UCLA
UCLA Previously Published Works

Title

Preprocedural Video Education on Liver Ablation Treatment

Permalink

https://escholarship.org/uc/item/8111v9vj

Journal

Journal of Radiology Nursing, 43(2)

ISSN

1546-0843

Authors

Anuran-Torres, Jhoanna
Cardin, Suzette
Grimley, Karen
et al.

Publication Date

2024-06-01

DOI

10.1016/j.jradnu.2023.09.015

Peer reviewed

eScholarship.org Powered by the California Digital Library
University of California

Journal of Radiology Nursing 43 (2024) 147–152

Contents lists available at ScienceDirect

Journal of Radiology Nursing

journal homepage: www.sciencedirect.com/journal/journal-of-radiology-nursing

Preprocedural Video Education on Liver Ablation Treatment

Jhoanna Anuran-Torres, DNP, RN, ACNP-BC [a,*], Suzette Cardin, PhD, RN, FAAN [b], Karen Grimley, PhD, RN [b], Su Yon Jung, PhD [b], Sue Kim-Saechao, DNP, RN, FNP-BC [a], Lauren Clark, PhD, RN, FAAN [b]

[a] Department of Interventional Radiology, Ronald Reagan UCLA Medical Center, Los Angeles, CA
[b] School of Nursing, University of California, Los Angeles, Los Angeles, CA

Keywords:
Anxiety
Anxious
Video education
Education
Knowledge
Procedure
Preprocedural
Surgery
Hepatocellular carcinoma
Cancer
Liver ablation

A B S T R A C T

Background: Anxiety is a common problem in patients scheduled for a procedure, and their level of anxiety increases as the procedure date approaches; pre-procedural anxiety is observed in hepatocellular carcinoma (HCC) patients scheduled for liver ablation treatment. There is currently a lack of standardized education provided to patients about liver ablation treatment, which may contribute to patients' anxiety.
Purpose: To test the effectiveness of a pre-procedural video educational tool to reduce patient anxiety and increase knowledge in HCC patients in an interventional radiology clinic setting.
Methods: This was a quasi-experimental, single-arm study, with a pre-test/post-test. Participant recruitment was based on a convenience sample. Inclusion criteria included: patients ages 18 and older; have biopsy-proven HCC or have a liver mass suspicious for HCC based on LI-RADS criteria imaging; no prior liver ablation treatment within three months of study onset. Participants watched a 7:04 minutes video and completed a 40-item State-Trait Anxiety Inventory and 10-item Knowledge Questionnaire before and after the video intervention to assess changes in anxiety and knowledge. Demographic variables evaluated included age, gender, education, and primary language.
Results: There were 16 participants who met inclusion criteria. The state anxiety scores were significantly lower after the intervention (Md = 33.50, n = 16) compared to before (Md = 47.50, n = 16), z = −2.67, p = .009, with a medium effect size, r = 0.47. The trait anxiety scores did not show sufficient evidence for a difference after the intervention (Md = 40.00, n = 16) compared to before (Md = 39.50, n = 16), z = 0.71, p = .50, with a small effect size, r = 0.13. The knowledge scores were significantly higher after the intervention (Md = 9.00, n = 16) compared to before (Md = 2.00, n = 16), z = −3.53, p = .0005, with a large effect size, r = 0.62. A nonparametric bootstrap and nonparametric permutation test also showed evidence for a difference in mean between the distributions of the state anxiety and knowledge pre- and post-intervention scores.
Discussion: The results of this study showed evidence for the effectiveness of video education in decreasing anxiety and increasing knowledge in HCC patients. A standardized pre-procedural video educational tool can be a useful practice across all interventional radiology departments as it is associated with improved quality of care and positive health outcomes.

Published by Elsevier Inc. on behalf of the Association for Radiologic & Imaging Nursing. All rights reserved.

