Anxiety and Internet Research Before Percutaneous Ultrasound-guided Diagnostic Procedures

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Abstract

Invasive procedures guided by ultrasound (US) are part of the routine medical diagnostic investigation. The lack of knowledge related to technical aspects about them can lead the patient to seek complementary information on the internet, which can trigger anxiety. However, the intersection between the areas of Radiology and Psychology is poorly studied. Here we show the profile of an anxious patient before an US-guided intervention.

One hundred thirty-three patients were evaluated. The State-Trait Anxiety Inventory (STAI) was applied for psychometry. Higher anxiety scores were significantly observed in female patient, in those who believe they had received inadequate information from the referring physician, and in those who assessed the online information to be unreliable or difficult to access. Patients who defined themselves as proactive in online searching reported lower anxiety. Our results show that the profile of an anxious patient before an US-guided intervention can be established. The recognition of this profile can guide measures to reduce anxiety in patients who will undergo an US-guided invasive procedure.

Introduction

Ultrasound (US)-guided invasive procedures are essential modalities in clinical oncology. Advantages of US include real-time imaging, rapid time to results, low costs, portability, safety, avoidance of radiation exposures of patients and medical staff, and immediate diagnosis of complications (e.g., bleeding) (1). The continued development of medical imaging devices has facilitated the delivery of an expanding set of interventional procedures for the benefit of an increasing patient population (2). In parallel, with the advent of the Internet, a profusion of information has become widely available. Access has become easy, allowing the retrieval of information before communication with a healthcare professional regarding questions or doubts related to the procedure (3). However, online information may be superficial and of varying quality, and may thus amplify anxiety, misperceptions, and confusion, rather than providing clarification to afford tranquility (4).

Studies that evaluate Internet use by patients in search of health information present conflicting data. Results of studies of Internet use by healthcare professionals are also divergent. Several investigators characterize the Internet as a tool to improve the doctor-patient relationship. As Hollander et al. (5) state, "The Internet is helping to create a more informed and more autonomous group of patients." A study by Google® (3) found an increasing rate of health-related searches. The platform was sought as the first source of information regarding their diseases approximated those who immediately consulted a physician (26% vs. 35%) (3). Another survey conducted by the same platform (6) showed that the primary topic surveyed by study subjects was medical treatment (60%), followed by general information about diseases (52%) and symptoms (48%). However, difficulties in comprehending medical language and uncertainties arising from the multiplicity of information are often reported (7).

The intersection between the areas of Radiology and Psychology is poorly studied. Nevertheless, it is extremely important since radiological exams are part of the initial approach for diagnosis and monitoring of cancer treatment. Therefore, the objective of the present study was to investigate the demographic and psychological profiles of patients undergoing US-guided invasive procedures, the patients' use of Internet searches about the proposed intervention, and the impact of these variables on anxiety levels before the procedure.

Results

One hundred thirty-three patients underwent US-guided invasive procedures. The mean age was 49.7 years (median 50, minimum 18, and maximum 83 years). Procedures included fine needle aspiration (FNA) and cutting needle biopsy (core biopsy). Of these, 77 (57.8%) had FNAs at anatomic sites distributed as follows: 50 thyroid, 10 breast, nine axillary lymph nodes, four cervical lymph nodes, three parotid, and one soft tissue lesion (nodule of the hand). Fifty-six (42.2%) patients underwent core biopsies: 50 breast, three prostate, and three cervical lymph nodes. Baseline characteristics are shown in Table 1.

Table 1 Baseline characteristics of patients undergoing US-guided invasive procedures.

Parameter	US	
Sex	**n**	**%**
Female	109	82%
Male	24	18%
Education		
Incomplete Fundamental	6	4.5%
Complete Fundamental (9 years)	6	4.5%
Incomplete High School	5	3.8%
Complete High School (12 years)	22	16.5%
Incomplete University education	25	18.0%
Complete University education (≥ 14 years)	69	51.9%
Origin		
Public Health System	29	21.8%
Private Health System	104	78.2%
Regular medical attention[1]		
Yes	120	90.8%
No	13	9.2%
Procedure previously performed		
Yes	55	41.4%
No	78	58.6%
Previous cancer treatment		
Yes	45	33.8%
No	88	66.2%
Individual subjective aspect of health status [2]		
Healthy	127	95.5%

US, ultrasonography.

