The Amsterdam preoperative anxiety and information scale provides a simple and reliable measure of preoperative anxiety

[L'échelle d'Amsterdam, pour des informations préopératoires et le degré d'anxiété, offre une mesure simple et fiable de l'anxiété préopératoire]

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Purpose: To compare three anxiety scales; the anxiety visual analogue scale (VAS), the anxiety component of the Amsterdam preoperative anxiety and information scale (APAIS), and the state portion of the Spielburger state-trait anxiety inventory (STAI), for assessment of preoperative anxiety levels in same day admission patients.

Methods: Patients completed the three anxiety assessment scales both before and after seeing the anesthesiologist preoperatively. The scales used were the STAI, the six-question APAIS, and the VAS. APAIS was further subdivided to assess anxiety about anesthesia (sum A), anxiety about surgery (sum S) and a combined anxiety total (i.e., sum C = sum A + sum S). These scales were compared to one another. Pearson's correlation (pair-wise deletion) was used for validity testing. Cronbach's α analysis was used to test internal validity of the various components of the APAIS scale. A correlation co-efficient (r) $\geq$ 0.6 and $P < 0.05$ were considered significant.

Results: Four hundred and sixty three scale sets were completed by 197 patients. There was significant and positive correlation between VAS and STAI r = 0.64, $P < 0.001$), VAS and APAIS r = 0.6, $P < 0.001$), sum C and STAI r = 0.63, $P < 0.001$) and between VAS and sum C r = 0.61, $P < 0.001$). Sum C and STAI r value were consistent with repeated administration. Cronbach's α-levels for the anxiety components of the APAIS (sum C) and desire for information were 0.84 and 0.77 respectively.

Conclusion: In addition to VAS, the anxiety component of APAIS (sum C) is a promising new practical tool to assess preoperative patient anxiety levels.

Objectif : *Comparer trois échelles d'anxiété : l'échelle visuelle analogique d'anxiété (EVA), la composante de l'échelle d'Amsterdam concernant les informations et l'anxiété préopératoires (APAIS, Amsterdam preoperative anxiety and information scale) et les paramètres d'état du questionnaire de Spielburger sur l'anxiété chronique et réactionnelle (STAI, Spielburger state-trait anxiety inventory) pour évaluer l'anxiété préopératoire des patients opérés le jour de l'admission.*

Méthode : *Pour tous les patients, les trois échelles d'évaluation de l'anxiété ont été utilisées avant et après la rencontre préopératoire avec l'anesthésiologiste. Ce sont la STAI, les six questions de l'APAIS et l'EVA. Le questionnaire APAIS a été ensuite subdivisé pour évaluer l'anxiété concernant l'anesthésie (somme A), l'anxiété concernant l'opération (somme O) et l'anxiété totale combinée (somme C = somme A + somme O). Ces échelles ont été comparées les unes aux autres. La corrélation de Pearson (suppression par paires) a été utilisée pour la validité de l'épreuve. L'analyse α de Cronbach a servi à tester la validité interne des diverses composantes de l'échelle APAIS. Un coefficient de corrélation (r) $\geq$ 0,6 et $P < 0,05$ ont été jugés significatifs.*

Résultats : *Quatre cent soixante-trois ensembles d'échelle ont été remplis par 197 patients. Une corrélation significative et positive a été observée entre les échelles EVA et STAI, r = 0,64, $P < 0,001$); entre EVA et APAIS, r = 0,6, $P < 0,001$); entre la somme C et STAI, r = 0,63, $P < 0,001$) et entre EVA et la somme C, r = 0,61, $P < 0,001$). Les valeurs de r de la somme C et de STAI sont apparues conformes à l'administration répétée. Les niveaux α de Cronbach touchant les composantes sur l'anxiété de l'échelle APAIS (somme C) et le désir d'information ont été de 0,84 et de 0,77 respectivement.*

Conclusion : *Les paramètres sur l'anxiété de l'échelle APAIS (somme C) semblent un nouvel outil prometteur d'évaluation préopératoire des niveaux d'anxiété qui s'ajoute à l'EVA.*