Introduction

Anxiety affects over 40 million adults (19.1%) and is the most common mental health disorder in the United States, according to the National Alliance on Mental Illness (National Alliance on Mental Illness, 2017). The American Psychological Association (2021) describes anxiety as "an emotion characterized by feelings of tension, worried thoughts, and physical changes." Anxiety is a common problem in patients scheduled for a procedure, and their level of anxiety increases as the procedure date approaches (Musa et al., 2020). Providers must assess and manage anxiety early on to alleviate physical and psychological symptoms and maximize healing (Klaming et al., 2013; Parizad et al., 2021).

The diagnosis of cancer can increase the risk of anxiety severe enough to interfere with treatment compliance, quality of life, and treatment outcomes (Lee et al., 2017). In 2020, there were nearly 10

* Corresponding author: Jhoanna Anuran-Torres, DNP, RN, ACNP-BC; Department of Interventional Radiology, Ronald Reagan UCLA Medical Center, 100 Medical Plaza, Ste 100, Los Angeles, CA 90095.
E-mail address: januran@mednet.ucla.edu (J. Anuran-Torres).

https://doi.org/10.1016/j.jradnu.2023.09.015
1546-0843/$36.00/Published by Elsevier Inc. on behalf of the Association for Radiologic & Imaging Nursing. All rights reserved.

million cancer deaths worldwide (Sung et al., 2021). The International Agency for Research on Cancer produced the Global Cancer Observatory (GLOBOCAN), which estimates the global burden of cancer is expected to be 28.4 million cases in 2040, which is a 47% increase from cancer diagnosis in 2020 (Sung et al., 2021). Sung et al. (2021) further examine the cancer burden based on the GLOBOCAN estimates and reveal that liver cancer is the third leading cause of death worldwide in 2020. Hepatocellular carcinoma (HCC) accounts for about 90% of the most prevalent histologic type of primary liver cancer (Kim and Viatour, 2020). The 5-year universal survival rate is under 20% after an initial HCC diagnosis (Laube et al., 2021).

Patients diagnosed with HCC need to undergo treatment to decrease tumor burden to improve their life expectancy. Surgery is the standard treatment modality for HCC. While some patients are not surgical candidates, others are not interested in major surgery and would prefer a less invasive treatment approach.

Thermal liver ablation treatment is a minimally invasive procedure that destroys tumors by applying heat, cold, or chemicals via a percutaneous probe that is directly inserted into the liver tumor. It has been widely adopted and accepted in the interventional radiology (IR) arena and performed in the outpatient setting. Patient recovery time is much quicker with ablation treatment compared to surgical resection (Voglreiter et al., 2018), allowing patients to return to work and resume physical activity a few days after treatment.

Liver ablation treatment may produce anxiety for some patients. An individual's emotions such as fear, intense worries, or increased alertness can be an expression of anxiety (Clifford and Jerit, 2018). Anxiety can be due to various factors, including emotions that make one feel not in control and the need to depend on others, the perception of tangible risk of the medical procedure, or ambiguity about the overall health prognosis and fear of death (Gambadauro et al., 2015; Musa et al., 2020). Preprocedural anxiety is a serious issue that can have adverse effects on patients. Anxiety can cause the body to consume more oxygen due to the body's increased metabolic rate, affecting the length of the procedure, recovery period, and length of hospital stay (Celik and Edipoglu, 2018; Musa et al., 2020). A patient's anxiety can compromise their learning and bias information processing, with negative consequences for knowledge retention (Clifford and Jerit, 2018). Anxious patients' ability to make educated medical decisions is often impaired. Adequate education about the procedure, preoperative and postoperative experiences, pain relief, medication use, length of stay in the hospital, and reassurance will help patients cope with surgical anxiety (Wilson et al., 2016).

Methodology

Design

The project was a quasi-experimental, single-arm study with a pretest/posttest design to assess the effect of preprocedural video-based education on anxiety and liver ablation procedural knowledge among patients who underwent an evaluation for liver ablation treatment. The quality improvement project duration was over a 3-month period.

