RESEARCH ARTICLE

Impact of incentive-based game therapy and transporting children on toy vehicle to operation theatre on reducing anxiety prior to induction of anaesthesia

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Abstract

Objective: To see if transporting paediatric patients to operation theatre using a battery-operated vehicle decreases preoperative anxiety and reduces incidents of postoperative adverse events.

Method: The study was conducted from May to August 2019 at the Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan, and comprised paediatric patients aged 3-5 years assessed as American Society of Anaesthesiologists grade I and II who were scheduled to undergo elective intrathecal chemotherapy under general anaesthesia. The subjects were randomised into intervention group A and control group B. Patients in group A were part of an incentive-based game in the holding bay area and were transported to the operation theatre using a battery-operated toy vehicle. Those in group B watched a pre-decided cartoon on television screen in the holding bay and were transported further using wheel chair. Induction of anaesthesia was done in the presence of guardians in both the groups. Patient anxiety was assessed using the modified Yale Preoperative Anxiety Scale in holding bay area T0, prior to induction of anaesthesia T1, and postoperative anaesthesia-related recovery T2. Data was analysed using SPSS 22.

Results: Of the 36 patients, 18(50%) were in group A; 12(66.6%) boys and 6(33.3%) girls with mean age 4.01±0.48 years. The remaining 18(50%) subjects were in group B; 13(72.2%) boys and 5(27.8%) girls with mean age 3.96 years. The difference in anxiety between the groups at T0 was non-significant (p=0.73). At T1 and T2, the scores were significantly lower group A compared to group B (p<0.05). Group A patients had better bag mask ventilation compliance at induction and remarkably less incidence of hypoxia, bronchospasm, postoperative agitation and early discharge from PACU.

Conclusion: Incentive-based game therapy decreased anxiety among paediatric patients preoperatively, made them more compliant and improved postoperative recovery.

Keywords: Anaesthesia, Anxiety, Children, Game therapy, Induction. (JPMA 72: 1388; 2022)

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Introduction

The number of children undergoing surgical procedures has been on the rise.[1] In the United States alone, approximately 450,000 children under the age of 18 are admitted annually for surgical procedures and the number is much higher for day-case procedures.[2] A quarter of these children happen to be aged <3 years, and a majority of these children experience a considerable level of anxiety and fear in the holding bay area prior to the induction of anaesthesia.[3] In the developed world, much emphasis is given to acclimatise these children with unfamiliar environment, and various techniques are used to reduce the level of anxiety.[4]

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Besides, parental presence did not deliver convincing results in reducing anxiety and could not prove to be more beneficial than administrating sedatives as premedication for reducing anxiety in children right before anaesthesia.[5] Such findings raise suspicion regarding the findings. Smartphones and gadgets have been of an assistance in such cases. Playing a video of the patients' choice reduced their anxiety remarkably before the induction of anaesthesia compared to the control groups.[6] Many interventions have shown promising results in decreasing the apprehension before anaesthesia, such as clown doctors, parental acupuncture and video games of child's choice, but a significant number of children still remain extremely anxious and are prone to develop emergence delirium, postoperative pain, sleeping disturbances, parent-child conflict and separation anxiety.[7]

The matter is not generally explored in the developing world, including Pakistan, as most patients are lost to follow-up once the treatment is completed.

A recent study observed the effectiveness of transporting children to the operation theatre (OT) on battery-operated toy car vehicle, and reported a lower level of anxiety prior to induction without the need of premedication with anxiolytics.[8] Another study reported that by using simple, cost-effective, non-pharmacological interventions before anaesthesia decreased anxiety and improved overall compliance in children undergoing procedures.[9]

The current study was planned to determine the effectiveness of incentive-based game therapy and transportation of children to OT on battery-operated toy vehicles for reducing preoperative anxiety in paediatric patients undergoing elective intrathecal chemotherapy under general anaesthesia (GA), and to evaluate intraoperative complications and postoperative anaesthesia-related recovery.

