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Evaluating Pre-Procedural Anxiety in Adults Undergoing Interventional Radiology Procedures

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Evaluating Pre-Procedural Anxiety in Adults Undergoing Interventional Radiology Procedures

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Dedication

First and foremost, after having been diagnosed with two cancers in the middle of this program, I especially wish to praise God for his healing powers and for giving me the strength to endure through it all. This DNP project is the culmination of my learning experience over the last four years and I would not have been able to reach this point without the love and support of my family. To my husband Bryan, you have believed in me, encouraged me, and never let me give up, especially when I was unsure of my future. I will forever be grateful for your dedication to our family and to me; as you've often had to take on additional responsibilities to allow me to follow my dream. Your love, patience, and support has allowed me to keep moving forward. I would also like to dedicate this project to my children, Hayley, Mackenzie, and Brody. You all have been understanding, helpful, and encouraging through this whole process. I'm so proud of all three of you for many reasons, including your academic goals and achievements. I hope you all continue to aim high and follow your dreams. Last but not least, I would like to thank my parents, Linda and Woody Barwick, for their continuing support and also, for teaching me the value of higher education.

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Abstract

PURPOSE: The purpose of this study is to evaluate pre-procedural anxiety with the Amsterdam Preoperative Anxiety and Information Scale (APAIS) in the adult population of the Interventional Radiology department at University of Kentucky Medical Center. The objective is to provide meaningful data to providers in this clinical area that could potentially facilitate better departmental workflow and also promote quality patient outcomes.

METHODS: A retrospective chart review, using a pre/post design, was used to evaluate the departmental implementation of APAIS. Case logs for the department were observed from January 2018 to June 2018 and then again, following APAIS implementation, from July 2018 to December 2018. Data evaluated from the case logs included: number of cases, number of cancellations, and number of general anesthesia cases as a means to evaluate if APAIS was effective in reducing cancellations and use of anesthesia for minimally invasive procedures. In addition, data was extracted from APAIS and the electronic medical records of the 259 inpatients and outpatients that met inclusion/exclusion criteria to determine the extent of pre-procedural anxiety in Interventional Radiology (IR) and to measure if APAIS scores were a predictor of intra-procedural anxiety. Staff participation with completing the APAIS form was also evaluated.

RESULTS: In this sample of 259 patients, APAIS identified 86 (34.5%) as not having any anxiety, 105 (42.2%) as having some anxiety, and 57 (22.9%) as having high anxiety prior to procedures. There was a positive correlation between needs information scores and anxiety scores, as well as a negative correlation between age and anxiety scores. For intra-procedure measures, there was no significance between anxiety levels and amount of medications received with the exception of those having percutaneous drains placed. However, there was a significant negative correlation between anxiety and level of sedation achieved. Post APAIS

implementation saw a decrease in all measures; although, only number of cancellations had a *p*-value < 0.05. There was a 44% staff completion rate of APAIS forms.

CONCLUSION: The implementation of APAIS was effective in identifying those with pre-procedural anxiety, predicting some physiological measures during procedures, and with lowering case cancellations. While not all outcomes were statistically significant, there is clinical significance worth further discussion. The implementation of a validated anxiety tool is beneficial in promoting quality departmental and patient outcomes.

Evaluating Pre-Procedural Anxiety in Adults Undergoing Interventional Radiology Procedures

Introduction

Mental health is considered a state of well-being that encompasses cognitive, emotional, and behavioral processes (WHO, 2019). Having good mental health is paramount to being productive in society, coping with stressors, and adapting to change. It also plays an integral role in the ability to participate in health-promoting behavior, as mental health has a direct relationship with physical health (ODPHP, 2019). In contrast, having poor physical health, from illness and chronic diseases, can lead to a decline in mental health.

It is also important to understand that poor mental health increases an individual's risk of developing other diseases, such as cardiovascular disease and diabetes (WHO, 2019; Miller et al., 2013). There are several proposed pathophysiologic processes that could explain the negative relationship between anxiety and adverse events that increase a patient's risk of other diseases, including: hypercortisolemia with insulin resistance, lifestyle risk factors, and sympathetic and/or vagal disturbances (Williams et al., 2013). Currently, mental health disorders are one of the main causes of disability in the United States, with the resulting burden being among the highest of all diseases. Mental health disorders ultimately lead to distress and are associated with decreased functioning, primarily by altering a person's thinking, mood, or behavior (ODPHP, 2019). Research shows that almost 60% of adults with a mental illness did not receive mental health services in the past year and that one-in-five Americans will experience mental illness at some point in their lives, costing $193 billion in lost wages (NAMI, 2019). Therefore, it is imperative that mental health disorders be screened in all patients on a regular basis.