Sample and Setting

The project's setting was an outpatient IR clinic at a large academic center in Los Angeles, California. The participants were patients referred to the clinic for liver ablation treatment, and recruitment was based on a convenience sample. All patients with HCC presenting for outpatient IR clinic evaluation for ablation treatment were screened and recruited if they met the inclusion criteria. Inclusion criteria included patients ages 18 and older who had no prior liver ablation treatment within 3 months prior to project onset to avoid potential clinical experience and knowledge bias toward answering the questionnaires; have a biopsy-proven HCC; or have a liver mass suspicious for HCC based on the Liver Imaging Reporting and Data System classification score. There has been evidence to show that Liver Imaging Reporting and Data System algorithms assist in stratifying the probability of HCC and overall malignancy; therefore, the American Association for the Study of Liver Diseases has adopted this as a part of HCC clinical practice (Chernyak et al., 2018). Exclusion criteria included patients under the age of 18 or those who had prior liver ablation treatment within the last 3 months prior to project onset.

Instruments

The project utilized a pretest/posttest design conducted on the same day of the initial clinic evaluation before meeting with the interventional radiologist. The dependent variables assessed were both anxiety level and knowledge retention of the video educational intervention. The empirical indicators were the State-Trait Anxiety Inventory (STAI) questionnaire and knowledge questionnaire developed by the primary project lead. The STAI questionnaire has 40 questions, rated on a 4-point scale, that measure anxiety and was validated with internal consistency coefficients between 0.86 and 0.95 and test-retest reliability coefficients between 0.65 and 0.75 (Spielberger et al., 1983). It is owned by Mind Garden, and the STAI questionnaires were available in different languages. The license to reproduce the questionnaires was purchased by the project lead.

Ten random patients were interviewed and preliminary surveyed to answer what they thought was the most essential information to know about liver ablation treatment to determine the most useful and beneficial information to be included in the video. The answers were reviewed, and some were included in the knowledge questionnaire. The knowledge questionnaire had 10 questions, with a minimum score of zero and a maximum correct score of 10. Nurse practitioners and physicians with at least 5 years of clinical experience in managing liver cancer patients and experts in ablation treatment created the knowledge questionnaire, also providing construct validity. Patients were asked to provide their age, sex, education level, and primary language on the questionnaire. The video education was provided in either English or Spanish and included information related to liver ablation treatment and what the patient would expect after treatment. Questionnaires were administered to participants before watching the video (T1) and again within 15 minutes after watching the video (T2).

Intervention

Brame (2016) reports that studies have shown that learning can be enhanced with technology, and video is a highly effective educational tool. The video script was created by the project lead with the assistance of medical stakeholders. The video was 7:04 minutes and was developed by the company Holvan (San Luis Obispo, CA), which focuses on improving the quality of care through advanced communication. The participants watched the video on either an iPad or via a web link that was directly provided to them via e-mail.

Data Collection

Questionnaires were administered to participants before watching the video (T1) and again within 15 minutes after the video observation (T2). The project lead was the sole implementer of the

video delivery to the patients and the collector of questionnaires from the patients postviewing. A sole implementer of the educational videos assured consistency in delivery and supported reliability in the project. The questionnaires were all completed before the interventional radiologist saw the patients.

Data Analysis

The sample demonstrated that the population was not normally distributed, so the normal methods (paired t-test, classic confidence interval for mean) could not be used. The Wilcoxon test for nonparametric data was used for primary data analysis. This method compared the median scores of the STAI and knowledge pre- and post-test questionnaires. The test analyses included descriptive statistics that evaluated measures of frequency, central tendency, and variation. A nonparametric bootstrap and nonparametric permutation test were also used to show evidence for a difference in mean between the distributions of preintervention and postintervention scores. Analysis was conducted by a statistician using R Version 4.2.0 (Vienna, Austria) and funded by the project lead.

Results

Demographics

A total of 16 patients met the inclusion criteria and participated in this quality improvement project. The majority of age group evaluated for liver ablation treatment was aged 60 to 69, followed by 70 and older. There were 68.7% males and 31.3% females. The video was mostly shown in English. Among the patients, the preferred primary language was English 56.3%, Chinese 18.8%, Spanish 12.5%, Korean 6.3%, and Vietnamese 6.1%. The mean highest level of education completed among the patients was 2 years of junior college, representing 25% of the participants. The remaining patients were equally distributed among all other educational categories, with 18.8% having attended either grade school, high school, undergraduate, or graduate school (see Table 1).