[1] Patients asked if they considered themselves to have regular medical follow-up.

[2] Patients asked about their perception of their general health.

Parameter	US	
Unhealthy	6	4.5%
US, ultrasonography.		
[1] Patients asked if they considered themselves to have regular medical follow-up.		
[2] Patients asked about their perception of their general health.		

Women demonstrated higher mean levels for anxiety in the STAI-State scale (P = 0.001) (Table 2). There was a statistically significant inverse relationship between patient assessment of the amount of information received from the referring physician and the STAI-State anxiety score (P = 0.006) (Table 3). Because this parameter had three possible responses, the Mann-Whitney test was used to compare responses two by two, with statistical significance found in the comparisons between the responses “little information” and “all necessary information,” and between “almost all necessary information” and “all necessary information” (P < 0.05). The relationship between the patient’s self-assessed proactivity and STAI scores are shown in Table 4.

Table 2 Relationship between gender and the anxiety score using the STAI scale.

STAI	Sex	Mean	Median	SD	n	IC	*P*
State	Female	44.0	45.0	9.1	109.0	1.7	0.001
	Male	36.6	37.0	8.4	24.0	3.4	
Trait	Female	39.7	39.0	8.2	109.0	1.5	0.063
	Male	36.2	34.5	9.8	24.0	3.9	
STAI, State -Trait Anxiety Inventory; US, ultrasound.							

Table 3 Relationship between the information previously provided by the referring physician and the anxiety psychometry provided by STAI. The questionnaire question was: "Do you consider that the requesting doctor provided all the necessary information before the procedure?"

	Answer	Mean	Median	SD	N	IC	*P*
State	Little information	49.2	48	6.6	5	5.8	0.006
	Almost all necessary information	47.3	46	8.7	22	3.6	
	All necessary information	41.2	42	9.2	105	1.8	
Trait	Few information	49.4	55	12.6	5	11.0	0.075
	Almost all necessary information	41.0	40,5	8.4	22	3.5	
	All necessary information	38.1	38	8.1	105	1.5	
STAI, State -Trait Anxiety Inventory.							

Table 4 Relationship between proactivity and anxiety score by STAI.

STAI	Answer	Mean	Median	SD	n	IC	*P*
State	Yes	41,8	42	9.6	108	1.8	0.003
	No	47,4	48	5.8	23	2.4	
Trait	Yes	38,6	38	9.0	108	1.7	0.129
	No	41,0	40	6.4	23	2.6	
STAI, State -Trait Anxiety Inventory.							

Patient assessments of the reliability of information available on the Internet regarding their procedure were significantly related to STAI-State scores, with higher scores associated with the “unreliable” answer (P = 0.007). STAI-State scores were also directly related to assessments of the difficulty of accessing information (mean of 39.3 points for those who considered access “easy” versus 45.4 points for those who reported accessibility as “difficult” (P = 0.001) (Table 5). There were no significant associations between STAI anxiety scores and educational level, age, past histories of previously undergoing the proposed procedure or cancer treatment, and subjective assessments of health status and the regularity of medical care (P > 0.05).

Table 5 Correlation between the subjective appraisals of the reliability and the difficulty in accessing online information regarding the US-guided invasive procedure. The available data refer to both those who searched and those who did not search online, and the anxiety score was measured by the STAI score.

STAI	Answer	Mean	Median	SD	N	IC	*P*
State	Reliable	40.2	40.5	10.6	60	2.7	0.007
	Unreliable	45.0	45.0	7.3	58	1.9	
Trait	Reliable	38.1	36.5	9.1	60	2.3	0.119
	Unreliable	40.2	39.5	8.3	58	2.1	
State	Easy	39.3	40	10.2	55	2.7	0.001
	Difficult	45.4	45	7.5	65	1.8	
Trait	Easy	37.5	37	8.2	55	2.2	0.060
	Difficult	40.5	39	8.9	65	2.2	

STAI, State -Trait Anxiety Inventory.

