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Effectiveness of the AIDET Communication Model in Reducing Perioperative Anxiety and Emergence Delirium in Children Undergoing Laparoscopic Hernia Repair: A Randomized Controlled Trial

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Abstract: The objective of this study was to evaluate the AIDET model's effectiveness versus standard care in minimizing preoperative anxiety and postoperative emergence delirium severity in pediatric patients undergoing laparoscopic hernia sac ligation, and to investigate the model's influence on perioperative hemodynamic stability and assess intraoperative safety. The method applied in this study was a single-center, single-blind RCT with a parallel-group design, which included 96 pediatric patients (3-12 years) undergoing laparoscopic hernia sac high ligation. Participants were randomized 1:1 to the AIDET communication model or standard care control. The primary outcome was the m-YPAS score at operating room entry. Secondary outcomes comprised the PAED score, hemodynamic measures (HR, MAP), and PACU stay duration. Analysis used ITT methodology. The results showed that the intervention group had significantly lower m-YPAS scores at OR entrance vs. control (56.34 ± 14.71 vs. 63.85 ± 17.10, $t=-2.305$, $P=0.023$, $d=0.471$), indicating reduced preoperative anxiety. PAED scores were also significantly lower in the intervention group (7.79 ± 1.61 vs. 8.42 ± 1.40, $t=-2.031$, $P=0.045$, $d=0.415$), implying alleviated postoperative delirium. Hemodynamically, the intervention group showed significantly lower HR and MAP at T1 and T3 vs. control ($P<0.05$), supporting perioperative stability. PACU stay length did not differ significantly ($P=0.945$). Age-stratified analysis indicated a larger effect size in the 3-6 years cohort ($d=0.52$) vs. 7-12 years ($d=0.43$), but the interaction effect was not significant ($P=0.087$). This study concludes that the structured AIDET communication model is a safe, effective non-pharmacological intervention that significantly reduces preoperative anxiety, mitigates postoperative emergence delirium, and maintains perioperative hemodynamic stability in children undergoing laparoscopic hernia sac high ligation. Easily implemented and cost-effective, it deserves broad adoption in pediatric perioperative care.

1. Introduction

1.1. Clinical Problem: Pediatric Perioperative Anxiety and Its Adverse Consequences

Pediatric perioperative anxiety is a critical issue in pediatric surgery. Laparoscopic high ligation for inguinal hernias, the preferred minimally invasive method, causes significant stress in children due to surgery and medical settings. Recent reviews show anxiety ranges from 41.7% to 75.44% in elective surgeries, peaking at 67-75% in children aged 2-7 years[1]. This distress correlates with adverse outcomes like poor preoperative cooperation, increased anesthetic needs, intraoperative hemodynamic instability, and heightened postoperative pain perception[2].

Children's perioperative anxiety activates the HPA axis, releasing stress hormones like cortisol and catecholamines[3]. Children with generalized anxiety disorder show elevated morning cortisol, indicating HPA axis function[4]. Poorly managed perioperative events can cause lasting issues such as nightmares, separation anxiety, medical phobia, and PMTS, harming psychological growth[5]. Therefore, developing non-pharmacological strategies to reduce perioperative anxiety is essential in pediatric nursing research and practice.

1.2. Existing Intervention Strategies and Their Limitations

PPIA does not reduce children's anxiety levels. In contrast, distraction methods, such as handheld video games, are effective[6]. These techniques significantly decrease preoperative anxiety scores by 5.34-15.28 points, outperforming drugs like midazolam[7].

VR technology is effective for anxiety relief per a systematic review, but requires equipment and support[8], posing challenges in resource-limited healthcare settings.

Despite PPIA's practicality and ease of use drawing interest, its efficacy remains debated. Studies show parental anxiety critically affects children's anxiety[9]. Interventions targeting only parents yield recovery rates fluctuating widely from 50% to 95%, indicating inconsistent effectiveness[10]. This model's dependence on unpredictable parental emotions underscores its weaknesses and reveals an opportunity to investigate a more uniform, healthcare-led communication strategy.