The most common mental health disorder in the United States is anxiety. Currently, there are approximately 42 million Americans who suffer from anxiety disorders (NAMI, 2019). According to the American Psychological Association (2019), anxiety is an emotion

characterized by feelings of tension, worried thoughts, and physical changes. While it is a subjective emotion, many factors can influence anxiety, including genetics and environmental factors. Age, gender, procedures, hospitalizations, and inability to cope are all examples of elements that can influence anxiety (Pritchard, 2009). There are several recognized classifications of anxiety, including: generalized anxiety disorders, social anxiety disorders, panic disorders, and phobias. Although not formally recognized as a diagnosis, acute procedural anxiety is another type of disorder that can either coincide with other anxiety disorders or appear independently.

Background

Acute procedural anxiety is defined as an excessive fear of medical procedures that manifests as acute distress, peaking immediately before the procedure, remaining steady during the procedure and decreasing immediately following the procedure. This acute fear or anxiety, while either rational or irrational, can ultimately cause a disruption or delay in necessary interventions (Choy, 2019). When these delays occur, it can sometimes be days before the patient is rescheduled for treatment, thus, impacting such factors as: lengthening hospital stay, delaying dialysis treatment, or increasing intravenous antibiotic usage.

In addition to potential disruptions or delays in procedures, studies show that left untreated, pre-procedural anxiety can cause a multitude of physiological and psychological responses including: tachycardia, hypertension, heightened senses, increased pain sensation, and changes in behaviors (Choy, 2019; Pritchard, 2009; Miller et al, 2013). These responses can prevent patients from remaining still during procedures and necessitate the use of additional medications. Other studies have shown that patients with untreated high pre-procedure anxiety, not only have longer procedure times, but also require higher doses of medications to achieve comfort (Hong, Lee, Lutharat, 2005; Ip, Abrishami, Peng, Wong, Chung, 2009; Johnson, 2010; Schupp,

Berbaum, Berbaum, Lang, 2005). Researchers have also examined the effects of anxiety on post-procedural outcomes. For example, higher levels of pre-procedural anxiety have been shown to be a predictor of post-operative pain and can cause depression, nausea, fatigue, and delayed wound healing (Celik & Edipoglu, 2018; Gonzales & Rutledge, 2015; Hong et al., 2009; Ip et al., 2009; Pritchard, 2009). In addition to these complications, Williams et al. (2013) found that anxiety was an independent predictor of inpatient mortality and major morbidity in the elderly population undergoing cardiac surgery.

The acute procedural anxiety phenomenon could be a result of concerns or fears that the patient has about their own disease process or fear of the unknown. Interestingly, most studies have found that women have more anxiety about procedures than men (Celik et al., 2018; Gonzales et al., 2015; Moerman, van Dam, Muller, Oosting, 1996; Heyer et at.,2015). It is possible that females are more likely to report anxiety than males due to the perceived notion that women are more likely to express vulnerability; however, this has not been established. Other reasons for anxiety found in the procedural population have been: poor information, fear of contrast media, a cold and sterile environment while waiting, and loss of control (Heyer et al 2015; Lunden, Lundgren, Persson, Lepp, 2015). In order to determine the reasoning for the acute anxiety response, first a dialogue has to begin between the provider and the patient. In addition, the use of a validated tool will potentially allow providers to recognize and diagnose this issue more accurately than clinical impression alone.

The Amsterdam Preoperative Anxiety and Information Scale (APAIS), used to assess and evaluate procedural anxiety and information needs, has been implemented by the Interventional Radiology (IR) department at University of Kentucky Medical Center (UKMC). This measure was initiated due to clinical and systems presentation of undocumented anxiety in IR, such as: delays in cases, inability of patients to remain still during procedures, voiced fears/concerns by

patients, cancellation of procedures due to anxiety, and use of general anesthesia for no other reason than severe anxiety. However, there are no processes in place to stratify the data or measure the effectiveness of this tool. Evaluation of this process will not only determine effectiveness, but will also show which areas in current practice, if any, need improvement to better address pre-procedural anxiety.

Primarily, APAIS has been validated and used to assess anxiety in the population receiving anesthesia for surgery as opposed to those receiving intravenous (IV) conscious sedation for minimally invasive procedures. In addition, the focus of most studies involving anxiety in IR have been to evaluate the effects of Complementary Alternative Medicine (CAM) therapies. Literature is sparse when it comes to a comprehensive evaluation of acute procedural anxiety with minimally invasive procedures in IR, especially with the use of APAIS.