Discussion

The profile of the patient who undergoes a US-guided percutaneous interventional procedure is usually female, with higher education and private health insurance, and reports regular medical attention. This patient undergoes the procedure for the first time, does not receive cancer treatment, and believes to be in good health.

We observed significantly higher anxiety scores among female patients, those who appraised that they had received insufficient information from their referring physicians, those who considered the information available on the Internet to be unreliable, and those who found online information difficult to access. However, patients who defined themselves as proactive demonstrated less anxiety before invasive interventions. These results are relevant in clinical practice, because there are few studies in the medical literature that associate Internet use, previous information communicated by the referring physician, and anxiety before US-guided invasive procedures.

Women presented with higher levels of anxiety. This finding is in accordance with those of other published studies. Yu et al. (8) studied cancer patients before diagnostic imaging exams. Of 328 participants, 152 (46.3%) were anxious, and women had higher levels of anxiety compared to men (P = 0.021). Surgical studies are more prevalent in the medical literature, and despite the inherent differences between populations, they can be instructive on the difference in anxiety between genders. Domar et al. (9) evaluated 523 patients undergoing elective surgery. Preoperatively, multiple parameters were evaluated, including age, sex, occupation, education, type of surgery, and whether the patient had previously undergone a similar procedure. The STAI questionnaire for anxiety psychometry was completed in the waiting room immediately before the intervention. Of all studied parameters, only female gender correlated positively with anxiety level. This finding has also been reported in other parts of the world. Jafar et al. (10) used STAI to evaluate 300 pre-surgical patients in Pakistan, and found

higher levels of anxiety in women. However, we consider it necessary to exercise caution before stating that these data represent an innate difference in anxiety levels between genders, because anxiety questionnaires are self-administered, and female patients may be more inclined to admit anxiety than males.

Patients who reported receipt of insufficient information from referring physicians were more anxious before US-guided interventions. The patient's lack of knowledge before a medical intervention has been the subject of previous studies. Kiyohara et al. (11) evaluated 140 patients before elective surgical procedures. STAI scores were correlated to the patients' understanding of their diagnoses, surgical procedures, and types of anesthesia. Knowledge regarding the diagnosis or the prescribed anesthesia did not influence anxiety levels. However, patients who had doubts about the surgical procedure had higher STAI-State anxiety psychometry scores. Our results showed that patients with little prior medical information have higher STAI-State scores, and add to previous studies of surgical patients by confirming the importance of adequate clarification before procedures in interventional radiology.

Studies have been conducted to elucidate patient behavior after medical appointments. Bell et al. (12) used an online questionnaire to evaluate 274 members of an Internet community who had undergone a medical consultation within the previous 30 days. Most respondents searched information online after their visits (68%). Those who referred that they had received insufficient information after the consultation were more likely to search. Li et al. (13) evaluated 311 patients who underwent consultations in 2019. The primary reasons for searching for complementary data on the Internet were curiosity and perceived incomplete information given by the physician. It is important to note that these studies have important limitations, as they studied members of small online communities, thus raising questions regarding the generalization of their findings to other communities and offline groups. In addition, participants were connected to the Internet and, possibly, more familiar with this technology than the general population. On the other hand, the present study brings new information to the medical literature, because it included patients in the waiting room awaiting their procedures, with the questionnaires being applied regardless of the participant's search for complementary information on the Internet. Despite these methodological differences, we believe that our results are complementary, and indicate that misinformation may lead the patient to search the Internet.

Patient appraisal of online information was also assessed. Those who assessed online information as "unreliable" and those who reported difficult access were more anxious. Previous studies have attempted to identify which criteria are credible quality indicators of online information. Johnson et al. (14) concluded that the formation of trust is influenced both by central parameters such as website content, as well as peripheral factors such as style and ease of access. On the other hand, Kelton et al. (15) concluded that reliability assessment is linked to the user's personal concepts and their identification with the available content. They proposed that a sense of concurrence between the user and the website results from a conformity between the information presented and "the user's own sense of identity, goals and values." Consequently, personal identification plays a central role in creating the perception of "reliable" information. Therefore, we have identified a clinical interaction amenable to intervention, in

which a more attractive and transparent communication interface between online information and the patient, in association with a greater sense of credibility, could decrease anxiety before an US-guided invasive procedure. A potential example would be the recommendation of trusted sites by physicians during consultations, preferably in the same institution where the procedure will take place.

