Comparation Of Different Scales To Assess Preoperative Anxiety In Children And Adolescent Undergoing Major Outpatient Surgery

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Abstract

Background: Anxiety in children triggered by a scheduled surgical intervention is a major issue due to its frequency, and the short, medium and long term consequences.

Aim: To compare different scales to assess preoperative anxiety in children at various points in the build-up to a MAS procedure, and to correlate each with the scale used to assess compliance with anaesthesia induction.

Methods: An observational study was carried out on a cohort of children between 2-16 years old that were to undergo major outpatient surgery and whose anxiety was assessed on arrival to the hospital (M0), during transfer to the surgical unit (M1) and in the operating room during anaesthetic induction (M2). Anxiety in the parents (measured on the State-Trait Anxiety Inventory - STAI) and in the children (measured with the Spence Anxiety Scale - Paediatric (SCAS-P), the State-Trait Anxiety Inventory Children (STAIC) and preoperative anxiety measurement scale - m-YPAS) was assessed, and the Induction Compliance Checklist (ICC) was passed.

Results: The study cohort included 129 patients aged between 2 and 16 years (75.2% male, median age 6.3 years). Anxiety scores in m-YPAS rose as the children got closer to the surgery, being greater at the entrance to the surgical unit (M0 = 25.8 ± 8.4; M1 = 32.8 ± 19.0; M2 = 34.0 ± 21.5). The m-YPAS scale is closely correlated with the ICC scale at the preoperative M1 (0.567) and M2 stages (0.803).

Conclusions: Standard anxiety assessment scales are not able to predict the quality of anaesthetic induction. By contrast, the m-YPAS scale demonstrates that there is an increase in anxiety as the paediatric patient nears the surgical procedure and that it can predict a poor anaesthetic induction.

Introduction

Scheduled major ambulatory surgery (MAS) is the most frequently surgical procedure carried out on children. Currently more than half of the interventions carried out in our area involve MAS[i]. Surgical procedures are capable of generating significant preoperative anxiety (POA) in as much as 70% of the paediatric population. This is mainly due to their separation from parents when faced with the threat posed by a strange environment and by a lack of understanding of the procedure and the potential suffering it may entail. In addition, the child's susceptibility, fear of physical harm, and feelings of sadness and punishment hat may be associated with surgery in its context as a scheduled procedure, contribute to the increase in POA. Other factors that may also be related to POA include age, temperament, any basal behavioural problems, prior surgeries and hospitalizations, the level of understanding of the parents and maternal anxiety[ii],[iii],[iv],[v],[vi],[vii].

Children with more severe POA experience more perioperative complications, such as prolonged anaesthetic induction, worse post-anaesthetic recovery, a need for higher doses of post-surgical analgesia and delirium on awakening[4]. In addition, in the mid to long term they are more likely to develop maladaptive behaviours, such as separation anxiety, general behavioural changes, aggressiveness, eating disorders, insomnia and nocturnal eneuresis[4,8,11][viii],[ix]. Moreover, this all translates into an increase in hospital costs and a worse perception of the quality of healthcare[5].

Several validated scales can be used to assess anxiety in children, yet each has its limitations and most are not specific to the perioperative context. Among these, we must consider the State Trait Anxiety Inventory (STAI), particularly in its version that is suitable for children over 5 years of age (children-C or STAIC), the Spence Anxiety Scale - Paediatric (SCAS-P) which is designed for use in the context of day hospitals, the Yale scale of perioperative anxiety (YPAS) and its version validated for children up to 12 years of age (m-YPAS)[x],[xi],[xii]. Anxiety levels are not constant throughout the surgical process, and they reach a maximum when entering the operating theatre and at the time the anaesthetist puts on the facemask. This situation compromises the suitability of the different scales and the optimal time at which they should be administered[5].