Anxiety

The possible scores from both state and trait anxiety questionnaires range from a minimum score of 20 to a maximum score of 80. The STAI scores are classified as “no or low anxiety” (20-37), “moderate anxiety” (38-44), and “high anxiety” (45-80)

Table 1
Frequency counts for demographic variables

Variable	Category	n	%
Age category	18-39 years	0	0
	40-49 years	1	6.3
	50-59 years	2	12.5
	60-69 years	7	43.8
	70 and older	6	37.5
Sex	Male	11	68.7
	Female	5	31.3
Highest level of education	Grade school (8th grade or lower)	3	18.8
	High school (12th grade)	3	18.8
	Junior college (2 years)	4	25.0
	Undergraduate college (3-5 years)	3	18.8
	Graduate school (>Bachelor's degree)	3	18.8
Primary language	English	9	56.3
	Spanish	2	12.5
	Chinese	3	18.8
	Korean	1	6.3
	Vietnamese	1	6.1
	Other	0	0

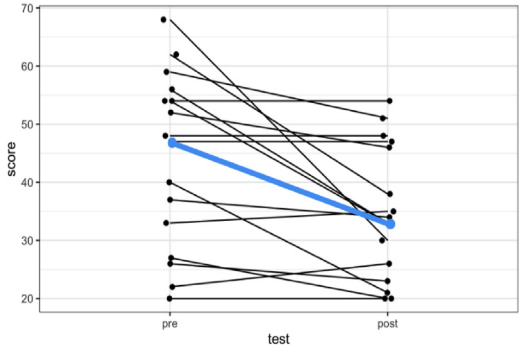

Figure 1. Pre- and post-scores for state anxiety.

(Kayikcioglu et al., 2017). The range of scores for anxiety (state) preintervention was 36.9 to 51.2. The range of scores for anxiety (state) postintervention was 29.6 to 40.4. The baseline state anxiety (STAI-S) scores showed a significant decrease after watching the video education, as shown in Figure 1. The mean state anxiety score preintervention revealed moderate anxiety (44.06, standard deviation [SD] = 15.09) was higher than the mean postintervention score, which revealed no or low anxiety (34.94, SD = 11.45) based on the standard interpretation. The mean change in the sample was −9.125. Based on the state anxiety changes, the Wilcoxon signed-rank test with continuity correction reveals that anxiety scores were significantly lower after the intervention (Md = 33.50, n = 16) compared to before (Md = 47.50, n = 16), z = −2.67, p = .009, with a medium effect size, r = 0.47. A nonparametric bootstrap with 100,000 iterations gives a 95% confidence interval for the mean change of (−14.9, −3.3). This interval is entirely negative, so it shows evidence of a decrease in the mean between the pre- and post-intervention scores. A nonparametric permutation test with null hypothesis that the mean change is zero gives a p value of 0.005. This is also evidence of a difference in the mean between the distributions of pre- and post-intervention scores.

The range of scores for anxiety (state) preintervention was 34.5 to 42.4. The range of scores for anxiety (state) postintervention was 33.3 to 42.0. The trait anxiety (STAI-T) baseline scores showed a decrease after watching the video with a few score outliers, as shown in Figure 2. The raw score mean trait anxiety score preintervention revealed moderate anxiety (38.75, SD = 8.46) with the mean postintervention score revealing no or low anxiety (37.75, SD = 9.18). The mean change in the sample, which is the best point estimate of the mean change in the population was −0.8125. The sample indicates that the population was not normally distributed, so the paired t-test could not be used. Applied to the trait anxiety changes, the Wilcoxon signed-rank test with continuity correction reveals that anxiety scores did not show sufficient evidence for a difference after the intervention (Md = 40.00, n = 16) compared to before (Md = 39.50, n = 16), z = −0.71, p = .50, with a small effect size, r = 0.13. A nonparametric bootstrap with 100,000 iterations gives a 95% confidence interval for the mean change of (−3.3, 1.6). This interval includes zero, so it does not give evidence for a difference in mean between the distributions of the pre- and post-intervention scores. A nonparametric permutation test with null hypothesis that the mean change is zero gives a p value of 0.57. This test does not give evidence for a difference in mean between the distributions of preintervention and postintervention scores.