Theoretical Framework

The theoretical framework used to guide this study is Merle Mishel's Uncertainty in Illness theory. This theory explains how illness-related events are cognitively processed and constructed by the patient, thus giving the provider the opportunity to either positively or negatively affect this process. The three major constructs are: antecedents of uncertainty, appraisal of uncertainty, and coping with uncertainty (McEwen, 2014). The antecedents are the patient's personal history and experiences, but this is also affected by their knowledge of the disease process. The departmental implementation of APAIS should provide a better understanding of the antecedents as it determines whether the fear is from the procedure or from the sedation and it tells the provider whether the patient needs additional information. The appraisal is where the patient uses illusion and inference from their experiences to place a positive or negative value on their uncertainty (McEwen, 2014). Information from this study has the potential to lead to departmental guidelines or interventions to reduce anxiety, therefore,

establishing a positive value on the appraisal. Any practice changes that allows the providers to intervene based on individual needs could lead to an alteration of the patient's coping mechanism and finally, to the end result of adaptation, thus lessening the acute procedural anxiety response.

Purpose

The purpose of this study is to evaluate pre-procedural anxiety, the effectiveness of using a validated tool, and staff participation with use of APAIS in the adult population of the Interventional Radiology department at University of Kentucky Medical Center. The specific aims are:

1. Assess differences in anxiety levels using APAIS scores among adults in IR by examining patient demographics, inpatient vs. outpatient status, APAIS measures, and types of procedures.
2. Evaluate APAIS scores as a predictor of intra-procedure measures including: change in vital signs above twenty percent of baseline, case times by procedure type, level of sedation achieved, and amount of medications given.
3. Evaluate the effectiveness of APAIS implementation by measuring pre/post total number of cases, cancellations, use of general anesthesia, and terminated procedures.
4. Measure staff participation with completion of APAIS forms.

Methods

A retrospective chart review, using a pre/post design, was conducted in the Interventional Radiology department at the University of Kentucky Medical Center. The department utilizes an electronic scheduling system rather than a case tracking system; therefore, initial data had to be collected by evaluating the paper case logs within the department from the time period of January 1, 2018 to December 31, 2018. Patient charting in this area is currently completed on paper, then scanned into the electronic medical record (EMR) by the Department of Medical

Records; however, for now certain forms, including APAIS, are kept in the department. Therefore, newly implemented APAIS forms were evaluated for completion, from July 2018 to December 2018, then the EMR was used to further determine inclusion/exclusion criteria and data were extracted from that sample. The principal investigator (PI) de-identified sensitive information using a crosswalk table to assign patients' medical record numbers (MRN) to a unique research code. The crosswalk table was stored in a password protected file created by the University of Kentucky's Information Technology (UKIT) department and can only be accessed on site. The de-identified data were uploaded to a separate password protected file, also created by UKIT. These data were then uploaded to an Excel spreadsheet and to a statistical software program, SPSS version 25, for analysis with statistical significance set at *p*-value of 0.05.

Setting

This study was conducted within the Interventional Radiology department at the University of Kentucky Medical Center, a Level-1 trauma center located in Lexington, Kentucky. UKMC is committed to serving the health needs of the people of Kentucky by utilizing cutting edge technology anchored in evidence-based practice. This institution is dedicated to the foundations of academic health care—research, education, and clinical care (UK HealthCare, 2019). Within the Interventional Radiology department, located on the third floor of Pavilion H, there are currently four procedure rooms; one room is dedicated to Neurosurgery diagnostics and interventions, two rooms are used for IR body cases, and 1 room is shared with the Endoscopy department. This department also utilizes a computerized tomography (CT) room on the second floor of Pavilion H, that is overseen by the Radiology department. At this time, intake and recovery of IR patients are completed in the neighboring Endoscopy prep and recovery area. Due to use of anesthesia or overflow, some patients are recovered in the post anesthesia care unit (PACU), located in Pavilion A.

Sample

Patient inclusion criteria were: 1) 18 years or older; 2) acute or progressive care inpatients referred to department; 3) outpatients; 4) Glasgow Coma Scale (GCS) of 15; 5) English speaking; 6) completed APAIS form. Patient exclusion criteria were: 1) patients scheduled for general anesthesia or local anesthesia; 2) intensive care unit (ICU) patients; 3) Neurosurgery patients scheduled for diagnostics or intervention; 4) emergent cases. For pre/post data, all cases except Neurosurgery cases were counted due to that patient population being seen by a different set of providers and not receiving an APAIS form. A total of 328 EMRs were reviewed due to completion of APAIS forms from July 2018 to December 2018; 69 were excluded, for a sample population of 259 patients.

Implementation Tool

The APAIS is a six-question tool that is focused on determining levels of anxiety and the need for further information in the preoperative population. Each of the six questions are answered using a five-point Likert scale, ranging from no anxiety (1) to extremely anxious (5). The overall anxiety score (4-20) is established from the sum of questions 1, 2, 4, and 5. The needs information score (2-10) is then answered with questions 3 and 6. In addition to these scores, this scale can be further categorized to determine whether the anxiety or fear is related to the sedation or to the procedure; the first three questions address the fear of sedation and the last three questions address fear of the procedure.