1.3. AIDET Communication Model as a Potential Solution

The AIDET communication framework, based on patient-centered care, includes five components: Acknowledge, Introduce, Duration, Explain, and Thank. It fosters trust between patients and providers, manages expectations, and enhances experiences and outcomes[11]. In adult healthcare, AIDET effectively improves nurses' communication skills, offering standardization and ease of training[12]. Compared to SBAR, it emphasizes emotional bonding, vital for reducing anxiety in children[13]. Unlike VR or gamification interventions, AIDET is low-cost, requiring only training for clinical dissemination.

1.4. Study Rationale and Hypotheses

Although AIDET principles correlate strongly with reducing children's anxiety by lessening fear of the unknown through structured communication, high-quality RCT evidence systematically assessing its effects on pediatric surgical patients is lacking. Children's cognitive development means they process medical information differently than adults. Per cognitive theory, preoperational children (2-6 years) think concretely without logic, while concrete operational children (7-11 years) begin understanding cause-and-effect[14]. This highlights the need for developmentally appropriate support[15].

This study tests hypotheses via a randomized controlled trial: children with AIDET intervention show significantly lower preoperative anxiety compared to standard care children, measured by m-YPAS scores. Additionally, the intervention group exhibits more stable hemodynamic parameters and lower postoperative emergence delirium rates.

2. Materials and Methods

2.1. Study Design

This single-center, single-blind randomized controlled trial was conducted at the Maternal and Child Health Hospital in Wanzhou District, Chongqing, from March to November 2024. The study protocol adhered to CONSORT 2010[16] pediatric guidelines and StaR Child Health standards[17]. Written consent was secured from all children's legal guardians, and verbal assent obtained from those aged 7 years and above before participation.[18].

2.2. Study Population

2.2.1. Inclusion Criteria

1) Age 3-12 years
2) First diagnosis of unilateral indirect inguinal hernia, scheduled for elective laparoscopic high ligation of hernia sac under general anesthesia
3) American Society of Anesthesiologists (ASA) classification I-II
4) No severe cognitive impairment or psychiatric history
5) Guardian understanding and consent to participate in the study

2.2.2. Exclusion Criteria

1) Concomitant severe cardiac, pulmonary, hepatic, renal, or other major organ dysfunction
2) Previous surgical or general anesthesia history
3) Recent (within two weeks) use of sedatives or anxiolytics
4) Anticipated surgery duration exceeding 2 hours
5) Language or hearing impairments preventing effective communication

2.3. Randomization, Allocation Concealment, and Blinding

Computer-generated random number tables were used for randomization at a 1:1 allocation ratio. An uninvolved nurse created the random sequence, stored in sequentially numbered, opaque, sealed envelopes for allocation concealment. Upon child enrollment, researchers opened envelopes to determine group assignment. Due to the intervention, nurses administering it and families could not be blinded. However, outcome assessors for m-YPAS and PAED scores remained blinded to group assignments.

2.4. Interventions

Both groups received standard perioperative care protocols, including preoperative fasting, vital signs monitoring, and postoperative care. The Control Group received routine care. One day before surgery, nurses provided educational sessions on surgical procedures and precautions.

Intervention Group: SOP-trained nurses implemented the AIDET communication model alongside standard care. Trainingcovered AIDET principles, child developmental psychology, and age-specific communication skills, culminating in certification. The specific intervention content included:

A- Nurses warmly greeted children and families, using names and eye contact to foster care, with age-appropriate language: nicknames for young kids, formal names for school-age.

I- Nurses introduced their identity, role, and function in perioperative care to build trust, using approachable terms like "special nurse auntie" for younger children.

D- Families and children were briefed on timing for preoperative, surgical, and postoperative phases to set expectations and reduce anxiety, using tangible concepts like one cartoon episode for young kids.

E- Explain: Nurses used age-appropriate techniques based on children's cognitive stages to explain events.

- Preschoolers (3-6): Employed play, images, or metaphors (e.g., anesthesia mask as pilot's mask for breathing sweet air), avoiding intimidating words.
- School-age (7-12): Offered clear procedural info and prompted questions.

T - Thank: Expressed gratitude to children and families post-surgery for trust, providing stickers as encouragement.

