), combines aspects of phenotype and deficit accumulation models and was an attempt to reduce the time of administration as much as possible while maintaining predictive power. A large study comparing the FRAIL scale, the Frailty Index (a prototypical accumulation of deficits assessment), Cardiovascular Health Study (CHS) scale, and the Study of Osteoporotic Fractures (SOF) scale found that both FRAIL scale

and Frailty Index had the highest predictive value for new disability and mortality over the 9-year study. Several other studies have validated the predictive value of the FRAIL scale for mortality and adverse outcomes (Maxwell et al., 2018; Chao et al., 2015). Based on the relevant literature, the FRAIL scale has appropriate validity and is an acceptable tool for implementation in this DNP project.

Frailty & Postoperative Delirium

There has recently been a rapid expansion in the awareness of frailty, recognizing its significance and improving the ability to identify the presence of frailty clinically. Despite these advances, there is a conspicuous lack of well-validated interventions available to manage frailty clinically (Dent et al., 2019). A strong association between preoperative frailty and postoperative delirium presents a potential area to make a meaningful perioperative intervention. Susano et al. (2020) found that patients undergoing elective spine surgery who scored 3 to 5 (moderate to severe frailty) on the FRAIL scale were over six times as likely to subsequently develop postoperative delirium. This association was also found in patients undergoing non-emergent coronary artery bypass grafting (CABG), though using a different assessment tool (Brown et al., 2016).

Intervention

Unfortunately, interventions specifically targeting frailty are lacking in the literature; therefore, we chose to target one of the most ubiquitous adverse consequences associated with preoperative frailty: post-operative delirium and cognitive dysfunction. Similar to frailty, postoperative delirium is associated with increased hospitalizations, increased 30-day mortality and also tends to most impact older individuals (Jin et al., 2020). The strength of the association

between frailty and postoperative delirium offers an opportunity to utilize the well-validated preoperative frailty screening to identify patients who would benefit from the more mature body of evidence associated with interventions that target postoperative delirium (Jin et al., 2020). Since both pain and opioid administration have been found to contribute to postoperative delirium, many proposed interventions utilizing multimodal, opioid-sparing analgesia (Vlisides & Avidan, 2019). In addition to regional and neuraxial anesthesia, perioperative administration of acetaminophen, NSAIDs, and dexmedetomidine has been found to be associated with reduction in postoperative delirium (Janssen et al., 2019). Additionally, avoidance of temperature derangement, limiting the use of benzodiazepines, and utilizing BIS monitoring to avoid excessively deep anesthetics have been found to be effective interventions (Jin et al., 2020).

Theoretical Framework

The Awareness-to-Adherence model was first described by Pathman et al. (1996) in their pursuit of understanding the barriers to the adoption of pediatric vaccine guidelines. They found that, by and large, primary care physicians progressed through the steps of awareness, agreement, adoption, and adherence sequentially. A recent study utilized a webinar and an E-newsletter to assess improvements in adoption and adherence to national statin/cholesterol guidelines and found that those interventions improved adherence (Fleming et al., 2020). In 1981, authors Penchansky and Thomas theorized that the concept of access, in the context of healthcare, represents the degree of fit between clients and the system. In layman's terms, access to a system directly relates to clients' ability or willingness to utilize a health service or system. They defined specific dimensions to access as availability, accessibility, accommodation, affordability, and acceptability. Availability refers to the adequacy of supply of the system, accessibility concerns the location of the client to the location of the system, accommodation references either the

manner of system organization to the clients or the ability of the client to accommodate the system, affordability addresses the barrier of cost, and acceptability concerns a client's attitude about the system (Penchansky & Thomas, 1981). The efficacy of frailty as a means of preoperative screening, like the pediatric vaccine guidelines described by Pathman et al. (1996), is widely accepted due to the robustness of the recent body of research, but like Patham's vaccine guidelines, there seems to be a disconnect between acceptance and implementation.