The aim of this study was to compare different scales to assess preoperative anxiety assessment in children at various points in the build-up to a MAS procedure, and to correlate each with the scale used to assess compliance with anaesthesia induction, the Induction Compliance Checklist (ICC)[xiii]. In this way we hoped to determine which scale best predicts POA and any related interference in anaesthetic induction. By identifying the most appropriate assessment tool to predict POA in children at each of the points prior to MAS should enable the most appropriate strategies to be adopted in order to combat anxiety. Adequate control of POA should improve the post-surgical evolution of these patients, resulting in reduced costs and improved patient satisfaction, as well as that of their caregivers.

Materials And Methods

The study was designed in accordance with the Helsinki Declaration and it was approved by the Clinical Research Ethics Committee of the Hospital Clínico San Carlos. This is a longitudinal prospective observational study of a cohort that underwent a paediatric MAS (MAS-P) procedure at a tertiary care university hospital, from October 2015 to March 2017. The patients were selected consecutively, and they were enrolled onto the study if they fulfilled the inclusion-exclusion criteria and accepted to participate in the study.

O **Inclusion criteria:** Patients between the ages of 2 and 16 who were going to undergo a scheduled MAS-P intervention as indicated by the Paediatric Surgery Service with an anaesthetic risk assessment ASA I or II. Informed signed consent was obtained from the parents or legal guardians, as well as the child's consent if aged 12 or older before inclusion onto the study.

O **Exclusion criteria:** patients with a history of prior surgery after the age of 2. Children with a history of previous surgeries before they were two-years-old were considered not to retain any memories of the surgical experience and therefore, as the variables analysed were not thought to be influenced by such experience it was considered they did not fulfil the exclusion criteria.

VARIABLES ANALYSED

- **Anxiety scales not specific to the surgical procedure**. All these scales were validated self-reported questionnaires to assess state and trait anxiety, and they were administered upon arrival of the family to the surgical day hospital (M0).

- **Spence Anxiety Scale-Paediatric** (**SCAS-P)[i].** This is a validated scale to measure anxiety in children between 8 and 15 years of age through the parent's direct responses. It contains 38 items where the frequency of the situations relating to the patient are expressed using a Likert-type scale, with the response options scored from 0 to 3: "never", "sometimes", "often" or "always". The total score is obtained by summing the responses for all the items and the higher scores are considered to reflect a greater degree of anxiety, with scores greater than 60 reflecting real anxiety.

- **State-Trait Anxiety Inventory Children (STAIC)[ii].** This scale evaluates anxiety in children aged between 5 and 16. It assesses 20 items of the anxiety state (transient states of anxiety) and 20 items of the anxiety trait (proneness to perceive anxiety), scoring these between 1 and 3 points depending on the degree of anxiety. To score state anxiety, the sum of the scores for the direct items of anxiety is subtracted from the sum of the score of the inverse, adding 40 to the result. For trait anxiety, another direct score is obtained by summing the scores of all the items. The scores vary between 20 (low anxiety) and 60 points (maximum anxiety). The final interpretation is based on evaluating the percentiles and the S-score of the validated scales according to sex and age. The reliability assessed with the Cronbach alpha coefficient was 0.82 for men and 0.87 for women, implying an acceptable internal consistency of the scale to measure anxiety.

- **State-Trait Anxiety Inventory (STAI).** This scale was used to evaluate the anxiety of the parents and it was completed by the child's father or mother (at their free choice). It assesses parental anxiety in state and trait anxiety blocks, each with 20 items. The scores may vary from 0 to 60 and the scale's scores are interpreted according to their conversion into the relevant percentiles and on a scale of 10. The test-re-test has a high correlation (0.73-0.86), and its validity has been proven with high and low levels of anxiety in studies performed on large cohorts of students, obtaining a correlation value of 0.83 to 0.94 that suggests very strong validity[14].