Patients and Methods

The study was conducted from May to August 2019 at the Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCHRC), Lahore, Pakistan. After approval from the institutional ethics review board, the sample size was calculated (Annexure I) on the basis of a previous study[8] at 95% significance level with 95% power and 15% dropout rate.

The sample was raised from among paediatric patients aged 3-5 years assessed as American Society of Anaesthesiologists (ASA) grade (Annexure II) I and II who were scheduled to undergo elective intrathecal chemotherapy under GA. Children with history of learning disability and hearing or visual impairment were excluded.

After taking informed written consent from the parents or legal guardians, the subjects were randomised into intervention group A and control group B. The randomization technique used for this study was "Block randomization", a group of patients coming on one day were allotted to the control group and the next group of patients coming on the next day were included in the study group. This alternation of the blocks was carried out in consecutive manner till the time study sample size was completed. Observer bias could not be blinded in this study as the intervention was quite evident, but parameters used to assess the anxiety remained the same for both patient populations.

Patients in group A were part of the incentive-based playing activity, and were transported to OT on a toy vehicle. A replica of the T piece commonly used for the inhalation induction was provided to the children in the preoperative waiting area. They were asked to blow air from one end to inflate the balloon at the other end. Child who would blow the maximum amount of air was promised to be rewarded at the end of the procedure. The activity lasted 1 hour to standardise time for play therapy. The small toy car to be given as reward was shown to the children during the playing activity. These were awarded after the procedure was done to all the children before their respective discharge from the post-anaesthesia care unit (PACU.

Furthermore, each child in group A was transported to the intrathecal chemotherapy station inside OT on battery-operated toy vehicle prior to GA induction.

In group B, a pre-decided cartoon was displayed on the television screen in the holding bay waiting area, and the children made use of the normal playing activities provided as per the usual routine. The children were provided with balloons to inflate and stickers in the holding bay, and were transported to the OT on wheelchair.

Induction of anaesthesia was done in the presence of

Annexure I: Sample Size Calculation

Sample Size For Comparing Two Means

Input Data

Confidence Interval (2-sided)	95%
Power	95%
Ratio of sample size (Group 2/Group 1)	1

	Group 1	Group 2	Difference*
Mean	56	69	-13
Standard deviation	5.8	12.2	
Variance	33.64	148.84	

Sample size of Group 1	15
Sample size of Group 2	15
Total sample size	30

*Difference between the means

Results from OpenEpi, Version 3, open source calculator--SSMean
Print from the browser with ctrl-P
or select text to copy and paste to other programs.

Annexure II: American Society of Anaesthesiologists physical status classification.

Class	Definition
ASA Physical Status 1	A normal healthy patient.
ASA Physical Status 2	A patient with mild systemic disease.
ASA Physical Status 3	A patient with severe systemic disease.
ASA Physical Status 4	A patient with severe systemic disease that is a constant threat to life.
ASA Physical Status 5	A moribund patient who is not expected to survive without the operation.
ASA Physical Status 6	A declared brain-dead patient whose organs are being removed for donor purposes.

Annexure III: Modified Yale Paediatric Anxiety Score.

A. Activity _____
B. Vocalizations _____
C. Emotional Expressivity _____
D. State of Arousal _____
E. Use of Parent _____

A. Activity
0. Can't code (child not visible)
1. Looking around, curious, playing with toys, reading(or other age appropriate behavior); moves around holding area/ treatment room to get toys or go to parent; may move toward OR equipment
2. Not exploring or playing, may look down, may fidget with hands or suck thumb (blanket); may sit close to parent while waiting, or play has a definite manic quality
3. Moving from toy to parent in unfocused manner, nonactivity derived movements; frenetic/frenzied movement or play; squirming, moving on table, may push mask away or clinging to parent
4. Actively trying to get away, pushes with feet and arms, may move whole body; in waiting room, running around unfocused, not looking at toys or will not separate from parent, desperate clinging

B. Vocalizations
0. Can't code (child not visible or can't hear audio)
1. Reading (nonvocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answers questions but may be generally quiet; child too young to talk in social situations or too engrossed in play to respond
2. Responding to adults but whispers, "baby talk", only head nodding
3. Quiet, no sounds or responses to adults
4. Whimpering, moaning, groaning, silently crying
5. Crying or may be screaming "no"
6. Crying, screaming loudly, sustained (audible through mask)