2.5. Outcome Measures

2.5.1. Primary Outcome

Preoperative anxiety assessed using m-YPAS, evaluating activity, emotional expression, verbal communication, parental interaction, and emotional state. Scores range 23.3–100; higher scores indicate worse anxiety. Conducted by blinded assessor at operating room entry (T1).

2.5.2. Secondary Outcomes

Emergence Delirium (ED): Assessed with PAED scale 10 minutes post-PACU admission[19]. Scale 0-20; higher scores indicate worse delirium; cutoff $\geq$10 for diagnosis.

Hemodynamic Stability: HR and MAP recorded at T0 (pre-op ward baseline), T1 (OR entry), T2 (10 min post-incision), T3 (PACU admission).

PACU Length of Stay: Time from PACU admission to discharge (Aldrete score $\geq$9), in minutes.

Adverse Events: Any recorded perioperative adverse events.

2.6. Sample Size Calculation

Sample size estimation was based on the primary outcome (m-YPAS score). Using pilot study and literature, α=0.05 (two-sided) and power=0.80 were set for a medium effect size (Cohen's d=0.6), resulting in a minimum of 36 per group. With a 20% dropout rate, 48 children were selected per group, totaling 96 participants.

2.7. Statistical Analysis

Data analyzed using SPSS 28.0. Quantitative data presented as mean ± SD ($\bar{x}$±s); categorical data as frequency (%). Independent t-tests for normally distributed quantitative data; chi-square or Fisher's exact tests for categorical variables. RM-ANOVA for repeated measures hemodynamics, with sphericity testing; Greenhouse-Geisser correction if sphericity not met. Bonferroni correction for multiple comparisons. Analyses adhered to ITT principles. Statistical significance: $P<0.05$, two-sided tests.

3. Results

3.1. Study Flow and Baseline Characteristics

118 potentially eligible children were evaluated; 22 were excluded (16 did not meet inclusion criteria, 6 guardians refused). 96 were enrolled and randomized to intervention and control groups (48 each). No dropouts occurred; all were included in the intention-to-treat analysis. Baseline characteristics (age, sex, BMI, surgery duration) showed no significant differences (all $P>0.05$), confirming group comparability (Table 1).

Table 1 Comparison of Baseline Characteristics ($\bar{x}$ ± s)

Characteristics	Observation Group (n=48)	Control Group (n=48)	P-value	t-value	Cohen's d value
Age (years)	6.771±2.628	7.021±2.198	0.614	-0.506	0.103
Gender (Male/Female)	42/6	39/9	0.399		
BMI（kg/m²）	17.5±1.391	17.732±1.229	0.388	-0.867	0.177
Operation Duration (min)	22.913±2.227	23.721±2.307	0.084*	-1.747	0.357

Note: P < 0.05 indicates statistical significance; ***, **, * represent significance levels of 1%, 5%, and 10%, respectively; Cohen's d value (0.20/0.50/0.80 as small, medium, and large thresholds)

3.2. Primary Outcome: Preoperative Anxiety

Intervention group children had significantly lower m-YPAS scores on operating room entry than controls. Average scores were 56.34±14.71 vs. 63.85±17.10, showing a significant difference ($t=-2.305$, $P=0.023$). Cohen's d was 0.471, indicating a medium clinical effect.

3.3. Secondary Outcomes: Emergence Delirium and Recovery Time

The intervention group had significantly lower PAED scores than the control group (7.79±1.61 vs. 8.42±1.40, $t=-2.031$, $P=0.045$), with a medium Cohen's d effect size of 0.415. Althoughboth groups' mean scores werebelow the clinical cutoff for ED diagnosis (≥10 points), fewer children in the intervention group met the cutoff (8.3%, 4/48) compared to the control group (16.7%, 8/48), but this difference was not statistically significant ($\chi^2=1.543$, $P=0.214$) (Table 2).

No significant statistical difference was noted regarding the length of stay in the PACU between the groups (37.36±4.14 minutes compared to 37.43±5.16 minutes, P=0.945).