Knowledge

There was an increase in knowledge scores after having watched the video education, as shown in Figure 3. The mean knowledge score preintervention (5.13, SD = 2.25) was lower than the mean

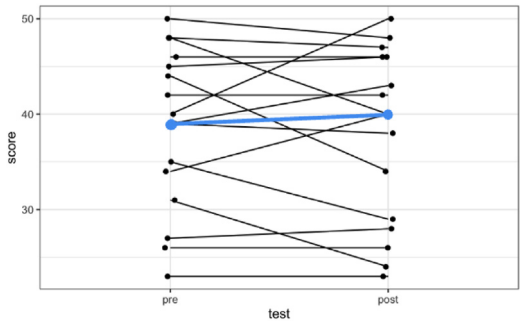

Figure 2. Pre- and post-scores for trait anxiety.

knowledge postintervention score (9.13, SD = 1.03). The mean change in the sample was 4.00. The sample indicates that the population is not normally distributed, so normal methods like the paired t-test could not be used. The Wilcoxon signed-rank test with continuity correction was applied to the knowledge score changes, which reveals that knowledge scores were significantly higher after the intervention (Md = 9.00, n = 16) compared to before (Md = 2.00, n = 16), z = −3.53, p = .0005, with a large effect size, r = 0.62. A nonparametric bootstrap with 100,000 iterations gives a 95% confidence interval for the mean change of (3.2, 4.9). This interval is entirely positive, so it shows evidence of an increase in the mean between the pre- and post-intervention scores. A nonparametric permutation test with null hypothesis that the mean change is zero gives a p value of 3.1*10^−5. The evidence shows a difference in the mean between the distributions of knowledge pre- and post-intervention scores.

Discussion

The project aimed to determine if implementing a liver ablation video education before clinic evaluation for ablation treatment by an interventional radiologist would decrease anxiety and increase knowledge in hepatocellular carcinoma patients. Additional demographic variables, such as sex, age, level of education, and preferred primary language, were also evaluated to determine if there was any association between the variables and anxiety. Based on the data analysis, due to the small sample size, there was no association between age and no association between education and posttest knowledge; all participants did well on the post-intervention knowledge scores.

The utilization of both the state and trait questionnaires allowed for a better understanding of the participant's anxiety level prior to treatment evaluation. There was good evidence for a decrease in state anxiety score after watching the video, with an average decrease of 5 points, thus showing statistical significance. Although this was found to be statistically significant, it may not be sufficient to completely change the experience of anxiety, as the categories of low, moderate, and high anxiety are constructed with numerical ranges in which a 5-point change may not be sufficient to move a participant from one experiential category to another. There was no average change in trait anxiety. Although the data analysis did not support the significance of trait anxiety, the sample did show a decrease in mean scores postintervention. Trait anxiety is more of an abiding trait or characteristic; it is generally less responsive to changes as compared to state anxiety. All participants had an improvement in their knowledge score, with an approximately 4 point increase in change after watching the video; therefore, there was a statistically significant association for an increase in knowledge. A table was created to demonstrate the Wilcoxon signed-rank test (see Table 2). The pre- and post-intervention means of state anxiety, trait anxiety, and knowledge as well as a boxplot to demonstrate the score changes were created (see Table 3, Figure 4).

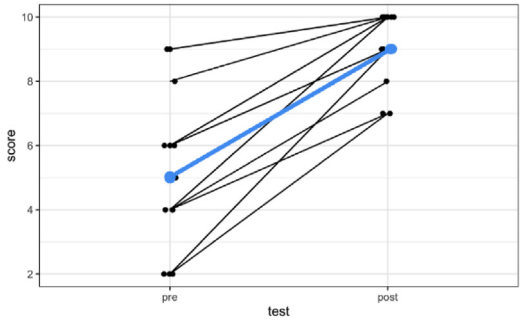

Figure 3. Pre- and post-scores for knowledge.