- **Scales specific to the surgical context: Modified Yale Preoperative Anxiety Scale (m-YPAS)[iii]**. This scale was developed by Kain in 1995 and its translation into Spanish was validated in 2015[iv] to be used on children aged between 2 and 12 years. Its extended version consists of 22 items, grouped into 5 domains: activities, vocalization, emotional expressivity, state of awareness, and interaction with family members. In this scale higher scores reflect a higher level of anxiety. The short version is comprised of 18 items and it ignores the interaction with family members, with a minimum score of 23 and a maximum score of 100[v]. In both scales, anxiety is considered to be present when the score is greater than or equal to 30. The m-YPAS scale was administered by two trained observers, obtaining video recordings of the patients and those around them at 3 specific points in the preparations prior to surgery for subsequent visualization and comparison.

- **Induction Compliance Checklist (ICC)[11].** This is an observational scale developed by Kain to measure the cooperation and behaviour of the patient during anaesthetic induction. It uses a checklist of 10 items that correspond to negative behaviours that are frequently observed at such time, scoring 1 point when these are present and 0 points if these are not observed. The ICC score is obtained by summing the scores for all the items (10 points maximum), with higher scores correlated with poor cooperation. Perfect anaesthetic induction (with no negative behaviours) scores 0 points, suboptimal induction is scored between 1 and 4 and a score above 4 is considered as poor induction. The ICC scale has only mild inter-observer and intra-observer variability (r>0.995).

STUDY DESIGN

After the informed consent was signed, the patient's POA was assessed at the following points during the day of the intervention:

Time point 0 (M0): This is the time when the patient arrives at the pre-operative hospitalization area. At this point, the researchers recorded a video to assess the patient's initial state of anxiety using the m-YPAS, and the self-reported questionnaires of the non-specific anxiety scales were administered to the child or the parents as appropriate and based on the patient's age: the STAI, SCAS-P or STAIC.

Time point 1 (M1): The point when the patient is transferred to the surgical area, to the entry into the operating theatre and he/she is separated from the parents. The researchers again record a video at this time point to assess the subject's preoperative anxiety using the m-YPAS scale.

Time point 2 (M2): This is the point at which anaesthesia is to be induced in the operating theatre. The researchers again record a video at this time point to assess the subject's preoperative anxiety using the m-YPAS scale and the anaesthesiologist completes the ICC checklist.

The collection of data for the study was limited to the day of the intervention, from admission to the day hospital to the time of anaesthetic induction. Epidemiological data were collected that included age, sex, underlying pathology and the surgical procedure to be performed. The evaluation of the m-YPAS scales at each of the three time points was performed by a single observer.

STATISTICAL ANALYSIS

Qualitative variables are presented as frequency distributions, while quantitative variables are summarized as the means and standard deviations (SD), or the median and interquartile range (IQR). Inter-observer reliability in the assessment of the video recordings was analysed in a group of 30 subjects at the three times points used in the study. The intraclass correlation coefficient (ICC) between the 2 observers was calculated to assess the inter-observer reliability, and the reliability proved to be very good, with an ICC of 0.949 at M0 (95% confidence interval -CI- 0.895-0.975); 0.800 at M1 (95% CI 0.607-0.904) and 0.838 at M2 (95% CI 0.682-0.922).

The Student's T test was used to compare means between two groups, while the linear relationship between quantitative variables was evaluated by calculating the Pearson correlation coefficient. To assess the predictive capacity of the different scales to differentiate patients with difficulties when anaesthesia is induced, the area under the curve (AUC) and its 95% CI was calculated. In all hypothesis testing, the null hypothesis was rejected with a type I error or error □<0.05. All the statistical analyses were performed using the statistical package SPSS 15.0.

Results

In this study, 129 patients (75.2% male) were analysed, 48 of them (37.2%) aged between 2 and 5 years, 58 (45%) between 5 and 12 years, and 23 (17.8%) between 12 and 16 years of age. The characteristics of the children included are summarized in Table 1. The assessment of anxiety using the m-YPAS scale (Table 2) showed that 10% of the children did display anxiety upon arrival at the hospital (M0), although this proportion increased to 27.4% of the children when they were transferred to the surgical unit (M1). Although at the time anaesthesia was induced (M2) the proportion of children with anxiety was lower (26.1%), the mean anxiety observed according to the m-YPAS scale was the highest of all three time points analysed (34.0 ± 21.5).