Proactivity in initiating online searches for health information has also been studied. Murray et al. (16) conducted a telephone survey that covered all regions of the United States, with 3209 participants. “Proactive” was defined as those who started a search for health topics on their own. The author concluded that proactive participants were more likely to consider themselves as excellent or particularly good at assessing the reliability of online information, as well as being able to successfully find relevant information. The present study demonstrated that the more proactive patients were less anxious at the time of the US-guided interventions. Mc Mullan et al. (17) published a literature review on the use of the Internet to obtain health information and its impact on the doctor-patient relationship. Three potential responses to patients who bring information from the Internet were discussed: 1) the healthcare professional feels threatened by the information and responds by defensively stating his "expert opinion"; 2) the healthcare professional and the patient cooperate in the analysis of online information; 3) the healthcare professional guides patients to reliable sites on the Internet. It is precisely this third response that our study supports, and leads us to formulate a question still to be answered in future research: whether proactivity can be promoted by the physician during consultation, and consequently reduce anxiety before US-guided invasive procedures.

We verified the absence of significant associations between STAI-Trait scores and the studied demographic parameters and Internet use. This finding was expected, because the STAI-Trait scale reflects a more chronic predisposition to anxiety. A meta-analysis published out by Schneider et al. (18) reviewed all published articles and unpublished dissertations between 1980 and 2005 that addressed psychosocial interventions for cancer patients that utilized STAI. The results for changes in STAI-Trait scores were equivocal, suggesting that pre-intervention stress is more accurately characterized by STAI-State. Thus, considering that the focus of our study was anxiety experienced moments before the invasive procedure, the STAI-State was expected to reflect the patient’s anxiety more accurately.

Several limitations of the present study must be considered. Regarding the quality of communication by the referring physician, we call attention to the lack of a structured diagnostic clinical interview. Additionally, we must consider the heterogeneity between the comparison groups. US-guided procedures vary widely, ranging from simple FNAs to liver biopsies. It is exactly this diversity of procedures that reflects an oncology center’s value to its patient population.

In conclusion,

Higher anxiety scores before invasive US-guided procedures were found in female patients, in those who appraised that they had received insufficient information from the referring physician, and in those who considered online information to be unreliable or difficult to access. The recognition of this profile can

guide measures to reduce anxiety in patients who will undergo an US-guided invasive procedure, such as improve patient-physician communication and provide proper and easily available online information.

Methods

Study Design

We conducted a prospective study that applied questionnaires to patients undergoing US-guided invasive procedures at a cancer center. This study was approved by our Institutional Review Board (Research Ethics Committee of the Antônio Prudente Foundation - A.C. Camargo Cancer Center; approval number: 2.063.731) and was in accordance with the ethical standards with the 1964 Helsinki declaration and its amendments. All patients provided informed consent before inclusion.

Figure 1 depicts the criteria used in patient selection. Inpatients were excluded, because the sense of clinical urgency during hospitalization often does not permit complementary Internet searches before medically indicated procedures.

Patients were evaluated at two separate timepoints (Fig. 2). First, the State-Trait Anxiety Inventory (STAI) was applied before the procedure. This tool has been used since 1970 (19) and has the most robust validation in the medical literature. Its primary purpose is to measure, through a self-administered questionnaire, current symptoms of anxiety, in addition to assessing a more chronic and generalized propensity for this emotional state. Second, after the procedure, another self-administered questionnaire was applied addressing multiple aspects: education, sociodemographic parameters, quantification of pain during the procedure, subjective questions about the reliability of information available on the Internet, among others. It is important to highlight the fact that the participants were informed that there were no correct answers to the questions in both questionnaires. Figure 1 illustrates the steps from the patient's arrival to the hospital to the application of the questionnaires and performance of the procedures.