Frailty and the FRAIL scale specifically are well-validated tools for predicting adverse patient outcomes and therefore meet the criteria for moving from research to practice. A major barrier to implementation has been the clinical resources required to implement previously long or involved assessment modalities. The FRAIL scale is an extremely short and easy assessment that has been shown to have similar predictive value to more thorough frailty indices. There has been little, if any, research conducted on how to effectively implement the FRAIL scale into practice. Investigation of frailty assessment implementation through the lens of Awareness-to-Adherence may help us improve frailty screen utilization and identify barriers that need to be overcome.

Methods

Project Design

Our study utilized a quasi-experimental, pretest-posttest study design and consists of an educational component paired with a quick reference guide in the form of a "badge buddy" for CRNAs. This study was undertaken with a research partner whose primary research question explored if the interventions influenced the study subjects' attitudes towards standardized frailty

screening, while this author's primary focus was on changes in knowledge and practice as a consequence of the interventions.

Setting and Sample

This project was conducted at a moderately sized community hospital in a metropolitan area in the southeast. This medical center is the smallest of three hospitals in a large, nationally recognized academic hospital system. The facility is a 186-bed, Magnet-recognized hospital and provides a comprehensive array of services, including cancer care, cardiovascular care, neuroscience, and various surgical specialties. This site specializes in a variety of inpatient and outpatient surgical services, including mastectomies and breast reconstruction, neuro-spine surgery, orthopedics, ENT, and ophthalmologic procedures. This site was chosen because of the interest shown by the clinical educator.

The population and sample for this project included all anesthesia providers at a moderately sized community hospital in a metropolitan area in the southeast. A convenience sample was taken of all providers able to attend an educational seminar presented in the provider lounge. After this, frailty screening "badge buddies" and the seminar information (paper and digital format) was made available to all study participants. The inclusion criteria for this study were all anesthesia providers who are able to view education material in any format and receive a badge buddy. There are no exclusion criteria and no incentives were offered to subjects to encourage participation.

Data Collection

The pretest survey (see appendix A) was designed in Qualtrics and distributed to CRNA staff via email by the nurse anesthesia clinical coordinator, our main point of contact at the study site. All retained respondent data were deidentified. To facilitate pairing data for analysis, respondents were asked to enter an email address, which was not retained, to which a randomized ID number was automatically sent.

Halfway through the 1-week pretest period, the clinical coordinator again shared the pretest link and encouraged staff CRNAs to participate. After the remainder of the pretest period, we presented an in-person educational lecture describing frailty as a concept, the current literature supporting the use of preoperative frailty screening, a specific discussion of the FRAIL scale, and suggested risk-reduction interventions (see appendix B). The expectation was that the presentation would be given at a formal staff meeting but our presentation was delivered in a much less formal fashion, to fewer subjects than anticipated. To ameliorate this shortcoming, we arranged for the clinical coordinator to subsequently distribute a digital copy of the presentation in the form of a PowerPoint to all staff CRNAs that were unable to attend the presentation.

At the conclusion of the presentation, the quick-reference "badge buddies" (see appendix C) outlining the 5-item FRAIL scale were distributed to CRNAs who were present, and the remainder was given to the clinical coordinator who distributed them amongst the staff, not in attendance. The researchers instructed CRNAs, and those not in attendance via email to utilize these quick reference cards to integrate frailty screening into their usual preoperative assessment of all patients aged sixty-five years and older. Subjects were encouraged to be alert for instances when the objective frailty assessment may differ from any subjective measures they may use.

One week prior to the end of the 30-day intervention period, we requested that the clinical coordinator send an email to CRNAs to encourage the continued use of the frailty screening and to anticipate the follow-up post-intervention survey tool. Once the intervention period was completed, a posttest survey was created, again utilizing Qualtrics, and distributed to CRNA staff members via the clinical coordinator. Again, to allow for data pairing, study participants were asked to enter the previously discussed randomized ID number into the post-survey. One week after the distribution of the postintervention survey, the respondent count was significantly lower than expected. In response, the researchers requested that the site's clinical coordinator send out a reminder encouraging staff to complete the survey. After this and a second reminder email, participation remained lower than expected.

Instrument

Unfortunately, the researchers were unable to find an applicable and well-validated survey that required the data collection for this study to be completed via a novel assessment instrument designed by the authors (see Appendix A). The survey incorporated demographic questions to allow analysis based on anesthesia provider credentials and how long since the completion of their training, in addition to gender identity and setting of ICU experience prior to their anesthesia training. Both the pre-test and post-test surveys were a combination of Likert-scale, multiple choice, and true/false items. Items addressing the specifics of the study implementation and utilization of the quick reference guide were included only in the post-test survey.