Limitations

The limitation of the study is that the quasi-experimental design may not yield the most reliable evidence on the intervention's effectiveness to support causality; thus, results cannot fully exclude confounding variables (Gopalan et al., 2020). The sampling plan may raise the external validity concern to generalize the same outcome to different patient populations or settings. A key barrier that posed a challenge in recruitment was the coronavirus disease 2019. The pandemic caused some patients to either delay or avoid seeking treatment due to the fear of contracting coronavirus disease 2019. There was also a significant increase in the use of telemedicine consultation. Telemedicine consultation made it challenging to recruit older patients or those who were technologically challenged. Some patients did not have access to a printer, know how to print, or completely answer the questionnaires in a timely manner. There were fewer participants recruited, giving us a much smaller sample size (n = 16) than expected. A bivariate analysis was conducted, but due to the small sample size, there was no association between anxiety and age or between education and posttest knowledge, thus limiting any further inferential results. A few participants verbalized that the STAI questionnaire was long and time-consuming to complete and that they required some verbal encouragement to finish the forms.

Another limitation of the project regarding knowledge retention that could have occurred is reactive measure. Since knowledge was being evaluated by using the same questionnaire twice, there is the possibility the participants' responses were affected when tested again, causing a threat to internal validity (Flannelly et al., 2018). In regard to data analysis, a bivariate analysis was conducted, but due to the small sample size, there was no association between anxiety and age and no association between education and posttest knowledge.

Implications for practice and research

The project demonstrated favorable results in decreasing pre-procedural anxiety and increasing knowledge with video education. The results will be disseminated within the departmental organization, including the key stakeholders. The video-based education will be used as a standardized educational tool for all HCC patients to watch during initial evaluation in the outpatient setting. Sustainability will require that all patients referred for liver ablation observe the educational video prior to an initial evaluation for treatment. The liver ablation video will be uploaded onto the IR website ready to be viewed and accessible to the general public

Table 2
Pre- and post-percentiles of state anxiety, trait anxiety, and knowledge

Measure	Percentiles				
	Minimum	25th	50th (median)	75th	Maximum
STAI-S anxiety preintervention (state)	20.00	31.50	47.50	54.50	68
STAI-S anxiety postintervention (state)	20.00	25.25	33.50	46.25	54.00
STAI-T anxiety preintervention (trait)	23.00	33.25	39.50	45.25	50.00
STAI-T anxiety postintervention (trait)	23.00	28.75	40.00	46.00	50.00
Knowledge preintervention	2.00	4.00	5.00	6.00	9.00
Knowledge postintervention	7.00	9.00	9.00	10.00	10.00
					n = 16

Table 3
Pre- and post-mean scores of state anxiety, trait anxiety, and knowledge

Measure	Preintervention: mean (95% CI)	Postintervention: mean (95% CI)	Difference: mean (95% CI)	Wilcoxon signed-rank test: p value	Paired permutation test: p value
Anxiety (state)	44.1 (36.9, 51.2)	34.9 (29.6, 40.4)	−9.1 (−15.2, −3.8)	0.009	0.005
Anxiety (trait)	38.6 (34.5, 42.4)	37.8 (33.3, 42.0)	−0.8 (−3.2, 1.6)	0.50	0.57
Knowledge	5.1 (4.1, 6.2)	9.1 (8.6, 9.6)	4.0 (3.1, 4.9)	<0.001	<0.001
					n = 16

when browsing online. The plan to further sustain the results includes adapting video education in different languages.

The use of technology in the form of educational videos has been shown to help patients understand their treatment plan more clearly. This improves any communication gaps between patient and provider and decreases anxiety due to apprehension of the unknown. The creation of a video educational tool and application in the clinical setting proves to be highly feasible and cost-effective for improving patient outcomes. Positive project outcomes can promote the development of additional video-based educational tools related to other procedures such as embolization. Access to these tools before treatment evaluation can provide the patient with the additional knowledge and confidence to undergo the procedure and to better understand what to expect postoperatively, thus decreasing preprocedure anxiety.

