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Impact of Integrated Nursing and Rehabilitation on Recovery Outcomes after Pediatric Appendectomy

Original Article

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Abstract

Background: Appendicitis is a common surgical emergency in children, often requiring appendectomy. Traditional postoperative care focuses on nursing protocols for pain management and mobility. Recent evidence suggests that integrated care models combining nursing and rehabilitation services can enhance recovery outcomes. This study aims to investigate the effectiveness of such a model in pediatric appendectomy patients.

Objective: To evaluate the impact of an integrated nursing and rehabilitation care model on recovery outcomes in children undergoing appendectomies.

Methods: This study was conducted over one year with 42 pediatric appendectomy patients randomly assigned to either an integrated care group or a standard care group. The integrated care group received combined nursing and rehabilitation services, while the standard care group received traditional postoperative care. Immediate postoperative recovery was evaluated using pain scores, wound healing assessments, and mobility tests at 24, 48, and 72 hours post-surgery. Long-term functional outcomes, including return to school and physical activity levels, were assessed at 1, 3, and 6 months. Patient and family satisfaction were measured at discharge and follow-up intervals.

Results: The integrated care group demonstrated significantly better outcomes: mean pain scores at 72 hours were 2.9 (SD = 0.3) compared to 3.8 (SD = 0.5) in the standard care group ($p < 0.01$). Wound healing scores at 72 hours were 1.4 (SD = 0.4) versus 2.3 (SD = 0.4) ($p < 0.01$). Mobility (TUG) scores improved from 9.0 (SD = 0.4) to 8.1 (SD = 0.4) ($p < 0.01$). Physical activity scores were 3.4 (SD = 0.6) at 1 month, 4.0 (SD = 0.4) at 3 months, and 4.4 (SD = 0.5) at 6 months, compared to 3.0 (SD = 0.5), 3.2 (SD = 0.6), and 3.6 (SD = 0.4) in the standard care group, respectively ($p < 0.01$). The integrated care group also had fewer days absent from school (mean 4.9, SD = 1.4 vs. 8.7, SD = 2.0) and higher patient satisfaction scores at all time points ($p < 0.01$).

Conclusion: The integrated nursing and rehabilitation care model significantly improved recovery outcomes for pediatric appendectomy patients, demonstrating better pain management, wound healing, mobility, and long-term functional recovery. These findings support the adoption of integrated care models to enhance postoperative recovery in pediatric surgical patients.

Keywords: Appendectomy, children, integrated care, nursing, pediatric surgery, rehabilitation, recovery outcomes

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INTRODUCTION

Appendicitis is a common surgical emergency in pediatric populations, often requiring prompt appendectomy to prevent complications such as perforation and peritonitis. Traditionally, postoperative care has focused on standard nursing protocols aimed at managing pain, monitoring wound healing, and ensuring early mobility. However, recent advancements in healthcare suggest that an integrated approach combining nursing and rehabilitation services could significantly enhance recovery outcomes (1). Integrated care models are designed to address the multifaceted needs of patients by incorporating a multidisciplinary team of healthcare providers, including surgeons, nurses, and rehabilitation therapists (2). This approach is grounded in the recognition that postoperative recovery is not solely dependent on surgical success but also on comprehensive postoperative care that facilitates physical, emotional, and functional rehabilitation. By optimizing pain management, expediting wound healing, and promoting early mobility, integrated care aims to reduce hospital stay duration and improve long-term functional outcomes (3).

The holistic nature of integrated care is particularly beneficial in pediatric patients, who may experience heightened anxiety and discomfort during the recovery process. Collaborative care protocols can provide more personalized and continuous support, thereby enhancing patient and family satisfaction (4, 5). Furthermore, evidence from previous studies suggests that such integrated approaches may lead to quicker returns to normal activities, including school and physical exercise, thereby minimizing the disruption to the child's daily life and promoting overall well-being (6). Despite the potential benefits, the implementation of integrated care models remains variable, and there is a need for robust empirical evidence to validate its effectiveness in pediatric appendectomy cases. This study aims to fill this gap by systematically comparing the outcomes of an integrated care model with those of standard postoperative care. By evaluating immediate postoperative recovery, long-term functional outcomes, multidisciplinary care processes, and patient and family satisfaction, this research seeks to provide a comprehensive assessment of the advantages and potential limitations of integrated care (7).