This tool was originally developed because of the lack of anxiety measuring scales that dealt with the current situation the patient faced. While there are several tools that measure anxiety, they are lengthy and not specific to the current situation, nor do they address the needs information component. The authors of this tool conducted a study of APAIS with the State-Trait Anxiety Inventory (STAI), which has long been considered the gold standard, to validate their

scale and determine values that display the level of anxiety. A score of 11 or greater on the anxiety portion is consistent with having high anxiety; whereas, a score greater than 7 shows a high need for information (Moerman et al, 1996).

Due to the needs of the IR department, the APAIS form was slightly modified to say sedation instead of anesthesia and two additional questions were added at the bottom (see Appendix A). The two questions were added to determine if the patient had received any formal education prior to the day of the procedure regarding the type of procedure or the type of sedation they would receive. If they had received prior education, the method in which it was given was then recorded.

Data Collection

Approval for this study from the University of Kentucky Institutional Review Board (IRB) and the University of Kentucky Nurse Research Board was obtained before collection of data began. This study was based on a retrospective chart review. APAIS forms were reviewed for completion, followed by an EMR review to establish inclusion or exclusion. During data collection, patient records were accessed using the MRN and data from APAIS and EMR were abstracted based on predetermined variables, then entered into a password protected electronic spreadsheet. For the sample population of 259 included patients, information was taken from APAIS to determine their anxiety score, needs information score, fear of procedure, fear of sedation, and if prior education of procedure and sedation were completed. The EMR was used to collect demographic information, level of care (inpatient vs outpatient), type of procedure, level of sedation achieved, amount of medication received, case times, and vital signs (baseline and during first five minutes of procedure). Case logs were also evaluated for number of cases, cancellations, use of general anesthesia, and cases where the procedure was terminated while the

patient was on the table. The case logs were measured six months before APAIS implementation and then six months post implementation.

Data Analysis

Descriptive statistics, including; frequency distributions, percentages, means, and standard deviations (SD) were used to delineate APAIS information, patient demographic measures, and staff completion of APAIS. The chi-square test for independence was used to determine the relationship between the categorical variables of number of cases, cancellations, usage of general anesthesia, and terminated cases. An independent sample t-test was completed to evaluate relationships between the binary (yes/no) variables (sex, fear of sedation, fear of procedure, needs information, history of cancer, history of anxiety, history of narcotic use, prior education, change in vital signs) and anxiety scores. Anxiety was also ranked as an ordinal variable (no anxiety, some anxiety, high anxiety) and Spearman's correlation coefficient was used to determine the relationship with the continuous variables of case times, level of sedation, and amount of medications. Spearman's correlation coefficient was also used to evaluate the relationship between anxiety and age, needs information scores and age, as well as anxiety and types of procedures. All analysis was completed using SPSS version 25 with *alpha* level of 0.05 used for determination of statistical significance.

Results

Characteristics and Anxiety Assessment

A total of 259 patients who met inclusion/exclusion criteria were included in this study. The mean age was 58.6 years (SD 14.5), with 56.6% of the sample being female, and 84.3% being Caucasian. Almost three-fourths of the sample were outpatients (73.9%), and the two most common procedures were biopsies (33.3%) and vascular access placements (30.9%). From the

sample, 16.1% had a documented history of anxiety and 22.1% reported having a history of narcotic use; however, 60.6% had a history of cancer. (see Table 1).

The mean APAIS anxiety score was 7.6 on a scale of 4-20, and a total of 65.1% of the sample scored as having some form of anxiety. Of that 65.1%, 22.9% scored greater than or equal to 11 on APAIS, thus falling into the high anxiety subset. The mean needs information score was 4.6 on a scale of 2-10, and a total of 32.1% were classified as needing information. Fear of procedure was greater than fear of sedation with frequencies of 34.9% and 18.9%, respectively. For prior procedure education, 52.1% of the sample (N=238) reported having received education, while 29.2% (N=236) had received prior education on sedation for procedures. The most common method of receiving prior education was from the referring provider (86.3%; see Table 2).

An independent sample t-test was used to determine statistical significance in the mean differences between certain binary variables and anxiety scores. Females had higher anxiety than males, with a *p*-value of 0.005. There was no difference in level of care (inpatient vs outpatient), prior sedation education (yes/no), history of narcotic use (yes/no), or history of anxiety (yes/no); however, there was a difference with regard to having received prior procedure education. The group that did not receive education had significantly higher anxiety, with a *p*-value at 0.001. Also, the sample that did not have a history of cancer had higher anxiety than those who did, with a *p*-value of 0.002. A chi-square test of association was used on the three different groups of anxiety levels (those with no anxiety who scored a 4, some anxiety with a score between 5-10, and high anxiety with a score equal to or greater than 11), and types of procedures. There was no significance in anxiety levels among the different types of procedures. In addition, Spearman's correlation coefficient was used to determine an association between anxiety and several measures. There was a positive correlation between needs information

scores and anxiety with a *p*-value of <0.001. There was a negative correlation between age and anxiety with a *p*-value of 0.04; however, there was no association between age and needing additional information.