Ethical considerations

The proposal was submitted to the Univestity of California Los Angeles (UCLA) Health Research, Evidence-Based Practice, and Innovation Program, which works in partnership with the UCLA Institutional Review Board (IRB) for review. Since this was a quality improvement project, neither certification of exemption from UCLA IRB review nor UCLA IRB approval was required. Patient-informed consent was obtained.

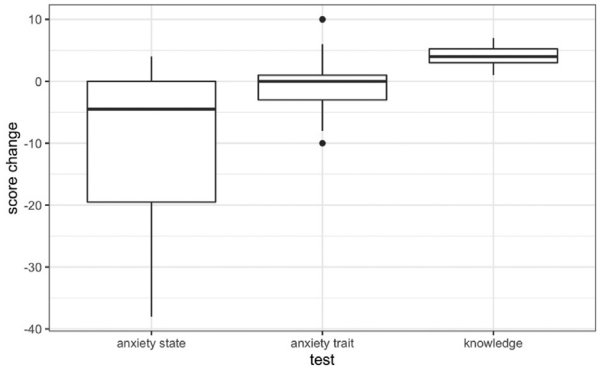

Figure 4. Boxplot of score changes of state anxiety, trait anxiety, and knowledge.

Conclusion

Many healthcare providers refer patients to consult with interventional radiologists for advanced minimally invasive treatments. Patient feedback, despite current education being provided, revealed gaps related to knowledge and education that may contribute to the patient's anxiety. The lack of standardized preprocedural education in the IR clinic was an apparent oversight that was addressed in this project to alleviate anxiety. The problem encouraged clinicians to pursue solutions in this target population. Video-based education offers a promising teaching modality and has proven effective in prior research on patients undergoing surgical procedures to positively increase knowledge and dispel fears, thus decreasing patient anxiety. Clinical nurses can help to reassess patients' educational needs prior to procedures and utilize video-based education in the clinical setting. Future research may investigate the impact of virtual education in waiting rooms at major medical centers to help prepare patients and families for procedures and postoperative care, thus, decreasing anxiety, encouraging active partnership in care, and empowering providers to continue toward creative mechanisms to improve outcomes.

CRediT authorship contribution statement

All authors have read and contributed to the manuscript.

Conflict of interest

The authors have no relevant disclosures. There was no grant funding or financial support for this manuscript.

Acknowledgments

Jhoanna Anuran-Torres would like to acknowledge and give special thanks to Dr. Lauren Clark, for all her time, guidance, mentorship, and support. Jhoanna would also like to acknowledge Dr. Suzette Cardin, Dr. Karen Ann Grimley, and Dr. Su Yon Jong. The committee shared their knowledge and expertise. Thank you to the UCLA School of Nursing, especially Dr. Nancy Jo Bush, Dr. Teresa Brown, and Soo Kwon. All were so compassionate and supportive.

Jhoanna would like to thank Dr. Sue Kim-Saechao, for her ongoing encouragement, support, and faith in me. The respect, mentorship, and friendship she had provided will always be cherished. Jhoanna is grateful to the UCLA IR clinic's administration, medical assistants, nurse practitioners, and physicians. Finally, Jhoanna would like to give her deepest gratitude to Mike Holliday at Holvan for helping to develop the liver ablation video.

References

American Psychological Association. (2021) Anxiety. Retrieved from https://www.apa.org/topics/anxiety/. Accessed May 30, 2021.

Brame, C.J. (2016). Effective educational videos: principles and guidelines for maximizing student learning from video content. *CBE—Life Sciences Education, 15*, Article es6.

Celik, F., & Edipoglu, I.S. (2018). Evaluation of preoperative anxiety and fear of anesthesia using APAIS score. *European Journal of Medical Research, 23*(1), 41.