The objective of this study is to investigate the effectiveness of an integrated nursing and rehabilitation care model on the recovery outcomes of children undergoing appendectomies. The findings are expected to offer valuable insights into optimizing postoperative care strategies to enhance recovery and satisfaction in pediatric surgical patients (8).

METHODOLOGY

The study was conducted over a one-year period from February 2023 to January 2024. 42 Participants were children aged 6-12 undergoing appendectomies, randomly assigned to either the integrated care model group or the standard care group (9). The integrated care group received combined nursing and rehabilitation services, whereas the standard care group received traditional postoperative care. Postoperative recovery outcomes were measured using a variety of tests and assessments.

For immediate postoperative recovery, pain management was evaluated using the Wong-Baker FACES Pain Rating Scale. Wound healing was assessed by clinical examination and the Southampton Wound Assessment Scale. Early mobility was measured using the Timed Up and Go (TUG) test. These evaluations were took place at 24, 48, and 72 hours post-surgery (10). Long-term functional outcomes were assessed through follow-up visits at 1, 3, and 6 months post-surgery. These visits included evaluations of the child's return to school, measured by the number of days absent, and physical activity levels, assessed by the Physical Activity Questionnaire for Older Children (PAQ-C).

The multidisciplinary care evaluation involved documenting collaborative processes among pediatric surgeons, nurses, and rehabilitation therapists. This included qualitative analysis of care protocols and their impacts on recovery outcomes. Data was collected through observation and structured interviews with healthcare professionals involved in the care of the patients. Patient and family satisfaction was gauged using surveys administered at discharge, and again at 1, 3, and 6 months post-surgery. The surveys included questions on perceived support, effectiveness of care, and overall satisfaction, using a Likert scale. Data were analyzed using appropriate statistical methods to compare outcomes between the two groups. The study aimed to determine whether the integrated care model leads to better immediate and long-term recovery outcomes, more effective multidisciplinary collaboration, and higher patient and family satisfaction compared to standard care.

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RESULTS

The results demonstrated that the Integrated Care Group had significantly better recovery outcomes compared to the Standard Care Group. The Integrated Care Group reported a mean pain score of 2.9 (SD = 0.3) at 72 hours post-surgery, compared to 3.8 (SD = 0.5) in the Standard Care Group ($p < 0.01$). Wound healing scores were also superior, with means of 1.4 (SD = 0.4) versus 2.3 (SD = 0.4) at 72 hours ($p < 0.01$). Additionally, the Integrated Care Group had fewer days absent from school, averaging 4.9 days (SD = 1.4) compared to 8.7 days (SD = 2.0) in the Standard Care Group ($p < 0.01$).

Table 1: Demographics Summary

Characteristic	Integrated Care Group	Standard Care Group
Age (mean ± SD)	9.8 ± 2.0	9.4 ± 1.8
Weight (mean ± SD)	33.5 ± 8.1	36.1 ± 11.1
Gender (% Male)	47.6%	61.9%

The demographics show that the Integrated Care Group had an average age of 9.8 years (SD = 2.0) and an average weight of 33.5 kg (SD = 8.1), with 47.6% male participants. The Standard Care Group had an average age of 9.4 years (SD = 1.8) and an average weight of 36.1 kg (SD = 11.1), with 61.9% male participants.

Table 2: Baseline Clinical Metrics Summary

Metric	Integrated Care Group	Standard Care Group
Pain Score (mean ± SD)	4.9 ± 1.0	5.0 ± 0.9
Wound Assessment (mean ± SD)	2.1 ± 0.4	2.0 ± 0.5
Mobility (TUG) (mean ± SD)	10.7 ± 2.2	9.9 ± 2.3
Physical Activity (PAQ-C) (mean ± SD)	3.0 ± 0.5	2.9 ± 0.5

Table 2 summary indicates that the Integrated Care Group had a mean pain score of 4.9 (SD = 1.0), wound assessment score of 2.1 (SD = 0.4), mobility (TUG) score of 10.7 seconds (SD = 2.2), and physical activity (PAQ-C) score of 3.0 (SD = 0.5). In comparison, the Standard Care Group had a mean pain score of 5.0 (SD = 0.9), wound assessment score of 2.0 (SD = 0.5), mobility (TUG) score of 9.9 seconds (SD = 2.3), and physical activity (PAQ-C) score of 2.9 (SD = 0.5).