APAIS as a Predictor

Change in blood pressure (BP), heart rate (HR), and respiratory rate (RR) above 20% of baseline were measured for four different types of procedures (vascular access, embolization, percutaneous drains, and biopsies) using chi-square test of association. Among the four procedures, there were no significance in the change of BP, HR, or RR with *p*-value at 0.81, 0.35, 0.78, respectively. Change in vital signs (see Figure 1) were also evaluated to determine if there was statistical significance associated with the three established ordinal levels of anxiety (no anxiety, some anxiety, and high anxiety). A change in BP was significant among the three levels of anxiety with an associated *p*-value of 0.02; however, there was no significant association between change in HR or RR and anxiety levels. Case times for each of the four procedures were also measured by the different levels of anxiety using Spearman's correlation. The high anxiety sample had slightly longer case times in all cases except for vascular access; however, there was no statistical significance (see Figure 2).

Level of sedation achieved was measured by the average score documented throughout the procedure. A score of 0 is associated with not being sedated, a score of 1 means that the patient is very lightly sedated but still alert, a score of 2 means the patient is sedated but will awaken with light stimuli, and a score of 3 or 4 means the patient is heavily sedated and is receiving anesthesia. All patients in this study were given IV conscious sedation; therefore, their levels of sedation ranged from 0-2. With regard to the different types of procedures, there was no statistical significance between level of sedation, amount of medications, and anxiety scores, except with percutaneous drains. Spearman's correlation coefficient was used on each of these

variables to determine if there was an association with anxiety scores. There was a positive correlation between the amount of Versed given and anxiety scores, with a *p*-value 0.05 and a negative correlation between the level of sedation achieved and anxiety scores, with a *p*-value of 0.03. Spearman's correlation coefficient was also used to determine if there was any association between the level of sedation achieved and the amount of medications given to patients with the three categorized anxiety levels. There was also a negative correlation between anxiety levels and level of sedation achieved. The mean level of sedation achieved, and the amount of medications received for all procedures can be seen in Table 3.

Pre/Post APAIS

For the six-month period of January to June 2018, there were 1996 cases of which 338 were canceled, 206 required anesthesia, and 22 were terminated on the procedure table. Following departmental APAIS implementation, there were 2037 cases of which 271 were canceled, 192 required anesthesia, and 15 were terminated on the procedure table during the period of July to December 2018. Using a chi-square test of independence, there was a statistical significance with a *p*-value of 0.005 for case cancellations. Use of anesthesia and terminated cases were not statistically significant, with *p*-values of 0.38 and 0.22, respectively (see Table 4).

Staff Participation

Of the 2037 cases following APAIS implementation, only 874 (43%) APAIS forms were placed in patients' charts. Of the 874 APAIS forms included in the charts, only 382 (44%) were completely filled out.

Discussion

This study aimed to facilitate the understanding of the impact that procedural anxiety can have in an area like Interventional Radiology, both on workflow and patient safety. Additional variables, such as history of anxiety and history of cancer, were also evaluated to determine if a

diagnosis of anxiety or a condition that is known to increase anxiety would correlate with acute procedural anxiety; they did not. Surprisingly, those without a history of cancer had a statistically significant association with high anxiety scores. This could be attributed to the fact that 33.3% of procedures completed in this sample were biopsies to assess for cancer and subsequently, possible fear of the unknown caused an elevation in their anxiety level.

Another variable, history of narcotic use, was also evaluated as a potential confounding variable for an increase in procedure medication amounts. However, only 22.1% of the sample were identified as either being prescribed narcotics or having a recreational habit, and there was no statistical significance in relation to anxiety scores. Overall, medication amounts used during the procedures were not significantly different among the three anxiety levels. These are important considerations when it comes to perceived reasons for increased anxiety or intra-procedure medication usage and can assist the provider with addressing acute procedural anxiety as a separate component.

As with other research, this study shows that females report as having higher anxiety than males. Again, this could potentially be related to the perceived notion that females' express feelings more easily or that males do not like to show weakness. Perhaps it would be helpful to allow the patients to fill out the APAIS form themselves as opposed to having a nurse read and record answers for them. Doing so may allow patients to feel more comfortable answering the questions without an audience.

Other research showed that procedural anxiety caused a need for more medications during procedures and longer procedure times (Ip et al., 2009; Hong et al., 2005; Schupp et al., 2005). However, these outcomes were not found in this study, but that does not mean there was no clinical significance, especially with regard to case times. It is important to note that case times were increased in three out of four procedure types and longer case times disrupt workflow and

potentially have a financial impact on the department. In regard to amount of medications and level of sedation achieved, there was no difference in amount of medications used between the anxiety levels, but there was significance in that the high anxiety group did not achieve the same level of sedation. Looking at the different procedure types, percutaneous drains did show more usage of Versed with higher anxiety scores, but again, those with higher anxiety scores in that same procedure type, did not achieve the same level of sedation. Based on these results, the high anxiety subset is not achieving the same comfort level during procedures as others with lower or no pre-procedural anxiety. This is beneficial for providers so they can be cognizant of the difficulty the high anxiety subset has in achieving comfort during procedures and potentially lead to interventions or guidelines that could address this issue.