Table 1. Characteristics of the patients included

		Frequency (%)
Sex	Male	97 (75.2)
	Female	32(24.8)
Age (years)	Median (IQR)	6.3 (4.0-9.6)
Surgery	Phimosis	56 (43.4)
	Inguinal hernia	32 (24.8)
	Cysts, fistulas and skin lesions	21(16.3)
	Other surgeries	13(10.2)
	Double surgical interventions	7(5.4)

IQR: interquartile range

Table 2. Results of preoperative anxiety assessments in parents and patients made achieved with scales that are specific and non-specific to the surgical context

SCALE	"n" (ASSESSED)	MEAN (SD)
m-YPAS 0	110	25.8 (8.4)
m-YPAS 1	106	32.8 (19.0)
m-YPAS 2	92	34.0 (21.5)
SCAS-P	46	18.2 (9.7)
STAIC-S	73	32.4 (8.1)
STAIC-T	73	32.0 (6.8)
STAI-S	121	21.1 (9.8)
STAI-T	120	18.5 (91.9)

m-YPAS 0, Moment 0 = baseline; m-YPAS 1, Moment 1 = during transfer to the surgical unit; m-YPAS 2, Moment 2 = arrival at the operating theatre for anaesthetic induction: m-YPAS, modified Yale preoperative anxiety scale; SCAS-P, Spence Anxiety Scale- Paediatric; STAIC, State-Trait Anxiety Inventory - Children; STAI, State-Trait Anxiety Inventory; STAI-S, STAI-State anxiety; STAI-T, STAI-Trait anxiety; STAIC-S, STAIC-State anxiety; STAIC-T, STAIC-Trait anxiety; SD, standard deviation.

In terms of the scales that were not specific to the surgical context (SCAS-P, STAIC, STAI), none of them gave results that were consistent with anxiety in the population analysed (Table 2). The scores of these scales were compared in terms of the presence or absence of anxiety according to m-YPAS at the same time point, M0. The only significant differences were evident in the self-assessment scale of trait anxiety in children aged 5 to 16 years (STAIC-T), with higher anxiety scores in those who developed anxiety according to the m-YPAS at that time (M0, 39.4 ± 9.2) than in those who do not (31.6 ± 6.4; p=0.014). No significant differences were obtained with the rest of the scales (Table 3).

Table 3. Average score and standard deviation (mean, SD) of each scale as a function of the qualitative anxiety obtained with m-YPAS at M0.

SCALE	*m-YPAS 0 < 30* (No anxiety)		*m-YPAS 0 > 30* (Anxiety)		p
	n	*mean (SD)*	*N*	*mean (SD)*	
SCAS-P	35	17.8 (9.2)	6	19.2 (14.1)	0.753
STAIC-S	57	32.9 (7.9)	5	34.2 (10.6)	0.729
STAIC-T	57	31.6 (6.4)	5	39.4 (9.2)	**0.014**
STAI-S	93	21.8 (10.3)	11	18.5 (10.8)	0.314
STAI-T	92	18.5 (9.7)	11	16.8 (7.4)	0.584

m-YPAS, modified Yale preoperative anxiety scale; SCAS-P, Spence Anxiety Scale - Pediatric; STAIC, State-Trait Anxiety Inventory Children; STAI, State-Trait Anxiety Inventory; STAI-S, STAI-State anxiety; STAI-T, STAI-Trait anxiety; STAIC-S, STAIC-State anxiety; STAIC-T, STAIC-Trait anxiety; SD, standard deviation.