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OVER two thirds of patients awaiting surgery are anxious.[1] The degree to which each patient manifests anxiety related to future experiences depends on many factors. These include, but are not limited to, age, gender, type and extent of the proposed surgery, familiarity with and preparedness for the procedures, previous surgical experience, and personal susceptibility to stressful situations (trait-anxiety).[2,3] Some degree of anxiety is a natural reaction to the unpredictable and potentially threatening circumstances typical of the preoperative period, especially for the patient's first few surgical experiences. However, excessive degrees of preoperative anxiety can lead to pathophysiological responses. These include tachycardia, hypertension, arrhythmias, and higher levels of pain that may persist into the postoperative period.[4,5]

Traditionally patients were admitted to hospital the day before surgery. Anesthesiologists used the in-patient preoperative visit to assess the patient's clinical and psychological state, and to establish rapport. These encounters were also used to address and alleviate patients' concerns regarding their upcoming procedure. Despite the apparent benefits of the in-patient preoperative visit, pre-anesthetic clinics (PAC), same day admission (SDA) for surgery as well as day surgery have now become the norm in most practice settings.

These changes have resulted in patients meeting their anesthesiologist just minutes before the operative procedure. Despite these time constraints, there is still a need for the anesthesiologist to address the patients' medical and psychological concerns. New tools are needed to assist the anesthesiologist in this task. One such needed tool is a quantitative scale of preoperative anxiety.

Such a scale could provide an opportunity for patients to express their feelings. Also, the ability to quantify anxiety objectively in the preoperative period has other advantages. The information could be used to screen for highly anxious patients who might benefit from preoperative anesthetic consultation or anxiolytic medications. An anxiety scale could be further utilized to assess adequacy of preoperative patient preparation, and to measure the effectiveness of preoperative communication.[6] Although the lengthy and complex Spielburger state-trait anxiety inventory (STAI) scale is the current standard, to date there is no universally accepted, simple, and brief quantitative test of preoperative anxiety.

Study purpose

We compared three quantitative tests assessing anxiety in American Society of Anesthesiologists (ASA) I and II patients preoperatively. The primary purpose of the study was to determine if there was a significant correlation between two simple and brief anxiety assessment scales; the anxiety visual analogue scale (VAS) and the recently introduced Amsterdam preoperative anxiety and information scale (APAIS), and the current standard measure of anxiety, the state component of the STAI. This was done to confirm the previous findings regarding the internal validity of the two components of the English version of APAIS in adult surgical patients' anxiety and information desire scales.[7]

A secondary purpose was to assess the situational changes in anxiety levels, as measured by the three scales, during the various preoperative periods. This was done in a subset of patients, where we investigated the changes between the three-scale correlations, in the same patients, when administered at various preoperative time periods.

Methods

Following University of Manitoba and Saint Boniface General Hospital Ethics Committee approval and written informed consent, patients seen in the PAC were asked to complete the three anxiety assessment questionnaires at four times i.e., before and after being assessed in the PAC and again before and after seeing the anesthesiologist on the day of surgery. Inclusion criteria into the study were patient consent, age > 18 yr, ASA physical status I and II, patient seen in the PAC, elective surgical procedure, no psychotropic medication, and English as a spoken and written language. Exclusion criteria were patients having known psychiatric condition requiring treatment, and difficulty understanding the nature of the study.

The assessment scales used were the 20-question STAI component of STAI,[8] the six-question APAIS,[7] and the anxiety VAS.[3] Complete descriptions of the STAI (range 20–80) and APAIS (range 6–30) have been published previously.[3,7] For purposes of analysis, the information desire questions of the APAIS (questions three and six) were separated from the anxiety questions (questions one, two, four, and five). The APAIS was further subdivided (Appendix) into subscales in order to separate anxiety about anesthesia (sum of anesthesia anxiety, "sum A" questions one and two), anxiety regarding surgery (sum of surgery anxiety "sum S", questions four and five) and a total of the two scores (sum of combined anxiety "sum C" = sum A + sum S). The VAS (range 0–100) consisted of a 100-mm line; zero on the left representing no anxiety, while 100 mm on the right end represented extreme anxiety.

