ASSESSMENT OF PREOPERATIVE ANXIETY USING VISUAL FACIAL ANXIETY SCALE: AN ALTERNATIVE TO THE VERBAL RATING SCALE?

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Summary Statement: The Visual Facial Anxiety Scale is a simple tool which could be used for assessing preoperative anxiety in the preoperative holding area. Anesthesiologists do not routinely evaluate patients' anxiety levels preoperatively.

There are no conflicts of interest among the contributors.

Abstract

Background—Evaluating preoperative anxiety level can be a difficult task for physicians. The Visual Facial Anxiety Scale (VFAS) was designed as an alternative to the Verbal Rating Scale (VRS) for assessing the level of preoperative [state] anxiety. We hypothesized that the VFAS would provide a stronger correlation between the patient and anesthesiologist categorical anxiety assessments than the VRS.

Methods—After obtaining IRB approval, 200 elective surgery patients were evaluated in the preoperative holding area. Patients were asked to evaluate their current anxiety level using the VFAS and the VRS, as well as to categorize their anxiety level as mild, moderate, or severe. The anxiety level was also assessed using the same categorical rating scale by the attending anesthesiologist. The anesthesiologists were also asked if they routinely evaluate the patient's anxiety level during the preoperative visit.

Results—A significant correlation was found between the VRS and VFAS for both patients ($r=0.79$, $p<0.0001$) and anesthesiologists ($r=0.92$, $p<0.0001$), but utilization of the VFAS resulted in 58% concordance of anxiety level between the patient and anesthesiologist (vs. only 35% with the VRS). Interestingly, 70% of anesthesiologists did not routinely evaluate the patients' preoperative anxiety level.

Conclusion—The VFAS is a simple tool which could be used for assessing preoperative anxiety. Anesthesiologists do not routinely evaluate patients' anxiety levels preoperatively.

Keywords—preoperative (state) anxiety, visual facial anxiety scale (VFAS), verbal rating scale (VRS), categorical anxiety rating scale

Introduction

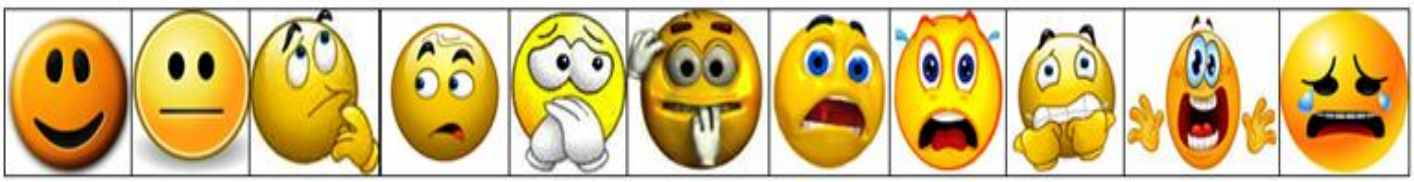
Preoperative anxiety is common prior to elective surgery, with a reported prevalence of up to 80%.[1-3] Common causes of preoperative anxiety include fear of surgery, anesthesia and surgical complications, previous unpleasant surgical experiences or predisposing personality traits.[4-7]

Anxiety can produce physiological changes such as alteration in autonomic tone,[8] increased catecholamine[9,10] increased vasoconstriction,[11] increased myocardial workload[12] and hemodynamic volatility[11] as well as reduced immune response[8] and coagulability.[13] Studies have suggested that excessive anxiety prior to surgery not only affects the patient's physiologic status at induction,[14-16] but also increases their intraoperative anesthetic requirement and can prolong recovery.[17-20]

The current "gold standard" for evaluating acute anxiety is the State-Trait Anxiety Inventory (STAI) which consists of two separate 20-item questionnaires and addresses worry, tension, apprehension, and nervousness.[21] However, its use in the preoperative setting may be limited and not feasible as it takes 5-10 minutes to complete the evaluation. The Visual Analogue Scale (VAS) has been used to allow patients to self-assess their level of preoperative [state] anxiety on a 100 mm scale from 0 = none to 100 = severe.[22] Another tool used to measure acute preoperative anxiety is the Verbal Rating Scale (VRS) where 0 indicates no anxiety and 10 indicates highest level of anxiety.[23]

We created the Visual Facial Anxiety Scale (VFAS) (Fig. 1) to assist patients in identifying their level of anxiety with a facial depiction of their anxiety level on an 11–faces pictorial scale. One objective of this study was to evaluate the correlation between patient and anesthesiologist scores using the two scales. We tested the hypothesis that the VFAS would provide a stronger correlation between the patient's and the anesthesiologist's categorical assessment of preoperative anxiety compared to the VRS. The secondary objective was to determine how frequently anesthesiologists evaluate the patient's anxiety level during the preoperative visit.