The correlation between each non-specific scale (SCAS-P, STAIC-S, STAIC-T, STAI-S, STAI-T) and m-YPAS was assessed at the same time (M0), and a positive correlation between m-YPAS (M0) and STAIC-T was found (r=0.347, p=0.006). However, there was no correlation between the m-YPAS and with the rest of the scales at either M1 or M2 (Table 4). A linear correlation analysis was performed between the non-specific scales (Table 5) and a significant mild-moderate correlation was evident between the parents' anxiety (both trait and state anxiety) and their children's anxiety. This correlation was evident with both the younger children’s anxiety (SCAS-P) and the older children’s trait anxiety (STAIC-T).

Table 4. Contingency study between self-administered scales non-specific to the surgical context

PEARSON CORRELATION r (p)	SCAS-P	STAIC-T	STAIC-S	STAI-S
STAI-T	0.364 (0.015)	0.272 (0.021)	-0.102 (0.392)	0.504 (0.000)
STAI-S	0.337 (0.025)	0.185 (0.118)	0.214 (0.068)	1
STAIC-T	NA	1	0.227 (0.054)	0.185 (0.118)
STAIC-S	NA	0.227 (0.054)	1	0.214 (0.068)

SCAS-P: Spence Anxiety Scale- Pediatric; STAIC: State-Trait Anxiety Inventory- Children; STAI: State-Trait Anxiety Inventory; STAI-S: STAI-State anxiety; STAI-T: STAI-Trait anxiety; STAIC-S: STAIC-State anxiety; STAIC-T: STAIC-Trait anxiety; NA: not applicable.

Table 5. Average score and standard deviation of m-YPAS as a function of the ICC scores. Mean difference, Pearson correlation analysis and Receiver Operating Characteristic (ROC) curves

	ICC = 0 PERFECT INDUCTION X (SD)	n	ICC >/ 1 IMPERFECT INDUCTION X (SD)	n	p	Pearson correlation r (p)	ROC curves (IC 95%)
m-YPAS 0	25.7 (8.8)	77	26.5 (8.7)	22	0.69	- 0.046 (0.646)	0.497 (0.358-0.636)
m-YPAS 1	28.1 (11.7)	75	42.5 (27.6)	21	**0.001**	0.567 (<0.001)	0.735 (0.607-0.863)
m-YPAS 2	25.7 (10.0)	67	58.1 (28.9)	19	**0.0001**	0.803 (<0.001)	0.812 (0.677-0.947)
SCAS-P	18.6 (9.5)	25	17.6 (10.9)	15	0.779	0.007 (0.965)	0.465 (0.269-0.662)
STAIC-S	31.4 (7.4)	59	34.0 (7.3)	7	0.402	0.137 (0.288)	0.611 (0.383-0.840)
STAIC-T	32.0 (6.6)	59	31.7 (8.2)	7	0.893	-0.015 (0.903)	0.473 (0.219-0.728)
STAI-S	20.6 (9.7)	84	21.2 (9.3)	23	0.793	0.135 (0.276)	0.611 (0.383-0.840)
STAI-T	19.1 (9.1)	83	17.4 (10.1)	23	0.430	-0.039 (0.690)	0.473 (0.219-0.728)

ICC 0, perfect induction; ICC >1, imperfect induction; X, mean; SD, standard deviation; m-YPAS, modified Yale preoperative anxiety scale; SCAS-P, Spence Anxiety Scale- Paediatric; STAIC, State-Trait Anxiety Inventory - Children; STAI, State-Trait Anxiety Inventory; STAI-S, STAI-State anxiety; STAI-T, STAI-Trait anxiety; STAIC-S, STAIC-State anxiety; STAIC-T, STAIC-Trait anxiety .

Anaesthetic induction was analysed using the ICC scale and 79.6% (n=103) of the cohort experienced perfect induction (ICC=0, absence of anxiety), whereas in 12.4% (n=16) induction was sub-optimal and in 8% (n=10) it was poor. As can be seen, non-perfect inductions appeared to be associated with a higher level of anxiety measured by m-YPAS at all time points (M0, M1 and M2), although these differences were only significant at M1 and M2 (Table 5). Likewise, significant correlations were found between the ICC and m-YPAS scores at M1 ($r=0.567$; $p<0.001$) and an even stronger correlation at M2 ($r=0.803$; $p<0.001$), with ROC operating curves showing medium-high predictive capacity at M1 (0.735; 95% CI=0.607-0.863) and high predictive capacity at M2 (0.812; 95% CI= 0.677-0.947). No correlations were found between the non-specific scales and the ICC (Table 5).