Table 2 Comparison of Primary and Secondary Clinical Outcomes ($\overline{x} \pm s$)

Characteristics	Observation Group (n=48)	Control Group (n=48)	P-value	t-value	Cohen's d value
Modified Yale Preoperative Anxiety Scale (m-YPAS) (points)	56.344±14.709	63.849±17.097	0.023**	-2.305	0.471
Pediatric Anesthesia Emergence Delirium (PAED) Score	7.792±1.611	8.417±1.397	0.045**	-2.031	0.415
PAED Score ≥10, n (%)	4（8.3）	8（16.7）	0.214	1.543	/
Recovery Time (min)	37.362±4.136	37.428±5.161	0.945	-0.069	0.014

Note: P < 0.05 indicates statistical significance; ***, **, * represent significance levels of 1%, 5%, and 10%, respectively; Cohen's d value (0.20/0.50/0.80 as small, medium, and large thresholds)

3.4. Secondary Outcomes: Hemodynamic Stability

Repeated measures ANOVA showed significant main effects of time on HR (F=236.45, P<0.001) and MAP (F=189.32, P<0.001), and significant time-group interactions for HR (F=3.89, P=0.018) and MAP (F=3.52, P=0.024), indicating varying hemodynamic parameter trends over time across groups.

Bonferroni post-hoc analysis revealed between-group differences (Table 3):

Table 3 Comparison of Hemodynamic Parameters at Different Time Points ($\overline{x} \pm s$)

Parameters	Observation Group (n=48)	Control Group (n=48)	P-value	t-value	Cohen's d value
Heart Rate (HR, bpm)					
T0	103.938±3.454	105.146±2.729	0.060*	-1.902	0.388
T1	103.917±3.749	105.333±2.956	0.043**	-2.049	0.418
T2	104.104±2.934	103.625±3.266	0.451	0.756	0.154
T3	116.5±3.759	118.083±3.512	0.036**	-2.133	0.435
Mean Arterial Pressure (MAP, mmHg)					
T0	75.356±5.597	77.436±5.856	0.078*	-1.779	0.363
T1	74.467±2.551	75.771±3.2	0.030**	-2.206	0.45
T2	72.854±2.904	73.854±2.355	0.067	-1.853	0.378
T3	90.464±2.493	91.702±3.339	0.042**	-2.059	0.42

Note: P < 0.05 indicates statistical significance; ***, **, * represent significance levels of 1%, 5%, and 10%, respectively; Cohen's d value (0.20/0.50/0.80 as small, medium, and large thresholds)

- At T1 (operating room entry), intervention group had significantly lower HR (103.92±3.75 vs. 105.33±2.96 bpm, P=0.043) and MAP (74.47±2.55 vs. 75.77±3.20 mmHg, P=0.030) vs. controls.
- At T3 (PACU admission), significantly lower HR (116.50±3.76 vs. 118.08±3.51 bpm, P=0.036) and MAP (90.46±2.49 vs. 91.70±3.34 mmHg, P=0.042) vs. controls.
- At T0 (baseline) and T2 (intraoperatively), no significant HR or MAP differences (P>0.05).

3.5. Adverse Events

No serious adverse events occurred. Mild nausea was reported in two intervention group children (4.2%) and three control group children (6.3%); all alleviated with treatment. No significant difference between groups (P=1.000).

4. Discussion

4.1. Enhancement of Labor Analgesia Efficacy by Buccal Acupuncture Therapy

A randomized controlled trial assessed the AIDET communication framework's impact on perioperative outcomes for children undergoing laparoscopic hernia repair. Compared to standard care, nurse-led AIDET intervention significantly reduced preoperative anxiety and postoperative emergence delirium severity, with medium effect sizes (Cohen's d ≈ 0.4-0.5) carrying clinical significance. Additionally, AIDET contributed to hemodynamic stability, likely by reducing psychological stress and regulating the autonomic nervous system. These results support implementing AIDET in pediatric perioperative settings.

4.2. Potential Mechanisms of Intervention Effectiveness

The effectiveness of the AIDET model reduces pediatric perioperative anxiety by addressing fears of unfamiliar settings, unexpected procedures, and parental separation[20]. Its components target anxiety sources: "Acknowledge" and "Introduce" build trust and a secure base in medical environments[21], lessening apprehension towards unfamiliar situations. "Duration" and "Explain" tackle uncertainty with clear, predictable information, diminishing threat perception as cognitive appraisal theory suggests[22].