Figure 1. Visual Facial Anxiety Scale (VFAS)



Material and Methods

This study was approved by the Institutional Review Board of Cedars-Sinai Medical Center in Los Angeles, CA and the requirement for written informed consent was waived. A total of 200 adult patients undergoing elective surgery were recruited between 2012 and 2013. Patient inclusion criteria included: 18-80 years of age and mentally capable of comprehending the anxiety evaluation tools. Patients with a history of severe anxiety or psychological disorders, or chronically using sedative or opioid-containing medications were excluded.

The VFAS was developed by adapting the Wong-Baker Faces Pain Scale.[24] The eleven different faces were found by browsing the internet through Google images and were put in sequential order based on how the investigators depicted the various grades of anxiety (Fig. 1). The face to the far left of the VFAS was chosen to represent no anxiety, while the face to the far right was chosen to represent the highest level of anxiety. The faces chart shown to the patients and anesthesiologist (Fig. 1) did not have numbers assigned to the individual facial cartoons to avoid biasing the patients and anesthesiologists. Once the subjects agreed to participate in the study, they were interviewed in the preoperative area. We acquired patients' history of prior surgery and asked a series of four questions in randomized order (determined beforehand by the statistician) as follows: 1) to rate their current anxiety level on a scale from 0 to 10 (VRS) 0= no anxiety and 10=the worst possible anxiety, 2) to point out on the provided VFAS, which face corresponded to how patients were feeling in regards to their level of anxiety and 3) to categorize their anxiety level as none, mild, moderate, or severe. Finally, the patients were asked which one more accurately described their level of anxiety the VFAS or the VRS.

The same four questions were then asked to the patient's anesthesiologist after they had performed their routine preoperative visit with the patient. In addition, the attending anesthesiologists were asked whether or not they had evaluated the patient directly for anxiety. If they answered in the affirmative way, they were asked which assessment tool have they used to determine the patient's level of anxiety.

Statistical Analysis:

In order to compare the VFAS and VRS data, the faces on the VFAS had to be converted into a number from zero to ten. Numbers were assigned from 0 (face on the far left) = no anxiety to 10 (face on the far right) = extremely high anxiety. (Table 2)

PASS 2008 statistical software was used for the analysis. The correlation between the patient's score and anesthesiologist's score was calculated with a Spearman rank correlation due to the non-normal distribution of the data, as well as a Pearson correlation for a description of the linear association. A Wilcoxon Rank Sum Test was used to compare the medians of groups defined by dichotomous patient characteristics. A Kruskal Wallis test was performed on each anxiety scale to compare the levels across different types of surgery. One sample t tests were used to compare whether the average bias was different from zero. P values <0.05 were considered statistically significant.

Results

Demographic characteristics of the 200 patients who completed the assessment are presented in Table 1.

Table 1. Demographic characteristics, history of previous surgery and type of surgery

	Patient Demographics (n=200)
Age (yr)	51.1±15.1
Gender	
Female (n)	115 [57.5]
Male (n)	85 [42.5]
History of previous surgical procedure	
Yes	138 [69%]
No	26 [13%]
Not Asked	36 [18%]
Type of surgical procedure (n, %)	
Cardiac surgery	12 [6%]
Orthopedic surgery	27 [13.5%]
Outpatient surgery	13 [6.5%]
Neurosurgery	14 [7%]
General surgery	134 [67%]

Numbers (n), percentages [%], and mean values (± standard deviation)

There is a strong correlation between the patient self-assessed category (mild, moderate, severe) and their anxiety score on the VRS and VFAS. Similarly, the anesthesiologist-assessed category also correlated with their VRS and VFAS scores. (Table 2)

Table 2. Categorizations of the Verbal Rating Scale (VRS) and Visual Facial Anxiety Scale (VFAS) as determined by patients and anesthesiologists to be: Mild, Moderate, or Severe. The numbers 0 [on the far left] to 10 [on the far right] were assigned to the faces to facilitate analysis of these data.