The utility of the m-YPAS to evaluate anxiety in the specific population aged between 12 and 16 years was assessed by analysing the correlation with the scales validated in this age group. There were significant correlations between the distinct scales and the self-questionnaires depending on the time of assessment, as observed in the overall assessment of the results. Indeed, a positive correlation was found between m-YPAS (M0) and STAIC-T ($r=0.524$; $p= 0.013$) for this age group. Likewise, ROC curves were generated by correlating the ICC with the m-YPAS at M1, obtaining an AUC of 0.895 (95% CI = 0.800-1.00, high predictive capacity), and with the m-YPAS at M2, obtaining an AUC of 0.713 (medium-high predictive capacity) for this age group.

Discussion

The results of this study show that the m-YAS scale shows a strong ability to predict the results of anaesthetic induction at both the M1 and M2 time points.

The cohort studied here is one of the largest on child POA published to date[5,[i],[ii]], and to our knowledge this is the first study to evaluates PAO using different scales in association with this phenomenon. When assessing anxiety throughout the pre-surgical circuit, low levels of anxiety were observed in all patients on arrival at the hospital (M0) regardless of the scale used to assess this. The highest proportion of patients with anxiety at this initial moment in time was found in the youngest group (from 2- to 5-years-old), in line with previous data[11,[iii]]. Moreover, the anxiety of the children increased as they advance through the preoperative stages towards the operating theatre, with separation from the parents being the moment at which most patients experienced PAO, even though the moment of anaesthetic induction is that at which the anxiety score is highest. Earlier studies have also indicted that the moment of anaesthetic induction as that at which anxiety is maximal[4,14,22]. The discrepancy between the time points with the maximum PAO scores and the highest proportion anxiety patients in our study can be explained by the fact that the parents are separated from their children when they enter the operating theatre, while in many of the studies reviewed the parents remain with their children until the moment of anaesthetic induction[4,5,[iv]]. Moreover, we found congruent correlations between state and trait anxiety measured with the self-questionnaire of the STAIC scale in children aged between 5 and 16 years, i.e.: the subjects with more anxious traits have higher levels of state anxiety.

Regarding the possibility of predicting PAO, we found a significant yet weak positive correlation between m-YPAS at M0 and STAIC-T. As such, the vital anxiety of children between 5 and 16 years of age may predict the PAO that they will experience on arrival at the hospital, and that children over 5 years of age who are more anxious in nature will more readily become anxious upon arrival at the hospital than those who are not. This finding translates into a concurrent validity between the STAIC-T and the specific m-YPAS scale administered at that same time (M0). However, none of the self-administered scales that are not specific to the surgical context showed predictive validity with the m-YPAS scale at the time points closest to anaesthetic induction (M1 and M2). Therefore, the self-administered scales evaluated in this study do not have predictive validity with the m-YPAS as the patient's progress through the different stages prior to MAS.

In this study, the moment of greatest anxiety is that which is closest to anaesthetic induction and it is that which determines the worst post-surgical evolution. As such, we cannot predict the anxiety that patients will experience by using the self-administered scales upon their arrival to hospital on the day of surgery. It might be speculated that if these scales were assessed before admission, as reported in some earlier studies, their predictive capacity will be even lower[15]. In this sense, we found a significant positive correlation of the m-YPAS scale showed with the ICC, which was moderate at M1 and strong at M2. Hence, this scale enables poor anaesthetic induction to be predicted, a prediction that is more reliable the closer to the moment of anaesthetic induction at which the m-YPAS scale is administered. This predictive capacity was not found for the non-specific scales.