Data Analysis

The survey was written and dispersed with Qualtrics, an online survey platform. Once the study period had ended and post-test data had been collected, raw survey data was exported to IBM SSPS Statistics, version 26 (IBM, 2019). The intent was to collect paired data for analysis, but unfortunately, due to the poor participation, the asymmetry between pretest and posttest data, and failure to correctly reenter the previously described randomized respondent ID, the decision was made to proceed with performing unpaired analysis. Likert-scale style items were analyzed by differentiating between agreement (agree or strongly agree) and non-agreement (Neither, disagree, or strongly disagree). Knowledge assessment composite scores represent each respondent's percentage of items answered correctly. Survey Data was analyzed for normality utilizing Shapiro-Wilk testing for each investigated variable, and all Likert items were found to be non-normally distributed, while responses to the knowledge scores were found to be normally distributed ($p = 0.05$). Analysis of non-normal (non-parametric) distributions was performed with Mann-Whitney U tests (critical $u = 19$), while normally distributed (parametric) data were analyzed with two-sample *t*-testing. An α-value of 0.05 was chosen to determine the significance of all statistical analyses.

Results

During our study period, we had 17 CRNAs respond to the pre-test and 9 CRNAs respond to our post-test. Two survey responses were submitted incomplete, one from each pre-test and one post-test. Since these data were almost entirely blank, they were removed from the sample, leaving 16 pretest and eight posttest responses for analysis.

Demographic Data

The same demographic data items were collected during both the pretest and posttest and due to the inability to pair data, this data is presented independently. Of the 16 pretest respondents, 4 (25%) had between 0-5 years of experience, 2 (13%) had 6-10 years, 0(0%) had 11-15, 4(25%) had 16-20 years, and 2 (13%) had greater than 20 years of experience. When asked about their anesthesia training, 11(69%) pretest respondents reported having a master's degree in anesthesia, while 5 (31%) reported having a doctoral degree. Only 3(19%) of our 16 pretest respondents identified as male, 12(75%) identified as female, and one chose not to respond. When asked about ICU experience prior to anesthesia, 8(50%) of 16 pretest respondents reported that the majority of their ICU experience was in cardiac or cardiac surgery ICUs, 1(6%) stated neuro ICU, 6(38%) stated medical ICU, no respondents chose trauma/surgical, and one respondent failed to answer this question.

Of the 8 posttest respondents, 4 (50%) had between 0-5 years of experience, 1 (13%) had 6-10 years, 0(0%) had 11-15, 2(25%) had 16-20 years, and 1 (13%) had greater than 20 years of experience. When asked about their anesthesia training, 6(75%) posttest respondents reported having a master's degree in anesthesia, while 2 (25%) reported having a doctoral degree. Only 1(13%) of our 8 posttest test respondents identified as male, 5(63%) identified as female, and 2 chose not to respond. When asked about ICU experience prior to anesthesia, 4(50%) of 8 pretest respondents reported that the majority of their ICU experience was in cardiac or cardiac surgery ICUs, 2(25%) stated neuro ICU, 1(13%) stated medical ICU, and 1 (13%) respondent chose trauma/surgical.

Table 1

Demographic Data of Study Participants

	Pretest		Posttest	
	n	%	n	%
Years of Anesthesia Experience				
0-5	4	25	4	50
6-10	2	13	1	13
11-15	0	0	0	0
16-20	4	25	2	25
>20	1	13	1	13
Anesthesia Degree				
MSN	11	69	6	75
DNP	5	31	2	25
Gender				
Male	3	19	1	13
Female	12	75	5	63
N/A	1	6	2	25
ICU Background				
Cardiac/Cardiac Surgery ICU	8	50	4	50
Neuro ICU	1	6	2	50
Trauma/Burn ICU	6	38	1	25
Medical ICU	0	0	1	13
N/A	1	6	0	13