Anxiety Category	Patient Evaluation	Anesthesiologist Evaluation
Mild	**VRS** **Mean:** 2.46 **Median:** 2 **Range:** 0-7 **SD:** ±1.71	**VRS** **Mean:** 2.43 **Median:** 2 **Range:**0-6 **SD:** ±1.49
	VFAS **Most common face:** 	**VFAS** **Most common face:** 
Moderate	**VRS:** **Mean:** 5.61 **Median:** 5 **Range:**2-8 **SD:** ±1.52	**VRS:** **Mean:** 5.82 **Median:** 6 **Range:**3-9 **SD:** ±1.30
	VFAS **Most common face:** 	**VFAS** **Most common face:** 
Severe	**VRS:** **Mean:** 8.82 **Median:** 9 **Range:**6-10 **SD:** ±1.33	**VRS:** **Mean:** 9 **Median:** 9 **Range:**7-10 **SD:** ±0.93
	VFAS **Most common face:** 	**VFAS** **Most common face:** 

SD = Standard deviation

The distribution of anxiety levels are shown in Table 3.

Table 3. Distribution of Anxiety levels based on the categorization: Mild/Moderate/Severe among patients and anesthesiologists.

	Patient Categorizations		Anesthesiologist Categorizations	
	n	**Percentage**	**n**	**Percentage**
Mild	127	63.5	118	59
Moderate	62	31	67	33.5
Severe	11	5.5	15	7.5

Further analysis using Spearman Correlation Coefficients shows a high significant correlation between the VFAS and VRS in both the patient (r=0.79) and anesthesiologist assessments (r=0.92) (Table 4). When comparing the patient's self-reported anxiety assessment to the anesthesiologist's assessment using the VFAS, there is a significant correlation of 0.476 ($p<0.0001$) (Table 4). While this is lower than the correlation using the VRS (r=0.499, $p<0.0001$), this correlation, however, is still well within the recommended range of 0.4 to 0.8 for criterion validity.[25]

Table 4: Spearman Correlation Coefficients between VRS and VFAS

Spearman Correlation Coefficients	
Patient VRS vs. Patient VFAS	0.786 ($p<0.0001$)
Anesthesiologist VRS vs. Anesthesiologist VFAS	0.917 ($p<0.0001$)
Patient VRS vs. Anesthesiologist VRS	0.499 ($p<0.0001$)
Patient VFAS vs. Anesthesiologist VFAS	0.476 ($p<0.0001$)

The Spearman Correlation Coefficient signifies how correlated the two scales are. A Coefficient of: "1" would indicate perfect correlation; "0" would indicate no correlation.

The difference between the anesthesiologist's VFAS score and the patient's VFAS score ranged from -7 to 7, with an average difference of -0.035 which is not significantly different from zero (t test, p=0.84). The proportion of anesthesiologists and patients who agreed exactly (difference of zero) when using the VFAS was 0.58. The Pearson correlation between patient and anesthesiologist scores using the VFAS was 0.45, which is not high although statistically significant from 0 ($p<0.0001$).

The difference between anesthesiologist VRS scores and patient VRS scores ranged from -8 to 7 with an average difference of -0.275, which was not significantly different from zero (t test, p=0.13). The Pearson correlation between these two was 0.48, $p<0.0001$. The proportion of anesthesiologists and patients who agreed exactly using the VRS was 0.35. Thus, there was more agreement between anesthesiologist and patient scores when using the VFAS. Figures 2 and 3 represent plots further comparing the two scales.

Figure 2: Plot showing Pearson Correlation between Patient VRS vs. Patient VFAS. A plot of the values of the two scales against each other shows that they are correlated (r=0.80, p<0.0001), but there is also a bias. The differences between the VFAS and VRS ranged from -6 to 4. The average difference (bias) was -1.495 (p<0.0001) taking the VFAS-VRS. The solid line is the identity line, where x=y, and is where the two scales would agree perfectly.