Another important finding in this study is that 52.1% of the sample reported receiving prior procedure education and 29.2% reported receiving prior sedation education. These results show that almost half of the patients who came in for procedures in this area were not fully aware of what their procedures entailed until they spoke to a provider for consent. In addition, a little over 70% of these patients did not know what kind of sedation they would be receiving for their procedure. As study findings show, there is a direct relationship between needs information scores and anxiety scores; therefore, a great opportunity is present in this area to lower anxiety scores by implementing processes to provide education prior to the day of procedure to this population. The APAIS is also valuable in determining which patients would benefit from additional information and which ones would not, via the need information component.

During the post-APAIS period, there were forty-one additional cases; however, there were sixty-seven fewer cancellations, fourteen less cases with anesthesia, and seven less terminations mid-procedure. Although only cancellations were statistically significant, there is clinical significance in the potential financial impact this reduction has on the department and also,

because more patients were receiving and completing medically necessary interventions. However, there was a missed opportunity in this patient population due to low APAIS completion rates that will be further discussed in limitations.

Limitations

Several limitations were identified in the design of this study. Data from the sample were collected through a retrospective chart review and this method did not allow for verification of recorded results. This study also occurred within a single center and had low staff participation. Low participation most likely had to do with the fragmented departmental areas, as the patient intake/work-up was started in a different department. Depending on staffing ratios for either department, the procedural IR nurse would not always have time to ensure completion without disrupting workflow. The department also utilizes a scheduling system rather than a case tracking system that would allow reasons for cancellations, use of anesthesia, and case terminations to be entered and tracked. The use of paper charting and no clear place for anxiety documentation limited the ability to review and identify those patients missing an APAIS form, as well as identify anxiety prior to APAIS implementation.

Recommendations for Futures Studies

Recommendations for future studies would include implementing a guideline for patients identified as having high anxiety, such as use of anxiolytics in the intake area or earlier sedation start times to begin during prepping of procedure. This would guide nurses and providers in promoting comfort during the peak of acute procedural anxiety and could allow anxious patients to achieve the same level of sedation as those identified as not having anxiety. After implementation, data could be analyzed pre/post to ensure that there was no significant increase in the amount of medications given, or any other adverse effects. Patient satisfaction could also

be evaluated at this time. Results post implementation could be measured against this study to determine differences.

Another recommendation for future studies would be to implement anxiety documentation using a validated tool at set intervals on patients' flowsheets and track such measures as vital signs and pain at established points. Currently, there is no anxiety documentation other than APAIS form pre-procedure and no established method to assess or document anxiety during the procedure. Researchers could look at other measures that this study did not, such as pain, during and after procedures. Another measure could be post-procedure medication usage for those with and without pre-procedure anxiety, as well as, recovery times and hospital length of stay for inpatients. Studies like this one have been conducted in the surgical setting, but research is lacking in the area of minimally invasive procedures in IR. Not only would this be a potential patient safety issue, but also a workflow/systems issue.

Evaluating the cost-effectiveness of a nurse navigator or more advanced practice providers (APPs) in this area could also be beneficial. This study has shown that information and prior procedure education has a direct result of influencing anxiety scores. Tracking reasons for delays and cancellations would assist with a cost analysis and provide an accurate picture for financial losses in this area. Having additional staff that could address the education gap could possibly lessen anxiety and further decrease delays and cancellations.

Conclusion

The goal of this study was to examine the prevalence of pre-procedural anxiety in the Interventional Radiology department and to determine if the use of a validated tool would assist with decreasing cancellations, decrease mid-procedure terminations, and use of general anesthesia for minimally invasive procedures. In addition, the scores from APAIS were used to evaluate whether they gave an accurate depiction of anticipated measures of intra-procedural

anxiety. While not all measures in this study showed statistical significance, there is clinical significance when dealing with the disruptions that procedural anxiety can lead to in this type of area. This study can give providers a better understanding of the effects of acute procedural anxiety and which areas need to be improved. It is imperative to acknowledge that acute procedural anxiety differs from other anxiety disorders and should be evaluated as such on the day of the procedure. Properly addressing this type of anxiety has the potential to enhance workflow and cost-effectiveness of the department, while increasing patient satisfaction and promoting safe, quality outcomes.