Primary Objectives

We inquired about the adoption of general and specific changes in practice to determine the influence of the study intervention on the practice of the study participants. When CRNAs were asked if they generally tailored their anesthetic plan based on their patient's level of frailty 15 of 16 (94%) pretest respondents and 7 of 8 (88%) posttest respondents indicated agreeance. All but one respondent indicated agreeance in each survey tool and although this does represent a decrease between the pretest and posttest, this was not found to be statistically significant ($u = 60$, $p = 0.75$). When CRNAs were asked if adhered to the specific risk-reduction intervention suggested by the researchers (midazolam avoidance), 4 of 16 (25%) of pretest respondents and 3 of 8 (38%) posttest respondents indicated agreement. This meager increase was not found to be significant ($u = 50.5$, $p = 0.37$).

In order to determine the extent to which study participants incorporated frailty in their preoperative assessment, we inquired about their consideration of frailty in general and also asked whether they utilized any established methods for frailty assessment. When study participants were asked if they used any method to assess their patient's preoperative degree of frailty, 8 of 16 (50%) of pretest and 6 of 8 (75%) of post respondents indicated agreeance. Though this represents an increase, the analysis failed to find significance ($U = 46.5$, $p = 0.24$). Very few survey respondents agreed to utilize a standardized metric for the assessment of frailty; 1 of 16 (6%) in the pretest and 2 of 8 (25%) in the post-test. This negligible increase was also found not to meet the criteria for statistical significance ($U = 48$, $p = 0.28$).

We also sought to determine if our interventions would have an impact on study participants' knowledge related to frailty and subsequent increases in postoperative delirium.

While the percentage of respondents who correctly answered knowledge assessment questions increased pretest to the posttest (43.8% vs. 45.8%), our analysis determined that there is not a significant difference (Mann-Whitney $U = 63.5$, $p = 0.976$).

The post-test survey tool also included questions related to the subject's participation in the study. Fifty percent (n=8) of respondents indicated that they were at the in-person presentation. One hundred percent agreed to review the digital presentation shared via email. Seventy-five percent acknowledged that they received a "badge buddy" at some point during the intervention period. Thirty-eight percent agreed that they feel confident implementing the FRAIL scale.

Discussion

Frailty screening is well established as an effective means of patient risk stratification in outpatient gerontology and has also been adapted for use in inpatient intensive care (Lin et al., 2018). More recently, there has been a growing body of research that supports the efficacy of frailty screening as a further tool for estimating perioperative risk (Lin et al., 2018; Ko, 2019; Donoghue, 2019; Lin et al., 2018). The intention of this DNP project was to help bridge the gap between a large body of research that suggests that frailty screening is an effective means of estimating intra and post-operative risk, including postoperative cognitive dysfunction, and seemingly limited clinical adoption.

Penchansky and Thomas's Theory of Access describe the five "A"s that identify the factors that characterize the interrelationship between provider and patient and discusses how these interactions shape access to healthcare. By providing CRNAs with education and a quick reference "badge buddy," we have attempted to address the *availability* of resources to

encourage the utilization of a frailty screening tool and risk reduction interventions. We also sought to determine if our interventions would impact the participants' understanding of frailty and their knowledge of risk-reduction interventions. The primary goal of this study was to determine the effect of an education presentation and distribution of a FRAIL scale "badge buddy" on the degree to which CRNAs implemented recommended frailty assessment and associated risk reduction interventions.

We found an increase in CRNAs who endorsed the utilization of a standardized frailty scale, as well as an increased agreement to the utilization of risk-reduction interventions and incorporating the patient's frailty status into their anesthetic plan. There was a negligible improvement in correctly answering knowledge assessment questions. Unfortunately, our analysis found that none of these findings met the criteria for statistical significance ($p < 0.05$).

Our limited ability to ascribe significance to our results may be partially related to a substantial decrease in participation when comparing our pretest (n=16) to our posttest (n=8). Though CRNAs at this clinical site are generally enthusiastic about research projects and keeping their practice up to date with current literature, this has led to a sizable burden on the staff who are expected to participate in many different DNP projects. Additionally, participants were allotted a 30-day period between intervention and posttest to allow time for utilization of their "badge buddy." During this time, neither I nor my co-investigator were assigned to this clinical site and were therefore unable to monitor implementation or bring awareness to the continued project.