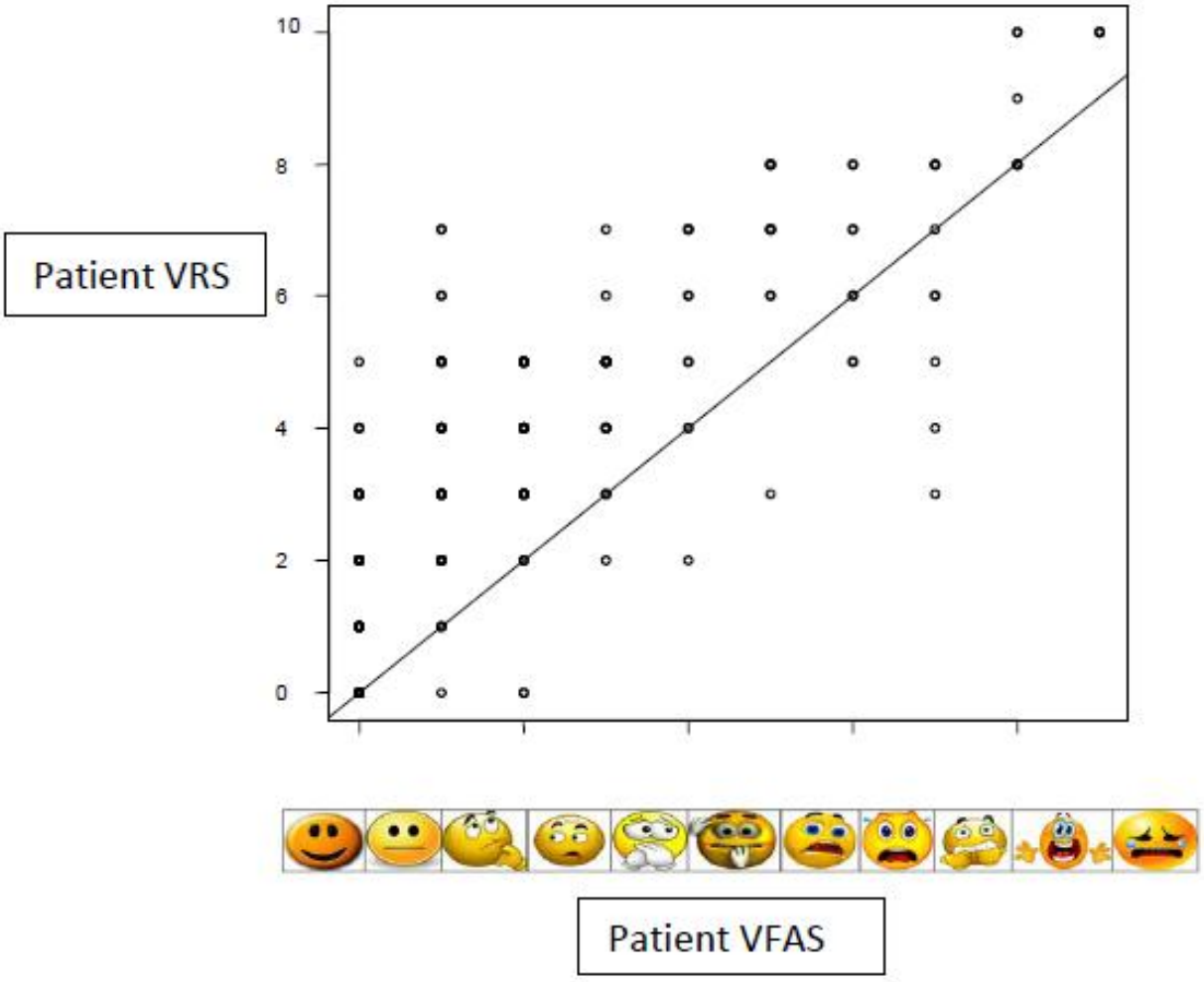
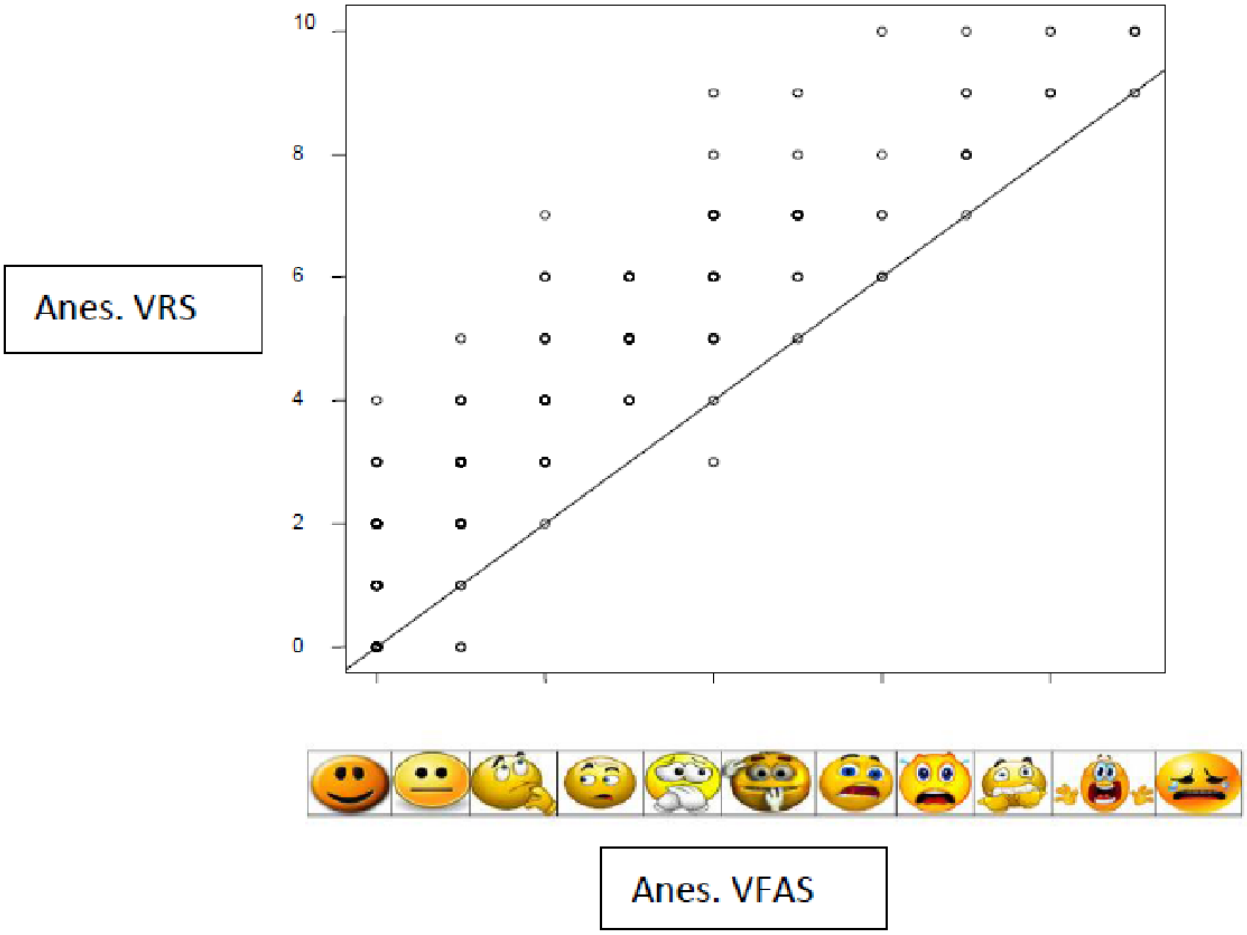