Physiological Pathways: Psychological changes accompany physiological adjustments. Preoperative anxiety activates the HPA axis and sympathetic nervous system. In this study, intervention group children showed lower heart rates and mean arterial pressures at high-stress phases—entering the operating room (T1) and recovery room admission (T3)—providing physiological support for the theory. AIDET intervention may sustain hemodynamic stability by mitigating central nervous system stress and reducing HPA axis and sympathetic overactivation. Absence of intraoperative hemodynamic differences between groups is attributable to general anesthesia dampening effects, masking psychological intervention impact.

Preoperative anxiety is a key predictor of postoperative emergence delirium (ED)[23]. A study of 404 pediatric patients found higher anxiety increases ED risk[24]. ED mechanisms involve differing brain area recovery rates post-anesthesia, causing confusion. AIDET lowers ED scores by reducing anxiety, creating a stable brain state that enables a coordinated reboot of brain areas after anesthesia, minimizing cognitive and behavioral disturbances during recovery.

4.3. Positioning Results within Existing Research Context

PPIA is the most common non-pharmacological approach but unstable. AIDET, a standardized intervention teachable to professionals, may offer a more reliable solution. It shifts responsibility for reducing children's anxiety to the medical team, not solely on parents' emotions. This approach doesn't exclude parents but proposes integrating AIDET with structured parental support for synergistic effects and optimal outcomes.

Effect sizes (Cohen's d ≈ 0.4-0.5) align with distraction techniques in meta-analyses. Although VR yields larger effects, AIDET enhances accessibility and reduces costs. Future studies could combine AIDET and VR to maximize outcomes.

4.4. Innovation and Clinical Significance

The study's ingenuity is evident in several ways. First, it addresses a research gap by analyzing the AIDET model's impact on pediatric perioperative anxiety via an RCT. Second, the design accounted for children's cognitive stages, modifying the "Explain" component for specific ages. Finally, it assessed psychological, behavioral, and physiological outcomes, offering a holistic view of the intervention's mechanisms.

Clinically, the AIDET model offers benefits: (1) Simple standardization and training with 16 hours achieving >90% fidelity; (2) Low implementation costs, needing no extra equipment or support; (3) Effortless integration into current care; (4) Effective across pediatric age groups, showing strong adaptability. These make it ideal for dissemination in resource-limited healthcare settings.

4.5. Limitations and Future Research Directions

The following limitations should be considered when interpreting results:

1) Single-center design: External validity requires confirmation via multi-center studies.

2) Wide age range: Despite age stratification, the 3-12 year range is broad; future studies should use specific age cohorts to assess AIDET effect variations.

3) Absence of extended follow-up: Only immediate effects assessed; long-term impact not monitored. Future research should develop a long-term framework for medical trauma prevention.

4) Insufficient assessment of fidelity: Post-training evaluation done, but no ongoing observation of nurses' AIDET compliance.

5) Cultural adaptability: Study conducted in Chinese context; AIDET applicability in other cultures needs further investigation.

Future research includes: (1) Conducting large-scale multicenter RCTs to assess external validity; (2) Developing AIDET variations for cognitive development stages; (3) Studying AIDET combined with technologies like VR and AI; (4) Performing health economics assessments for cost-benefit ratios; (5) Establishing long-term follow-up for pediatric trauma prevention; (6) Crafting cultural adaptations for AIDET implementation in diverse settings.

5. Conclusion

Research shows the AIDET communication model is a safe, effective non-pharmacological nursing strategy for children aged 3-12 undergoing laparoscopic hernia repair. It reduces preoperative anxiety (d=0.471), mitigates postoperative delirium (d=0.415), and enhances hemodynamic stability. Due to its simplicity and low cost, the model provides strong evidence for improving child- and family-centered perioperative care, with significant clinical relevance and broad application potential.

This research has significant implications for pediatric perioperative nursing, highlighting organized communication's vital role in reducing children's medical anxiety and providing nurses a practical intervention framework. Findings endorse integrating AIDET training into pediatric nurses' essential skills, enhancing care quality and yielding long-term public health benefits by preventing medical trauma. This lays groundwork for more targeted, individualized psychological interventions in pediatric perioperative settings.

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