The demographic data of respondents highlighted some unexpected trends. There were significantly more female respondents compared to the national average of CNRAs, which may

be representative of the population or could also be the result of a differential willingness to participate. Approximately 30% of respondents were doctoral trained, which is likely the result of the relatively recent requirement for programs to confer a DNP, but we had expected that a higher proportion of respondents would have a DNP because of the increased focus on research incorporated into the curriculum. A higher proportion of participants had between 0-5 years of anesthesia experience, which, again, may be representative of the population or increased willingness to participate due to their own proximity to their training.

Limitations

We have identified several limitations of our project. The first of which is the relatively small sample size. The project's sample consisted of sixteen participants who completed the pre-survey, eight of whom completed the post-survey. Our initial goal had been to get fifty percent participation or twenty of the forty CRNAs on staff at the facility. A smaller sample size reduced the statistical power and ability to ascribe statistical significance. A larger sample size would reduce the margin of error and lend greater power to identify the effects of our interventions.

The second limitation is test subject attrition. In future studies, more emphasis should be placed on offering incentives or implementing other retention strategies. The statistical analysis was weakened in part because participation dropped during the time between the intervention and the follow-up survey. The asymmetrical sample sizes of the pretest and posttest survey responses increase the margin of error and decrease the analysis' ability to detect significant differences in responses before and after the intervention.

The third limitation is the lack of existing research incorporating our chosen project design. After an exhaustive search of the literature, there were limited current studies found on

the intervention of a badge buddy to implement screening. There was no research found about the implementation of education and a badge buddy to increase the utilization of frailty screening. Other interventions for the implementation of frailty screening existed that were outside the scope of this DNP project, like changing the computer system to autogenerate a score for staff. Because of the lack of existing literature, a novel tool was created to assess staff practice and knowledge that had no prior research to support its validity and reliability.

The fourth limitation is limited access to the sample population and time constraints. My colleague and I were guests at the hospital site and had limited ability to follow up with potential participants. We coordinated with the site's clinical coordinator to schedule an opportunity to present, which we understood would be at a staff meeting. In reality, the presentation was much more impromptu and only included CRNAs that happened to be at work and were available to attend. Because of the limited turnout, we again collaborated with the clinical coordinator to distribute badge buddies and a digital copy of the presentation to those who were not in attendance. We also relied on this contact to initially disseminate information about our project to staff and to send follow-up reminders to staff soliciting survey responses. The secondhand nature of communication and limited ability to follow up with participants likely hindered generate buy-in from the staff.

The researchers worked with the CRNA student clinical coordinator liaison to schedule a presentation time and advertise it so staff would attend. The researchers also relied on the liaison to distribute the presentation and badge buddy to staff who could not show up to the presentation and had to follow up with them to contact the staff for survey response reminders. The limited way in which follow-up could occur potentially limited buy-in from staff to complete the

surveys. This was all also done within the constraints of the strict deadlines for DNP project completion.

Recommendations for Future Study

When considering the challenges faced with implementation and data collection during this study, there would likely be a benefit in reimplementing a similarly designed study. A multicenter study would vastly increase the potential sample size, as well as improve the generalizability of the findings. Additionally, the original intention of this project was to collect paired pretest/posttest data but this ultimately compounded challenges with communication and likely served as a potential barrier to post-survey response after the 30-day intervention period. Implementation of a more streamlined, reliable means of pairing data would be required in future studies. Increased researcher presence at the study site before and during the implementation phase could have a significant impact on the ability to garner buy-in from stakeholders and potential participants.

Conclusions

This project sought to bridge the gap between a well-established body of literature on the efficacy of frailty as a model to risk stratify perioperative patients and seemingly limited implementation in anesthesia practice. It is our belief that anesthesia providers will increasingly utilize frailty, though high production pressure, in addition to other barriers, will continue to hinder adoption. The 5-item FRAIL Scale is a relatively brief and well-validated tool that is a relatively simple means of incorporating frailty assessment into anesthesia practice. Although our data failed to reach the level of statistical significance, I believe our results give some

indication that we were able to at least increase awareness of the benefits of assessing frailty among the study participants.