The three assessment scales were compared to one another. Pearson's correlation (pair-wise deletion) was

TABLE I Demographic data

Age	*41 ± 12 yr (mean ± SD)*			
	(Count/Percent)		*(Count/Percent)*	
Gender	Female	(110/56%)	Male	(87/44%)
ASA score	I	(56/28%)	II	(141/72%)
Previous surgery	No	(25/13%)	Yes	(172/87%)

TABLE II Frequency distribution of the type of surgical procedure

Type	*Count (%)*
General surgery	67 (34%)
Neurosurgery	35 (18%)
Urology	31 (16%)
Plastic surgery	24 (12%)
Orthopedic	15 (8%)
Other	25 (12%)

used for concurrent validity testing among the three scales. Cronbach's α analysis was used to test internal validity of the various components of the APAIS scale. The results of internal validity were compared to those of the original report by Moerman.[7] A correlation coefficient (r) > 0.6 was considered significant and statistical significance was assumed at the $P < 0.05$ level.

To assess the situational changes in anxiety levels during the preoperative period, the data from patients who completed the last set of scales ($n = 113$), were analyzed by repeated-measures of analysis of variance. Least squares means test matrices were generated for *post hoc* comparisons. We considered $P \leq 0.05$ to be significant for group × time interactions. Bonferroni's correction was applied when multiple comparisons were examined within groups. The Number Cruncher Statistical System (NCSS) 2000 and SAS programs were used for statistical analysis.

Results

A total of 197 patients (110 females and 87 males) participated in the study. The descriptive demographic data of the study population is shown in Table I. Table II lists the type of surgical procedures, while the number of completed scales at each of the four study periods is shown in Table III. As not all participants completed all three sets of questions at each stage, it was decided to pool the data resulting in a total of 460 sets of the three scales that were used for the correlation tests.

There was significant and positive correlation between VAS and STAI as well as VAS and total APAIS. There was no significant correlation between the STAI and total APAIS (Table IV). Analysis of the various anxiety components of the APAIS scale (sum A, sum S and sum C) revealed significant correlations between sum C (sum of anesthesia anxiety + sum of surgery anxiety) and STAI, and between sum C and VAS (Table V). The calculated Cronbach's α-level for the anxiety components of the APAIS (sum C) was 0.84 and the Cronbach's α-level for the information desire was 0.77.

The results of the level of anxiety as measured by VAS, STAI, and sum C at the four time periods, respectively are shown in Figure 1. Although, there were no significant gender differences in anxiety levels, by any of the three scales at any of the four times, the three scales showed a consistent pattern throughout the preoperative course. Anxiety reducing effect of the SDA visit is demonstrated by the drop in the three scales, which is followed by further rebound to higher levels of anxiety when patients presented to the SDA unit. Of note also, the three scales showed further decrease in patients' anxiety levels, after meeting the anesthesiologist in the preoperative holding area (time effect for VAS, STAI, and sum C, were $P < 0.0001$, $P < 0.0001$, and $P < 0.0011$, respectively).

Figure 2 shows Pearson's correlation values between the three scales (VAS, STAI, sum C) at the four time periods in a subset of participants who completed the last set of scales ($n = 114$). The level of correlations between VAS and STAI, and sum C and VAS fluctuated with subsequent administrations of the scales on the same patients, particularly on the post-PAC assessment (VAS *vs* STAI), and SDA (sum C *vs* STAI). On the other hand the correlation between sum C and STAI shows progressive improvement with repeated administrations.

Discussion

The findings of our study support the previously reported correlation between the STAI and anxiety component of APAIS (sum C), in patients in the preoperative period[3,7] and in the detection of patients' preoperative anxiety.[9] We report the use of an English version of the APAIS scale in an adult surgical population. The findings also support the utility of VAS as a measure of preoperative anxiety.