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Table 1. *Demographic and clinical characteristics. (N = 249)*

	Mean (SD) or *n* (%)
Age	58.6 (14.5)
Sex	
Male	108 (43.4%)
Female	141 (56.6%)
Ethnicity	
Caucasian	210 (84.3%)
African American	26 (10.4%)
Hispanic	3 (1.2%
Asian	1 (0.4%)
Other	9 (3.6%)
Level of Care	
Inpatient	65 (26.1%)
Outpatient	184 (73.9%)
Types of Procedures	
Vascular access	77 (30.9%)
Embolization	29 (11.6%)
Percutaneous drain	39 (15.7%)
Biopsy	83 (33.3%)
Other	21 (8.4%)
History of Anxiety	
Yes	40 (16.1%)
No	209 (83.9%)
History of Cancer	
Yes	151 (60.6%)
No	98 (39.4%)
History of Narcotic Use	
Yes	55 (22.1%)
No	194 (77.9%)

Table 2. *APAIS distributions (N=259)*

	Mean (SD) or n (%)
APAIS Anxiety Score No Anxiety Some Anxiety High Anxiety	7.6 (4.6) 86 (34.5%) 105 (42.2%) 57 (22.9%)
APAIS Information Score Needs Information	4.6 (2.7) 80 (32.1%)
Fear of Sedation	47 (18.9%)
Fear of Procedure	87 (34.9%)
Prior Procedure Education N=238	124 (52.1%)
Prior Sedation Education N=236	69 (29.2%)
Education Methods Referring provider Phone call Internet Other N=124	107 (86.3%) 4 (0.03%) 3 (0.02% 11 (0.09%)

Table 3. *Mean values of sedation level and medications used for all procedures*

No Anxiety N=86	0.87 sedation level 131.40 mcg Fentanyl 2.79 mg Versed
Some Anxiety N=105	0.84 sedation level 104.85 mcg Fentanyl 2.15 mg Versed
High Anxiety N=57	0.78 sedation level 126.32 mcg Fentanyl 2.9 mg Versed

Table 4. *Pre/Post APAIS*

	Pre APAIS	Post APAIS	*p*
Cancellations	338	271	0.005
Use of Anesthesia	206	192	0.38
Terminated cases	22	15	0.22