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APPENDIX

Appendix A: Pre/Post Survey

Demographics

1. Anesthesia years of experience
    a. 1-5 years
    b. 6-10 years
    c. 11-15
    d. 16-20
    e. >20
2. Level of education
    a. MSN
    b. DNP
3. Gender Identity
    a. Male
    b. Female
    c. Other
    d. Prefer not to answer
4. The majority of my ICU experience prior to beginning an anesthesia program was
    a. Surgical/trauma ICU
    b. Neuro ICU
    c. Cardiac ICU
    d. Medical ICU

Knowledge

1. What medication class is most likely to increase risk of postoperative delirium in older adults?
    a. Antihistamines
    b. Anticholinergics
    c. Benzodiazepines
    d. Muscle relaxers (i.e. cyclobenzaprine, methocarbamol, etc.)
    e. NMDA receptor antagonist (i.e. ketamine)
2. At what age would you consider making changes to your standard anesthetic plan to prevent age related adverse effect?
    a. 60
    b. 65
    c. 70
    d. 75
    e. 80
3. What frailty risk factor is the most sensitive for predicting negative surgical outcomes?
    a. Advanced age
    b. Mental status
    c. Low physical activity
    d. Comorbidities

e. Outpatient polypharmacy

Attitudes

1. Access to a standardized frailty screening tool would increase the likelihood that I will use it to assess my patients preoperatively for frailty.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree
2. A standardized preoperative frailty screening would be a valuable tool for assessing patient's intraoperative risk
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly Agree
3. Ideally frailty screening should be completed by
    a. Preanesthetic clinic
    b. Preop nurse
    c. Anesthesiologist
    d. CRNA
    e. Frailty screening is not really worth the additional time/resources

Practice

4. I currently use some method to assess my patient's frailty.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree
5. I tailor my anesthetic plan based of the patient's level of frailty.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree
6. I do give potentially high-risk medications (i.e. midazolam, scopolamine, ketorolac, etc.) to patients 65 years and older.
    a. Always
    b. Frequently
    c. Sometimes
    d. Rarely

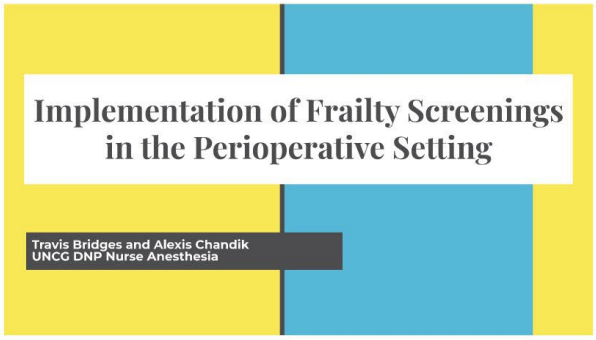
e. Never

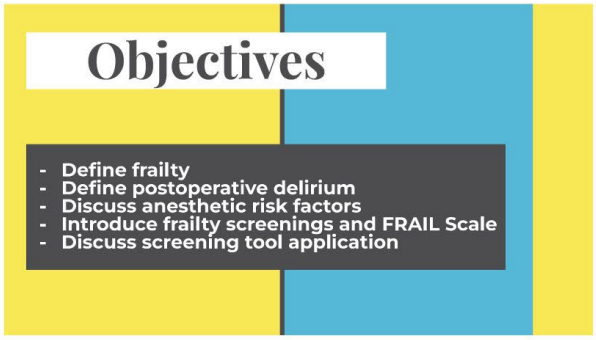
7. I currently use a standardized metric to measure my patient's frailty status.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree

Post Test Only

8. I can confidently use the FRAIL Scale to assess my patient's frailty status.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree
9. The FRAIL Scale is a useful tool to assess a patient's frailty.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree
    f. Strongly agree
10. I was present for the in-person presentation
    a. True
    b. False
11. I reviewed the presentation slides received via Email.
    a. True
    b. False
12. I received a "badge buddy" at any time during the study period.
    a. True
    b. False

Appendix B: Educational Presentation





Frailty

Frailty is a general state of wellness in which physiologic reserve is reduced, making the patient more susceptible to homeostatic disturbances

Physiologically weakened state constitutes deficits of:

- Neurologic control
- Mechanical performance
- Energy metabolism

Risk Factors:

- Advanced age
- Low physical activity *most powerful predictor
- Multiple comorbidities
- polypharmacy

Exacerbation of Frailty in the Perioperative Setting

ANESTHESIA

- Reduced drug metabolism
- Home medication competing for metabolic enzymes

Increased Risk of:

- hemodynamic instability
- Respiratory complications
- Postoperative delirium

In the perioperative setting , frailty places the patient at a higher risk for increased morbidity and mortality and increased risk for postoperative delirium.