Anxiety in the preoperative period is not only an unpleasant emotional state, but may lead to significant psycho-physiological disturbances. Williams *et al.* have shown that high preoperative anxiety levels can lead to increased postoperative analgesic requirement and prolonged hospital stay.[4] Others have shown that preoperative anxiety can have a significant contribution to adverse perioperative outcome.[1,5]

TABLE III Number of questionnaires completed, mean and SD of completed scales at different data collection times (n = 197)

	Before seen in PAC			*After seen in PAC*			*On admission day of surgery*			*After seen in preop. holding area*		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*	*n*	*Mean*	*SD*	*n*	*Mean*	*SD*
VAS	172	32.6	26.1	120	29.1	24.2	102	49.6	28.2	93	45.3	26.9
APAIS	196	15.3	5.9	136	14.0	4.9	121	15.7	5.8	114	14.4	5.3
STAI	187	37.8	13.0	140	34.6	12.2	120	42.7	13.1	111	39.0	13.2

SD = standard deviation; PAC = pre-anesthetic clinic; VAS = visual analogue scale; APAIS = Amsterdam preoperative anxiety and information scale; STAI = Spielburger state-trait anxiety inventory.

TABLE IV Pearson's correlation coefficients

	VAS	*APAIS*
STAI	0.64*	0.51
VAS	—-	0.6*

* = significant, $P < 0.001$. VAS = visual analogue scale; APAIS = Amsterdam preoperative anxiety and information scale; STAI = Spielburger state-trait anxiety inventory.

TABLE V Correlation coefficients between the subcomponent of APAIS, STAI, and VAS

	Sum A	*Sum S*	*Sum C*
STAI	0.51	0.60*	0.63*
VAS	0.5	0.56	0.61*
Sum A	——	0.55	0.85*

* = significant, $P < 0.001$. APAIS = Amsterdam preoperative anxiety and information scale; STAI = Spielburger state-trait anxiety inventory; VAS = visual analogue scale.

Having accurate scales for quantitative assessment of preoperative anxiety is important for other reasons. Badner *et al.*, showed a low correlation between the anesthesiologists' subjective assessment of patient anxiety at the preoperative visit and the STAI score assessment of patient anxiety.[2] In their report the STAI score correlations compared to those of staff anesthesiologists, anesthesiology residents and the combined group were r = 0.33, r = 0.23 and r = 0.28 respectively. This suggests that subjective anxiety assessment can be inaccurate and that quantitative anxiety assessment could provide better information for patient care.

Having effective communication skills is an important task for practicing anesthesiologists.[10] Smith and Shelly suggested that as a consequence of improved anesthesiologist communication skills, patients would "suffer less anxiety, be more satisfied with their care, recover faster and maybe suffer less postoperative pain". Also, they highlighted the need to ascertain the effectiveness of these skills by practitioners.[11] We are unaware of any practical tools to assess the effectiveness of communications in the preoperative period.

Evans *et al.* evaluated the effectiveness of the communication skills of general practitioners by examining the pre- and postconsultation changes in anxiety levels. They showed that inadequate information transmission during the interaction had an anxiety provoking effect. They also demonstrated that patients of doctors trained in communication skills reported greater satisfaction and less anxiety.[6] Thus, the potential exists for assessment of change in patient levels of preoperative anxiety to be used as an indirect means of assessing practitioners' communications skills.

Anxiety VAS has the advantage of being a very simple, short, quick and easy test to explain to patients. Kindler and colleagues recently showed that VAS was an effective measurement of preoperative anxiety in a university hospital setting.[12] Similar results have been reported by others.[9,13,14] The potential disadvantage with VAS is the "central tendency bias" of this subjective measurement. This is an inherent problem and is related to the fact patients are asked to use an unfamiliar method to express their anxiety. When participants are unsure how to respond they will avoid extreme responses or "play safe" and contract their responses within the range of the potential responses that they feel may apply to their subjective sensation.[9,15] The same can be said also for any other likert type scale, including APAIS. Our study was not designed to investigate for this bias.