C. Emotional Expressivity
0. Can't code (can't see face or child not visible)
1. Manifestly happy, smiling, or concentrating on play
2. Neutral, no visible expression on face
3. Worried (sad) to frightened, sad, worried, or tearful eyes
4. Distressed, crying, extreme upset, may have wide eyes

D. State of Apparent Arousal
0. Can't Code (child not visible)
1. Alert, looks around occasionally, notices watches what anesthesiologist does with him/her (could be relaxed)
2. Withdrawn child sitting still and quiet, may be sucking on thumb or face turned into adult
3. Vigilant looking quickly all around, may startle to sounds, eyes wide, body tense
4. Panicked whimpering, may be crying or pushing others away, turns away

E. Use of Parents
0. Can't code (child not visible)
1. Busy playing, sitting idle, or engaged in age appropriate behavior and doesn't need parent; may interact with parent if parent initiates the interaction
2. Reaches out to parent(approaches parent and speaks to otherwise silent parent), seeks and accepts comfort, may lean against parent
3. Looks to parents quietly, apparently watches actions, doesn't seek contact or comfort, accepts it if offered or clings to parent
4. Keeps parent at distance or may actively withdraw from parent, may push parent away or desperately clinging to parent and will not let parent go

Total adjusted score = (A/4 + B/6 + C/4 + D/4 + E/4) × 100/5

guardians in both the groups. Patient anxiety was assessed using the modified Yale Preoperative Anxiety Scale (mYPAS) (Annexure III)[10] at 3 point times: in the holding bay area (T0), prior to GA induction (T1), and postoperative anaesthesia-related recovery (T2). The score ranges from 22.33 to 100[11] with higher scores indicating higher levels of anxiety.

Table: Patients characteristics.

	Intervention Group (n= 18)	Control Group (n= 18)
Mean Age (years)	4.01±0.48	3.96±0.63
Age Range (years)	3.3-4.9	3.0-5.0
Weight (kg)	14.37	14.01
Gender Male/Female	12/6	13/5
Guardian (Father/mother/others)	8/8/2	10/8/0

Intraoperative GA was standardised in both groups. After standard monitoring, inhalation induction with sevoflurane/ oxygen/air was commenced. At the end of the procedure, the patients were shifted to PACU where they were monitored for recovery. Data regarding discharge time and post-anaesthesia agitation after waking up from GA was also noted.

Data was analysed using SPSS 22. Mean and standard deviations were calculated for continuous variables. Frequencies and percentages were calculated for categorical variables. Data normality was checked using histograms and Shapiro Wilk test. Independent sample "t" test was used to compare the mean difference between the groups. P<0.05 was considered statistically significant.

Results

Of the 50 children initially approached, 36(72%) completed the study. Of them, 18(50%) were in group A; 12(66.6%) boys and 6(33.3%) girls with mean age of 4.01±0.48 years. The remaining 18(50%) subjects were in group B; 13(72.2%) boys and 5(27.8%) girls with mean age of 3.96±0.63 years (Table).

The difference in anxiety between the groups at T0 was non-significant (37.66±16.02 in group A compared to 39.27±12.2 in control group; *p*=0.73). At T1, intergroup difference was significant (53.94±23.8 in group A compared to

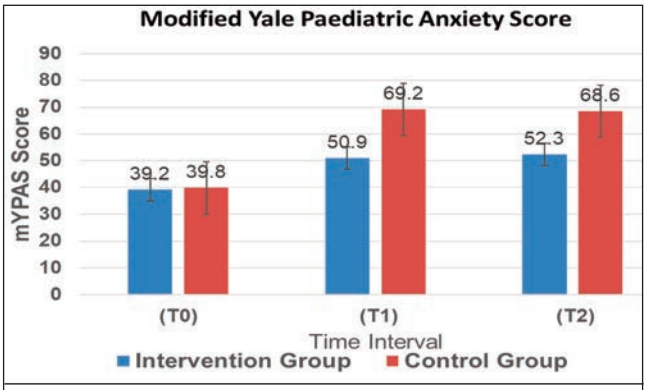

Figure-1: Anxiety levels between the groups at Preoperative assessment in holding bay (T0), prior to induction of anaesthesia (T1) and postoperative recovery (T2).