Postoperative Delirium

Prolonged delirium following exposure to anesthesia.

Frail patients at increased risk due to

- Reduced drug metabolism/elimination
- Cortical suppression from anesthetic medications

Why do we care?

- Increased length of recovery
- Increased cost to the hospital
- Increased cost to the patient

Exacerbates of Postoperative Delirium

Smoking gun: benzodiazepines

- Suppression of the central nervous system
- Binds to GABA receptors and enhances GABA affinity for the receptor
- Hyperpolarizes the nerve membrane by increasing chloride channel opening
- Metabolized by CYP450
- Patients receiving benzodiazepines are three times more likely to develop postoperative delirium

Listed in the American Geriatric Society (AGS) Beers Criteria of drugs that are inappropriate to administer to older adults and should be avoided

- List of five criteria design to help limit drug related complications in the older population
- Numerous drugs included on this list including ones given during anesthesia like diphenhydramine and droperidol

AGS Beers Criteria:

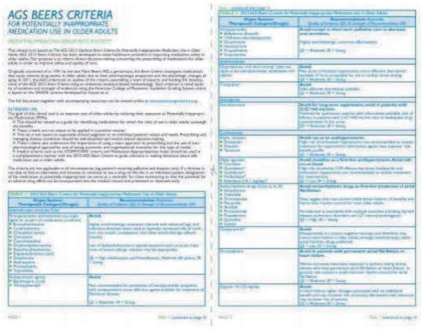
1. Potentially inappropriate medications in older adults
2. Potentially inappropriate medications to avoid in older adults with certain conditions
3. Medications to be used with considerable precaution in older adults
4. Medication combinations that may lead to harmful interactions
5. Medications that should be avoided or dosed differently for those with poor renal function

Table 1.

Abbreviated Beers List of High-Severity Medications

Drug	Concern
Indomethacin	Most CNS side effects of any NSAID
Pentazocine	Confusion, hallucinations
Trimethobenzamide	Ineffective, adverse extrapyramidal effects
Muscle relaxants & antispasmodics: methocarbamol, carisoprodol, cyclobenzaprine, metaxalone, orphenadrine	Anticholinergic side effects, sedation, weakness
Flurazepam	Prolonged half-life in elderly, leading to prolonged sedation and increased risk of falls
Amitriptyline	Anticholinergic side effects
Doxepin	Anticholinergic side effects
Meprobamate	Highly addictive, sedating
Benzodiazepines (short-acting): >3 mg lorazepam; >60 mg oxazepam; >2 mg alprazolam; >15 mg temazepam; >0.25 mg triazolam	Increased sensitivity in elderly—use lowest effective dose
Benzodiazepines (long-acting): chlordiazepoxide, diazepam	Prolonged half-life in elderly, leading to prolonged sedation and increased risk of falls
Disopyramide	Most potent negative inotropic; could induce CHF; has anticholinergic side effects
Methyldopa	Bradycardia, exacerbation of depression
Chlorpromazine	Prolonged half-life in elderly, leading to hypoglycemia
GI antispasmodics: dicyclomine, hyoscyamine, belladonna alkaloids	Anticholinergic side effects
Anticholinergics & antihistamines: chlorpheniramine, diphenhydramine, hydroxyzine, cyproheptadine, promethazine	Anticholinergic side effects
Barbiturates (except phenobarbital), except when used for seizures	Addictive, more ADEs than other sedatives in elderly
Meperidine	Ineffective, may cause confusion
Ticlopidine	Not proven better than ASA, possibly more toxic
Ketorolac	Avoid in elderly—asymptomatic GI pathology possible
Amphetamine & anorexics	Dependence, HTN, angina, MI
NSAIDs: naproxen, oxaprozin, piroxicam	GI bleeding, renal failure, HTN, CHF
Ranolazine	Long half-life; excessive CNS stimulation, agitation
Stimulant laxatives (long-term; except in presence of opiate analgesics, bisacodyl, cascara sagrada	Exacerbate bowel dysfunction
Amiodarone	Prolonged QT interval, risk of TDP
Nitrofurantoin	Renal impairment
Methyltestosterone	Prostatic hypertrophy; cardiac problems
Thioridazine	CNS, EPS
Mibefradine (short-acting)	Hypotension, constipation
Mineral oil	Potential for aspiration
Desiccated thyroid	Cardiac effects