The calculated Cronbach's α-level of the anxiety components of the APAIS scale is very similar to those reported by Moerman *et al.* (0.86)[7] and Miller *et al.* (0.82).[9] Our calculated Cronbach's α-value for the desire for information components (0.76) was higher than previously reported by Moerman (α-value of 0.68), but very similar to the value reported by Miller (α-value of 0.75). These findings confirm the internal consistency and reliability of the measurements and would suggest that this newly introduced scale is reproducible and has potential for being widely used

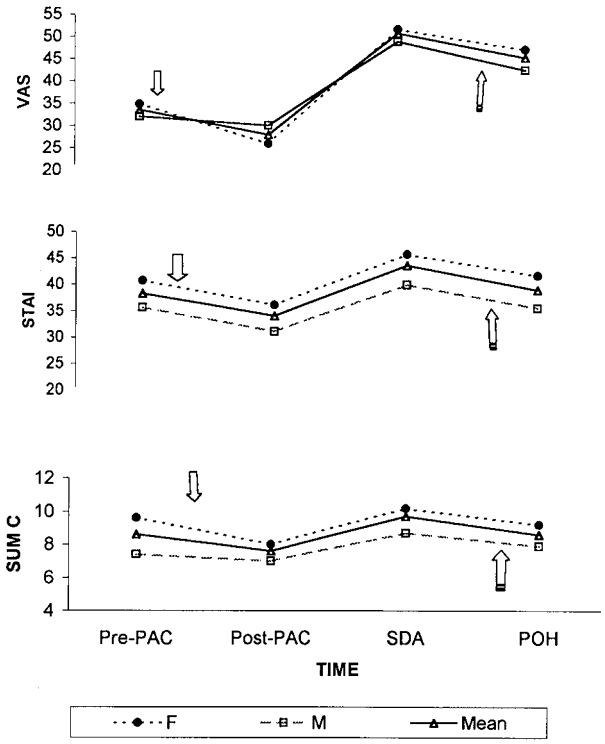

FIGURE 1 The levels of preoperative anxiety as measured by the three scales. The scales were completed at four time periods: before seen by the preoperative nursing staff (down arrows) at the pre-anesthesia clinic (Pre-PAC); after the PAC visit (Post-PAC); on the day of surgery upon admission to the SDA unit; and a few minutes after meeting the anesthesiologist (up arrows) at the preoperative holding unit (POH). (Time effect for VAS, STAI, and sum C, were $P < 0.0001$, $P < 0.0001$, and $P < 0.0011$, respectively).

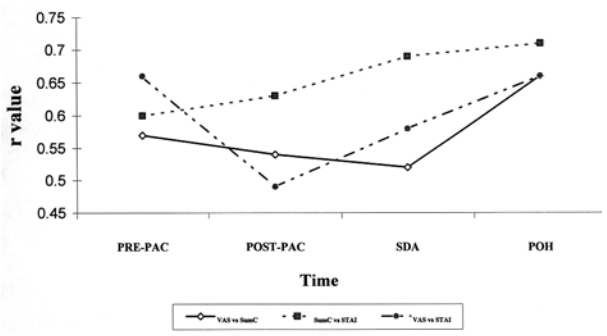

FIGURE 2 Pearson's correlation coefficient value (r value) between the three scales at the four preoperative times. The correlation between sum C and STAI showed consistent improvement with repeated administration, with a value of r = 0.75 ($P <$ 0.0001) at the preoperative holding area (POH).

in preoperative anxiety assessment. It is important to note that the lack of correlation between total APAIS and STAI is not surprising, since the APAIS is a composite of two separate scales as shown by the above Cronbach's α values.

The consistency and reproducibility with repeated administration are also important features for any scale. In this study, sum C had a consistent correlation profile with the gold standard anxiety scale (STAI) as seen in Figure 2. The reasons for the drop in the correlation between VAS and STAI on subsequent administration of the scales are unclear and warrants further investigation.