Figure 3: Plot showing Pearson Correlation between Anesthesiologist VRS vs. Anesthesiologist VFAS.

A plot of the values of the two scales against each other shows that they are correlated (r=0.90, p<0.0001), but there is also a bias. The differences between the anesthesiologist VFAS and VRS ranged from -5 to 1. The average difference (bias) was -1.74 (p<0.0001), taking the VFAS-VRS.



Spearman Correlation Coefficients between VRS and VFAS among Mild/Moderate/Severe categories of patients and anesthesiologist in table 5.

Table 5: Spearman Correlation Coefficients between VRS and VFAS among Mild/Moderate/Severe categories

	Patient VFAS	Patient VRS	Anesthesiologist VFAS	Anesthesiologist VRS
Mild/Mod/Severe Ratings	0.619 (p<0.0001)	0.729 (p<0.0001)	0.807 (p<0.0001)	0.813 (p<0.0001)

** The patient and anesthesiologist response of mild was coded as 0, moderate as 1, and severe as 2.

A Wilcoxon test was performed to compare each scale between categories of prior surgery status and categories of gender (Table 6). The data showed a significant negative correlation between patient age and anxiety ratings on the

VFAS and the VRS (-0.197, -0.182 respectively). There was no correlation between the patient's age and the patient's scale preference (VRS or VFAS). Compared to males, female patients had a significantly higher median anxiety level on both scales when self- assessed and assessed by their anesthesiologists (Table 6). There was no statistical significance between those who had prior surgery and those who had not (Table 6). There were no significant differences in anxiety levels amongst the various types of surgeries.

When patients were asked which scale 'more accurately' described their level of anxiety, 42% of patients preferred the VFAS, while 43% preferred the VRS, and 15% had no preference. Fourty-six percent of anesthesiologists preferred the VFAS, while 40% preferred the VRS and 14% had no preference. Of note, 70% of anesthesiologists did not routinely evaluate the patient's anxiety level as part of their preoperative evaluation

Table 6: A Wilcoxon Rank Sum Test was used to compare the medians of various variable groups.