To our knowledge, this study is the only one to date that has assessed adolescents between 12 and 16 years of age in this context. The assessment of anxiety in this group followed the same pattern as that in other age ranges. Moreover, there was a consistent relationship between the STAIC (trait) and the m-YPAS at M0 in this age group (the greater the basal anxiety, the greater the anxiety measured with the m-YPAS scale at M0). Likewise, higher levels of anxiety were observed with the m-YPAS at M2 in those subjects who experienced imperfect anaesthetic induction. As such, the results of the m-YPAS scale at both M1 and M2 also has predictive validity as to how children aged between 12 and 16 years will undergo anaesthetic induction.

Parental presence during anaesthetic induction is one of the best studied non-pharmacological interventions to reduce PAO, which has led to this procedure being implemented in many countries, with little negative impact[4,5,26]. However, there are conflicting results regarding the impact of parental presence on the outcome in their child[26,[v],[vi],[vii]]. From the data presented here, the children appeared to experience more trait and state anxiety than their parents, although within the average levels of anxiety in the population.

The SCAS-P scale was completed by the parents of children aged 2-5 years old and we found a significant correlation between the SCAS-P scale and the STAI-S or STAI-T scales, such that when the SCAS-P score increased so did the STAI-S and STAI-T scores. This may be due to the fact that both scales were completed by the child's mother or father and indeed, a positive correlation between children's anxiety and parental anxiety has been described previously[16]. However, in our cohort, weak positive correlations were observed between STAIC-S and STAI-S although they did not reach statistical significance, whereas the correlation between STAIC-T and STAI-S and STAI-T was significant. Therefore, according to our study parents' anxiety (both trait and state anxiety) appears to influence their children's trait anxiety.

This study has some limitations that must be taken into account. Firstly, the predominance of males in the cohort reflects the high prevalence of phimosis surgery in the study population, probably reflecting the real-world population of paediatric MAS. The use of video recording, and in particular, the presence of a person making the video recording may modify the patient's normal behaviour, as proposed previously. However, interaction between the cameraman and the child was avoided in our study to minimize this risk. Among the strengths of the study is the sample size and the inclusion of the group of adolescents aged between 12-16 years, which have not been studied previously in this context.

In conclusion, in this study we found a progressive increase in PAO related to MAS from the time of admission to the point of anaesthetic induction among children and adolescents. The information obtained with scales that are not specific to the surgical context are consistent with that obtained the m-YPAS scale when applied at the same time, yet they do not show any predictive value regarding the subsequent progression of anxiety. When administered at entry to the surgical unit, the m-YPAS scale has predictive value regarding the quality of anaesthetic induction. Therefore, our results suggest that the m-YPAS scale should be used with children and adolescents at the time of transfer to the surgical unit in order to anticipate the need for anxiety management measures at such time, particularly as adequate management of PAO could improve the quality of anaesthetic induction and ultimately, the post-surgical evolution of the paediatric patient. It remains to be determined whether or not the presence of the parents during anaesthetic induction influences their child's anxiety levels, regardless of previous anxiety values.

Declarations

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Contributions

AVC, BJ, LFG, EA and ALP collected date, performed the statistical analysis, and write the manuscript. ALP and MF collected date and performed the statistical analysis. AVC and EA designed the study and collected date. AVC, BJ, LFG, CS, CGP and BSP collected date. AVC, EA, MF designed the study, helped the statistical analysis and edited the manuscript. All author read and approved the final manuscript.

List Of Abbreviations

MAS: major ambulatory surgery

POA: preoperative anxiety

STAI: State Trait Anxiety Inventory

SCAS-S: Spence Anxiety Scale – Paediatric

YPAS: Yale scale of perioperative anxiety

ICC: Induction Compliance Checklist

P-MAS: paediatric major ambulatory surgery

m-YPAS: modified Yale scale of perioperative anxiety

SD: standard deviations

IRQ: interquartile range

ICC: intraclass correlation coefficient

CI: confident interval

AUC: area under the curve

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