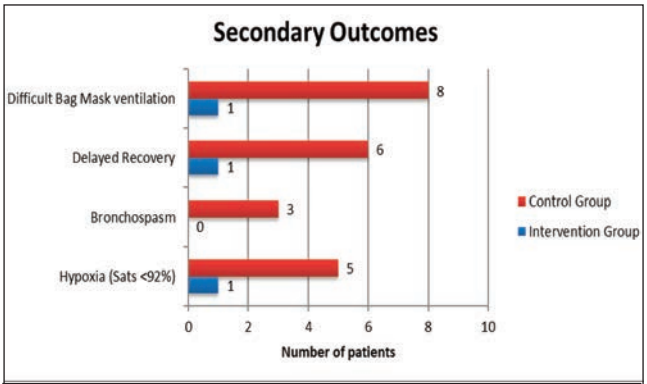

Figure-2: Ease of anaesthesia management.

65.37±17.8 in control group; p<0.05) and the same was the case at T2 (52.33±17.54 in group A compared to 64.83±18.97 in control group; *p*=0.04) (Figure 1)

Group A patients had better bag mask ventilation compliance at induction and significantly less incidence of hypoxia, bronchospasm, postoperative agitation and early discharge from PACU (Figure 2).

Discussion

Induction of GA can be very distressing for children, especially in the younger age group. Factors contributing to this distress and anxiety include unfamiliar faces, separation anxiety from parents, unfamiliar hospital procedures and uncertainty about anaesthesia or surgical procedure.[12] There is ample literature regarding the use of pharmacological interventions that may reduce the anxiety in paediatric patients and enhance their cooperation before GA induction.[13-15] However, these interventions require intravenous (IV) cannulation or oral anxiolytic administration which may itself be a paradoxical source of stress and anxiety. Non-pharmacological measures and presence of parents at the time of GA have been studied thoroughly, but have not reported any meaningful results in reducing anxiety despite widespread practice in clinical settings.[16]

In the current study, the use of incentive-based game therapy provided some familiarisation to children with the GA induction mask to overcome their fear, and, secondly, the use of battery-operated toy vehicle to transport them to the OT helped in reducing anxiety due to unfamiliar surroundings and faces.

The children in the study were aged 3-5 years. The age group was selected for two reasons. Firstly, the patient population was primarily those who were diagnosed with leukaemia. Age at first presentation of disease and commencement of treatment falls within this age group. Hence, this was their first exposure to GA. Secondly, older children with similar medical characteristics tend to have a recall of previous GA experience. This may have contributed to recall bias and may have led to higher levels of anxiety scores. Since these children have repeated GA exposure during the course of treatment, evidence suggests that any child who experienced high levels of anxiety and distress at any one point in time tends to be less cooperative than others.[17]

When it comes to scoring system for calculating anxiety, studies have used various tools, leading to outcome measures that have rarely been consistent owing to different scoring scales.

The current study used mYPAS, which has 5 parameters: activity, vocalisation, emotional expressivity, state of arousal, and use of parents. These parameters represent different domain of child anxiety, and the scale was used at 3 timepoints during the perioperative phase, quantifying the range between 22.33 as baseline to 100 as maximum value[11,18] with higher scores indicating higher anxiety.

Local data is scarce and the studies have investigated adult patient's anxiety levels prior to GA induction with no intervention to reduce anxiety.[19] To the best of our knowledge, no study has been conducted in the paediatric population in this regard.

The current study has limitations owing to its small sample size. Moreover, patients can be followed up to assess if they developed any learning disabilities, cognitive dysfunctions or behaviour changes.

Conclusion

Simple measures, such as game therapy and transporting children on toy vehicle car, decreased the anxiety level in children before GA induction and made them more compliant.

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Conflict of Interest: None.

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