Pre-procedure questionnaire

There are two subdivisions of STAI, each with unique characteristics. The first is the Anxiety-State scale (STAI-State), which assesses the current state of anxiety, asking how respondents feel “now,” using items that measure subjective feelings of apprehension, tension, nervousness, concern, and autonomic nervous system activation. The second is the Anxiety-Trait scale (STAI-Trait). It assesses relatively stable aspects of the “propensity to anxiety”, including general states of calm, confidence, and security. This psychometric tool for anxiety is self-administered and has 40 items, 20 of which are allocated to each subscale. The score range for each subtest is 20 to 80, with higher scores indicating greater anxiety (9–12). A cutoff value of 39–40 points is generally used for detecting symptoms of clinically significant anxiety (10). Completion of the questionnaire by most adults requires approximately 10 minutes.

Post-procedure questionnaire (supplementary material)

The following clinical and sociodemographic data were collected: age, sex, education, and patient referral source (public or private health system). Patients were asked to provide past histories of undergoing the procedure and previous treatment or follow-up for any neoplasm. Subjective aspects regarding regular medical follow-up and general health (if patients considered themselves “healthy” or “unhealthy”) were also queried.

Closed questions were used so that patients could position themselves regarding their assessments of the amount of information communicated by the referring physician before the procedure, and their proactivity in searching for medical information on the Internet. The subjective concept of proactivity was assessed by asking, "A proactive person is one who seeks to anticipate problems, to know situations before they happen ... Do you consider yourself proactive in the search for information about your health?" Patient appraisals of the reliability of online information and ease of access were also queried.

Statistical Methods

The obtained STAI-State and STAI-Trait anxiety scores were compared with other variables. Normality distribution was tested using the Kolmogorov-Smirnov test and p-values of 0.021 for State and 0.004 for Trace were obtained. Thus, the non-parametric Mann-Whitney test was used for comparing two subgroups, and the Kruskal-Wallis test was used when 3 subgroups were analyzed. Tests developed in this study considered a significance of 5%. SPSS software, version 20.0, was used in the analyzes.

Declarations

Competing interests

The authors declare that they have no conflicts of interest. The authors have no relevant financial interests to disclose. No funding was provided for this work.