Figure 1. *Percentage of VS change above 20% baseline by anxiety levels*

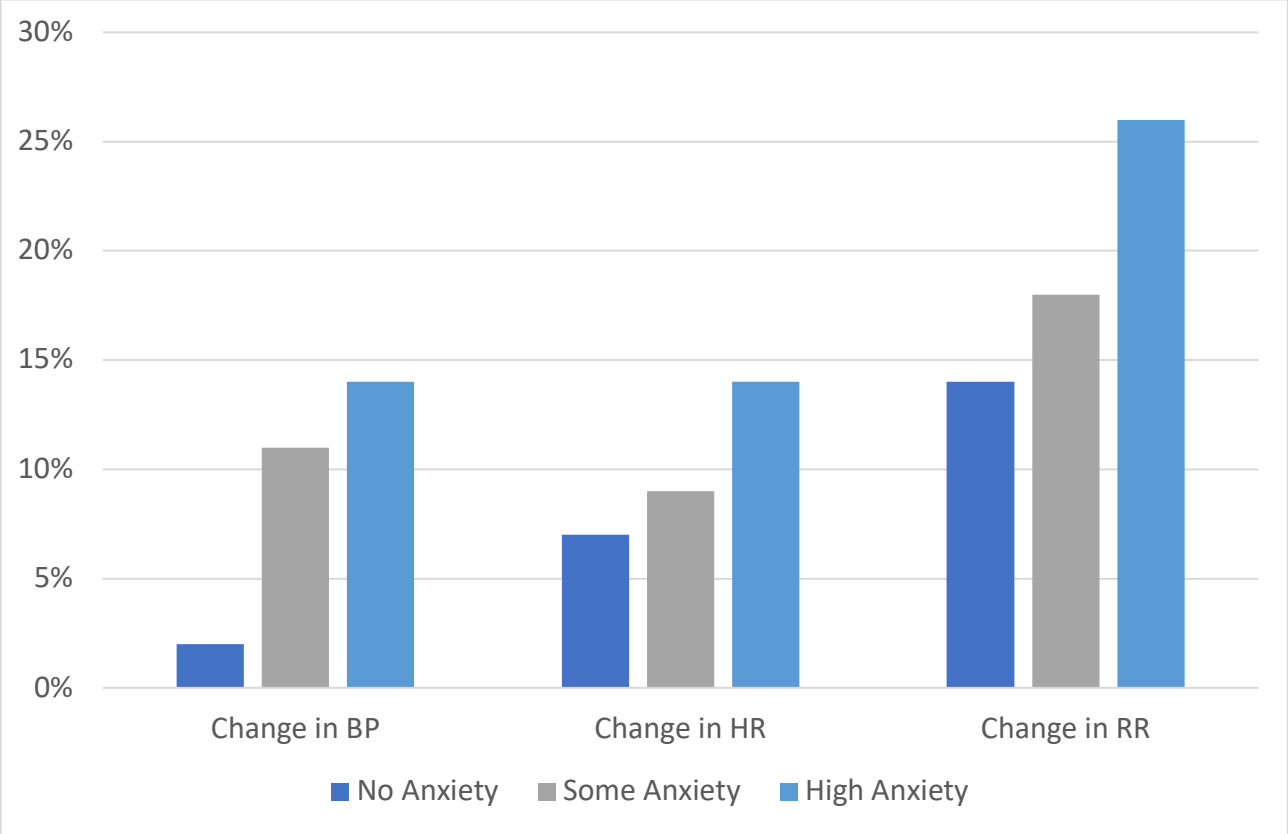
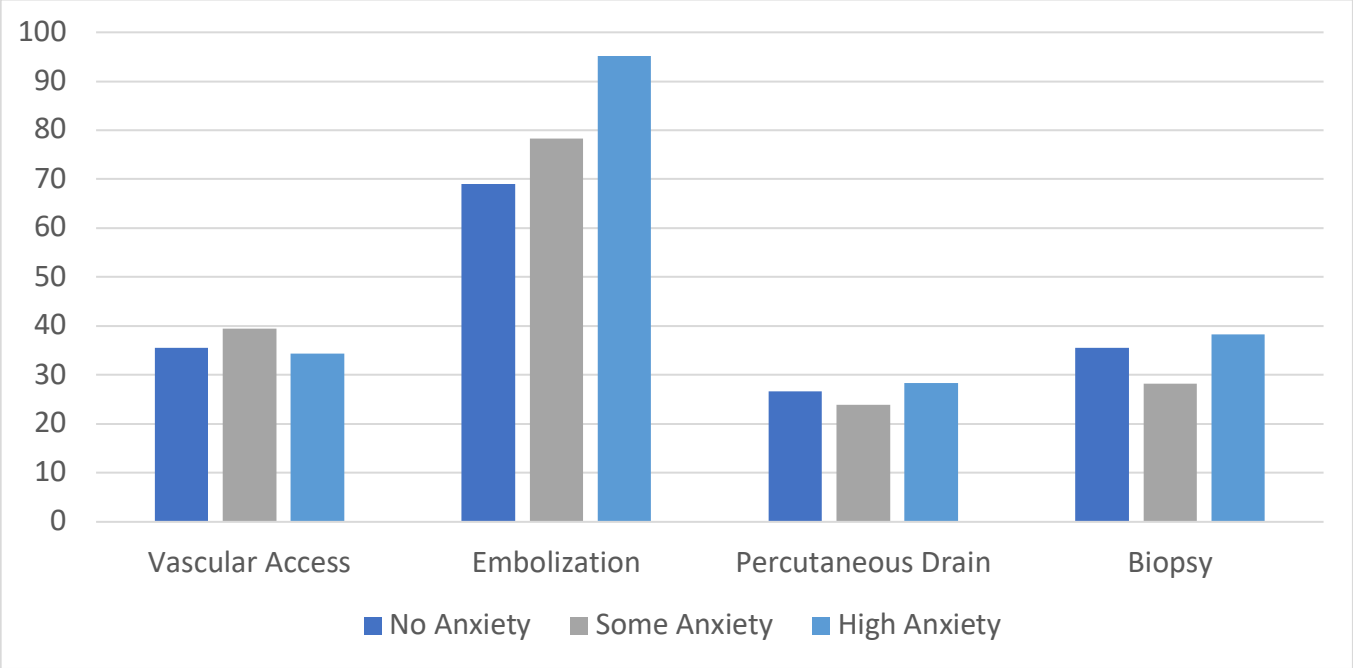


Figure 2. *Case times of procedures in minutes by anxiety levels*



Appendix A

Patient label

Date_____ Time_____

Type of procedure_____

Amsterdam Preoperative Anxiety and Information Scale

APAIS QUESTIONS	Not at all 1	2	3	4	Extremely 5
1. I am worried about the anesthetic/sedation					
2. The anesthetic/sedation is on my mind continually					
3. I would like to know as much as possible about the anesthetic/sedation					
4. I am worried about the procedure					
5. The procedure is on my mind continually					
6. I would like to know as much as possible about the procedure					

Total score for questions 1, 2, 4, and 5 combined: _____. **For score of 11 or greater; notify procedure RN.**

Total score for questions 3 and 6 combined: _____. **For score of 6 or greater; notify procedure RN.**

Education prior to the day of procedure

1. Before today, did you receive any education regarding your procedure? **Y** or **N**
2. Before today, did you receive any education regarding sedation for your procedure? **Y** or **N**

If so, what was the method used?

1. Physician/Nurse/Referring office? _____
2. Phone call? _____
3. Internet? _____
4. Other? _____

NOTES_____