ADE, adverse drug event; ASA, aspirin; CHF, congestive heart failure; CNS, central nervous system; EPS, extrapyramidal side effects; GI, gastrointestinal; HTN, hypertension; MI, myocardial infarction; NSAID, nonsteroidal anti-inflammatory drug; TDP, torsades de pointes.
Source: Reference 11.



AGS BEERS CRITERIA
FOR POTENTIALLY INAPPROPRIATE MEDICATION USE IN OLDER ADULTS

Identifying Frailty

Current standard of practice: none…

Meta-analysis shows use of frailty screenings improves identification of frailty in patients that is both consistent and reliable

- Community settings
- Inpatient and intensive care settings
- Surgical services

Many different tools have been studied:

- PRISMA 7, Tilburg Frailty Screening Tool, Frailty Index, etc.

Most widely studied tools are variations of the Frailty Index

- Shown to be a consistently valid and reliable identifier of frailty
- Test is time-consuming…

Incorporating Frailty Screenings into Anesthesia Care

No standardized method exists to identify frailty which leaves an opening for care to be inconsistent between anesthesia providers…

Using a standardized frailty metric to guide care has been shown to reduce incidences of postoperative delirium.

Most frailty screenings take time… so how can anesthesia providers identify frailty in a manner that creates consistent care between providers?

Shorter frailty assessment tools exist, most notably a variation of the frailty index called the FRAIL Scale

FRAIL Scale

Time to complete: around 5 mins

Can be used a a guide to open a dialogue with the patient in the preoperative interview to discuss their overall general health

F- fatigue

R- resistance

A- ambulation

I- illness

L- loss of weight

Assessment of these factors is used to generate a score that correlates with a frailty rating

FRAIL Scale

Frail Scores range from 0-5, one point for each component: 0=best to 5=worst

Robust = 0 points

Pre-Frail= 0-1 points

Frail = 3-5 points

FRAIL Scale	
Fatigue	How much time during the previous 4 weeks did you feel tired? (all of the time, most of the time = 1 points)
Resistance	Do you have any difficulty walking up 10 steps alone without resting and without aids? (Yes = 1 point)
Ambulation	Do you have any difficulty walking several hundred years alone with without aids? (Yes = 1 point)
Illness	How many illnesses do you have out of a list of 11 total? (5 or more = 1 point)
Loss of weight	Have you had weight loss of 5% or more? (Yes = 1 point)
(The illnesses include hypertension, diabetes, cancer (other than a minor skin cancer), chronic lung disease, heart attack, congestive heart failure, angina, asthma, arthritis, stroke, and kidney disease).	

Interventional Recommendations

The American Geriatric Society recommends that all anesthetics be tailored to consider the physiologic changes of aging in adults older than 65 years.

Frailty Screenings provide a more targeted assessment of factors that lead to decreased drug metabolism and physiologic reserve.

If a patient is screened as "frail", it is recommended to hold medications on the American Geriatric Society's Beer Criteria list, notably benzodiazepines

Conclusion

Frailty is a state of reduced physiologic reserve

Commonly associated with the geriatric population

Frailty puts patients at increased risk of postoperative delirium

Frailty is exacerbated by drugs commonly given during anesthesia including, but not limited to midazolam

Frailty screenings can successfully and consistently identify frailty

It is up to the anesthesia provider to make judicious use of available tools to assess and provide patient specific care and improve postoperative outcomes

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