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Figures

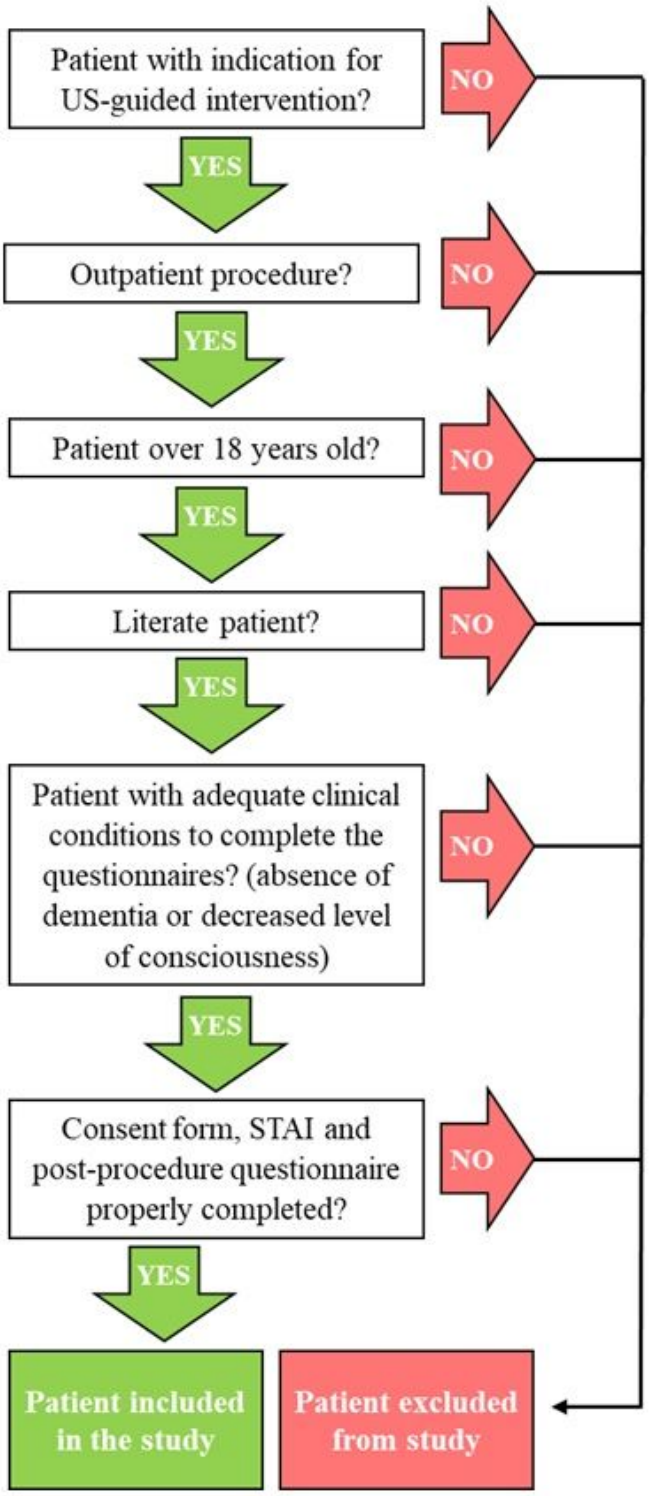

Figure 1

Inclusion criteria. STAI, State -Trait Anxiety Inventory; US, ultrasound.

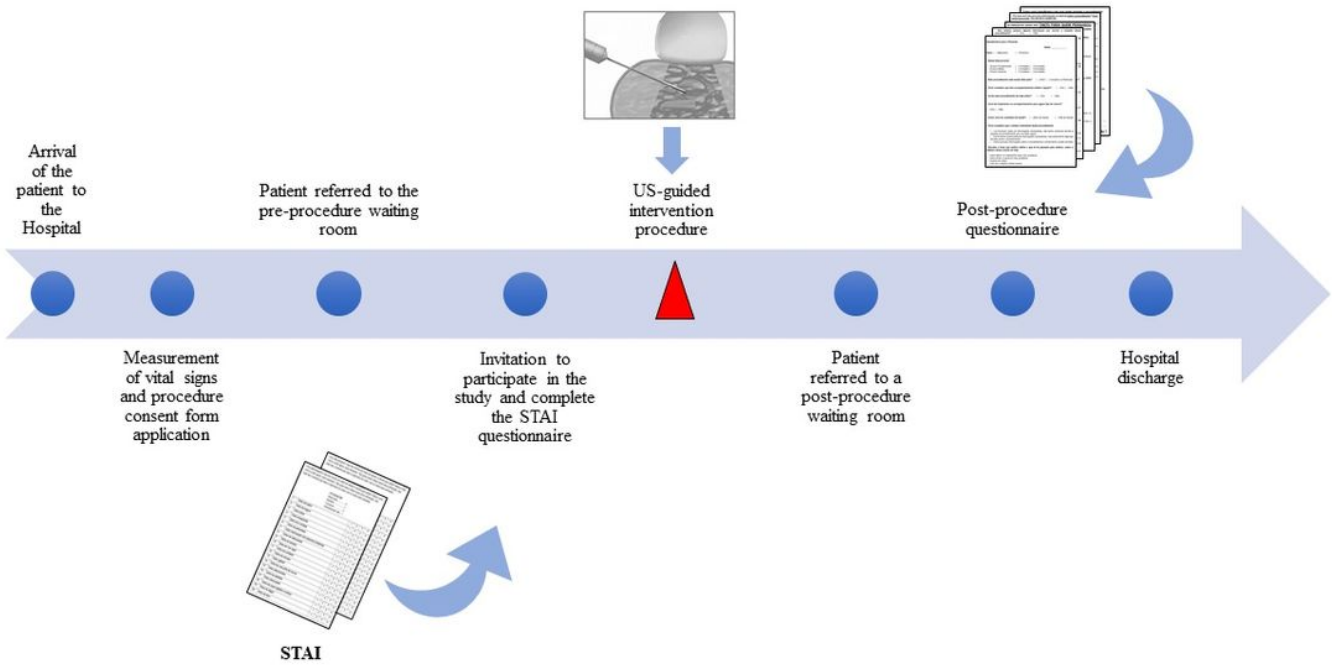

Figure 2

Timeline representing the steps from the patient's arrival to the hospital to the presentation of the questionnaires and performance of procedures. STAI, State -Trait Anxiety Inventory; US, ultrasound.

Supplementary Files

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- SupplementaryMaterial.docx