Chernyak, V., Fowler, K.J., Kamaya, A., Kielar, A.Z., Elsayes, K.M., Bashir, M.R., et al. (2018). Liver imaging reporting and data system (LI-RADS) version 2018: imaging of hepatocellular carcinoma in at-risk patients. *Radiology, 289*(3), 816-830.

Clifford, S., & Jerit, J. (2018). Disgust, anxiety, and political learning in the face of threat. *American Journal of Political Science, 62*(2), 266-279.

Flannelly, K.J., Flannelly, L.T., & Jankowski, K.B. (2018). Threats to the internal validity of experimental and quasi-experimental research in healthcare. *Journal of Health Care Chaplaincy, 24*(3), 107-130.

Gambadauro, P., Navaratnarajah, R., & Carli, V. (2015). Anxiety at outpatient hysteroscopy. *Gynecological Surgery, 12*(3), 189-196.

Gopalan, M., Rosinger, K., & Ahn, J.B. (2020). Use of quasi-experimental research designs in education research: growth, promise, and challenges. *Review of Research in Education, 44*(1), 218-243.

Kayikcioglu, O., Bilgin, S., Seymenoglu, G., & Deveci, A. (2017). State and trait anxiety scores of patients receiving intravitreal injections. *Biomedicine Hub, 2*, 1-5.

Kim, E., & Viatour, P. (2020). Hepatocellular carcinoma: old friends and new tricks. *Experimental & Molecular Medicine, 52*, 1898-1907.

Klaming, L., Van der Zwaag, M., Van Minde, D., & Geraedts, H. (2013). The influence of an audiovisual intervention on patient experience in a digital x-ray room. *J Participat Med, 5*, Article e36.

Laube, R., Sabih, A., Strasser, S.I., Lim, L., Cigolini, M., & Liu, K. (2021). Palliative care in hepatocellular carcinoma. *Journal of Gastroenterology and Hepatology, 36*(3), 618-628.

Lee, K.-T., Lin, J.-J., & Shi, H.-Y. (2017). Anxiety and depression are associated with long-term outcomes of hepatocellular carcinoma: a nationwide study of a cohort from Taiwan. *The World Journal of Biological Psychiatry, 19*(6), 431-439.

Musa, A., Baron, D.A., Anavim, A., Al-Hihi, M., Ali, M.A., Pendi, K., et al. (2020). Notions of preprocedural patient anxiety in the realm of IR. *Journal of Vascular and Interventional Radiology, 31*(2), 336-340.e1.

National Alliance on Mental Illness. (2017) Anxiety disorders | NAMI: National Alliance on Mental Illness. Retrieved from https://www.nami.org/About-Mental-Illness/Mental-Health-Conditions/Anxiety-Disorders. Accessed June 1, 2021.

Parizad, N., Goli, R., Faraji, N., Mam-Qaderi, M., Mirzaee, R., Gharebaghi, N., et al. (2021). Effect of guided imagery on anxiety, muscle pain, and vital signs in patients with covid-19: a randomized controlled trial. *Complementary Therapies in Clinical Practice, 43*, Article 101335.

Spielberger, C., Gorsuch, R., Lushene, R., Vagg, P., & Jacobs, G. (1983). *Manual for the state-trait anxiety inventory*. Palo Alto, CA: Consulting Psychologists Press.

Sung, H., Ferlay, J., Siegel, R.L., Laversanne, M., Soerjomataram, I., Jemal, A., et al. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA. A Cancer Journal for Clinicians, 71*, 209-249.

Voglreiter, P., Mariappan, P., Pollari, M., Flanagan, R., Blanco Sequeiros, R., Portugaller, R.H., et al. (2018). RFA guardian: comprehensive simulation of radiofrequency ablation treatment of liver tumors. *Scientific Reports, 8*(1), 787.

Wilson, C.J., Mitchelson, A.J., Tzeng, T.H., El-Othmani, M.M., Saleh, J., Vasdev, S., et al. (2016). Caring for the surgically anxious patient: a review of the interventions and a guide to optimizing surgical outcomes. *The American Journal of Surgery, 212*(1), 151-159.