The patients' anxiety levels drop consistently, regardless of the scale used, after the PAC visit. This reduction confirms the effectiveness of the interaction during the visit to reduce patient anxiety, though this effect is temporary. Both male and female patients' anxiety levels increase significantly by the time they present on the day of surgery, to be followed by a rebound reduction to a lesser degree after interacting with the anesthesiology staff members in the preoperative holding area. The lack of gender effect on the level of anxiety has been shown by other investigators.[16]

Figure 3 is used for illustrative purposes and to give an example of the use of the anxiety scale to indirectly assess the effect of individual practitioner's on patient preoperative anxiety. It shows the mean values of sum C of two patient groups (each $n = 3$) according to their anesthesia providers who assessed them on the day of surgery at the preoperative holding area. The patients' anxiety levels, as measured by the three scales, followed the usual pattern of initial drop, after the PAC visit, and then the rebound effect of increased anxiety levels when presenting to the SDA unit. The patients interacting with anesthesiologist A (Group I) anxiety levels (as measured by sum C values) follow the usual pattern of modest reduction after meeting the anesthesiologist in the preoperative holding area. Group II patients demonstrate an opposite response to the usual modest drop in anxiety levels at this time period, with their anxiety levels rebounding upward after being seen by anesthesiologist B in the preoperative holding area. Having a short and accurate scale of preoperative anxiety, such as sum C, that can be used in the preoperative period in such manner could also be useful in providing an assessment of practitioner communication skills and permitting appropriate educational interventions.

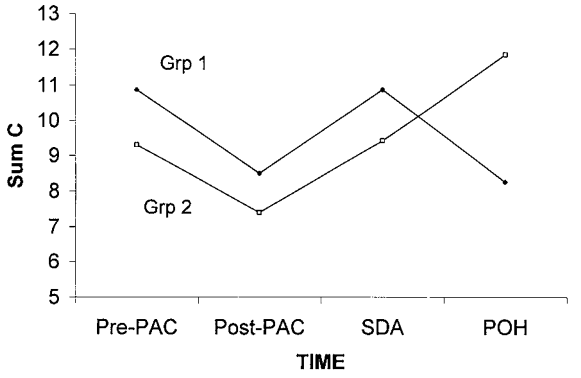

FIGURE 3 Sum C values for two patient groups, classified per their anesthesiologist. Patients in Group II had an increase in their anxiety levels immediately after being seen in the preoperative holding area (POH).

Both the APAIS and STAI are appropriate to use in the preoperative setting because of the diffuse nature of preoperative fear. The short nature of APAIS compared to STAI (6 *vs* 20 statements) requires less time to complete (2 *vs* 5–7 min), and its consistently reliable correlation with the gold standard STAI make it a more practical tool for anxiety measurement with the current time-constraints of clinical practice. Other potential APAIS applications include screening, judging the need for consultation and pre-medication, and research.

Conclusion

Anxiety testing is feasible in the preoperative period. We evaluated three quantitative scales for preoperative anxiety assessment. We have shown that both the anxiety component of APAIS (APAIS sum C) and VAS correlated significantly with the standard STAI test in this surgical patient population. Various advantages of the APAIS were re-tested and affirmed in this study. Patients easily understood APAIS sum C, the anxiety component of APAIS. The brief time required to complete APAIS sum C and VAS make them practical tools to measure anxiety in the preoperative period. APAIS-sum C may be preferable because of the consistent correlation with the anxiety gold standard measurement scale compared to the VAS with repeated administration.

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APPENDIX The Amsterdam preoperative anxiety and information scale (APAIS)

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

The subscales

Anesthesia-related anxiety	Sum A = 1 + 2
Surgery-related anxiety	Sum S = 4 + 5
Information desire component	= 3 + 6
Combined anxiety component	Sum C = sum A + sum S (1 + 2 + 4 + 5)