Wilcoxon Rank Sum Test: No Significant Differences Between Patients With Prior Surgery and Those With No Prior Surgery	
Patient Visual Facial Anxiety Scale	p=0.255
Patient Verbal Rating Scale	p=0.550
Anesthesiologist Visual Facial Anxiety Scale	p=0.858
Anesthesiologist Verbal Rating Scale	p=0.393
Wilcoxon Rank Sum Test: Significant Differences Between Genders	
Patient Visual Facial Anxiety Scale	p=0.000
Patient Verbal Rating Scale	p=0.002
Anesthesiologist Visual Facial Anxiety Scale	p=0.131
Anesthesiologist Verbal Rating Scale	p=0.047

$p < 0.05$ implies that the two group medians are significantly different.

Discussion

This study demonstrated a high correlation between the VFAS and VRS for the assessment of acute preoperative anxiety by both patients and anesthesiologists. The proportion of perfect agreement (zero difference) between anesthesiologists and their patients on the level of anxiety the patients were experiencing upon entering the operation room was higher when using the VFAS (vs. VRS). Interestingly, our results showed that only 70% of attending anesthesiologists did not routinely attempt to evaluate their patients' level of preoperative anxiety and none used a measurement tool to evaluate preoperative anxiety.

The "gold standard" STAI[21] is rarely utilized in the immediate preoperative period because its lengthy architecture limits its use as a bedside instrument as it takes ~10 min to complete the questionnaire. In clinical studies involving assessments of preoperative anxiety levels, investigators have typically employed the Visual Analog Scale (VAS) to quantify the level of acute (state) anxiety levels. [26] However, the accuracy of the VAS as a tool for assessing anxiety has been questioned. [27] When used for assessing cognitively impaired adults, Numerical Rating Scales (NRS) and facial scales have been found to be comparable for assessing the level of pain in this population.[28] The proposed VFAS could be utilized as a simple bedside tool for the preoperative assessment of anxiety.

The availability of a preoperative anxiety assessment scale that is user-friendly, brief and reliable might make anesthesiologists more inclined to utilize it for evaluating the patient's preoperative anxiety level. As demonstrated in the current study, 70% of attending anesthesiologists do not even attempt to assess the patient's level of preoperative anxiety. Additionally, a previous study has demonstrated large discrepancies between anesthesiologists' perception of patients' anxiety levels and patients' self-assessments.[29]

Studies have shown that the patient's assessment of acute anxiety can differ depending on the type of scale being utilized.[18] Anxiety measurement scales that are less familiar to the patient can create a bias in measurement of the level of anxiety. Thus, it is important that the scale be easy to administer and understand, require only a short time to administer, and have a high degree of correlation between the anxiety levels as assessed independently by the patient and the healthcare provider. The VFAS is advantageous in assessing preoperative anxiety due to it being easy and brief. Another advantage of the VFAS is that it is not restricted to only English-speaking patients. If there is strong agreement between the anxiety level assessed by the anesthesiologist and the patient, it could provide the anesthesiologist with a more accurate assessment of the patient's acute preoperative anxiety level.

A major limitation of this study is that we did not compare the VFAS to a validated test for assessing preoperative state anxiety (e.g., STAI a 20-item scale). Importantly, a previous study demonstrated that the VRS for anxiety was highly correlating with Spielberger's State Anxiety Inventory scores.[30] The preoperative anxiety assessment should be performed in the preoperative holding

area prior to the patient entering the OR as part of the comprehensive evaluation by the anesthesiologist. We choose to compare the VFAS to the VRS as the latter scale is commonly used for other perioperative evaluations (e.g., pain) and is reliable and familiar to both patients and anesthesiologists.

In conclusion, use of the visual facial anxiety scale provided a stronger correlation between the patient's and the anesthesiologist's categorical assessment of preoperative anxiety than the commonly used numeric rating scale. This novel scale can be utilized as a simple tool for the preoperative assessment of a patient's acute [state] anxiety. Interestingly, most anesthesiologists participating in this study did not routinely evaluate the patients' level of preoperative anxiety. Future outcome studies are needed to determine if the use of this facial scale correlates with other more sophisticated anxiety measure tools, and if the routine assessment of preoperative anxiety levels will effect the use of preoperative sedative-anxiolytic drugs (e.g., midazolam).

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