Table 3: Follow-Up Clinical Metrics Summary

Metric	Integrated Care Group (mean ± SD)	Standard Care Group (mean ± SD)	P-Value
Pain Score (24 hrs)	4.0 ± 0.5	4.5 ± 0.4	<0.01
Pain Score (48 hrs)	3.7 ± 0.3	4.0 ± 0.5	<0.01
Pain Score (72 hrs)	2.9 ± 0.3	3.8 ± 0.5	<0.01
Wound Healing (24 hrs)	2.7 ± 0.5	3.0 ± 0.7	<0.01
Wound Healing (48 hrs)	1.8 ± 0.5	2.7 ± 0.4	<0.01
Wound Healing (72 hrs)	1.4 ± 0.4	2.3 ± 0.4	<0.01
Mobility (TUG) (24 hrs)	9.0 ± 0.4	10.6 ± 0.5	<0.01
Mobility (TUG) (48 hrs)	8.4 ± 0.5	10.0 ± 0.5	<0.01

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Mobility (TUG) (72 hrs)	8.1 ± 0.4	9.5 ± 0.6	<0.01
Physical Activity (1 month)	3.4 ± 0.6	3.0 ± 0.5	<0.01
Physical Activity (3 months)	4.0 ± 0.4	3.2 ± 0.6	<0.01
Physical Activity (6 months)	4.4 ± 0.5	3.6 ± 0.4	<0.01

Table 3, follow-up clinical metrics reveal that the Integrated Care Group had mean pain scores of 4.0 (SD = 0.5) at 24 hours, 3.7 (SD = 0.3) at 48 hours, and 2.9 (SD = 0.3) at 72 hours. Their wound healing scores were 2.7 (SD = 0.5) at 24 hours, 1.8 (SD = 0.5) at 48 hours, and 1.4 (SD = 0.4) at 72 hours. Mobility (TUG) scores improved from 9.0 (SD = 0.4) at 24 hours, to 8.4 (SD = 0.5) at 48 hours, and 8.1 (SD = 0.4) at 72 hours. Physical activity (PAQ-C) scores were 3.4 (SD = 0.6) at 1 month, 4.0 (SD = 0.4) at 3 months, and 4.4 (SD = 0.5) at 6 months. Comparatively, the Standard Care Group had higher mean pain scores of 4.5 (SD = 0.4), 4.0 (SD = 0.5), and 3.8 (SD = 0.5) at 24, 48, and 72 hours, respectively. Their wound healing scores were 3.0 (SD = 0.7), 2.7 (SD = 0.4), and 2.3 (SD = 0.4) at the same time points. Mobility (TUG) scores were 10.6 (SD = 0.5), 10.0 (SD = 0.5), and 9.5 (SD = 0.6), while physical activity scores were 3.0 (SD = 0.5), 3.2 (SD = 0.6), and 3.6 (SD = 0.4) at 1, 3, and 6 months, respectively. The integrated care group showed statistically significant better results across all metrics ($p < 0.01$).

Table 4: Additional Metrics Summary

Metric	Integrated Care Group (mean ± SD)	Standard Care Group (mean ± SD)	P-Value
Days Absent from School (mean ± SD)	4.9 ± 1.4	8.7 ± 2.0	<0.01
Multidisciplinary Collaboration Qualitative Score (mean ± SD)	8.0 ± 0.9	6.2 ± 1.0	<0.01
Patient Satisfaction (Discharge) (mean ± SD)	9.2 ± 0.5	7.2 ± 0.4	<0.01
Patient Satisfaction (1 month) (mean ± SD)	9.4 ± 0.4	7.0 ± 0.5	<0.01
Patient Satisfaction (3 months) (mean ± SD)	9.6 ± 0.5	7.8 ± 0.4	<0.01
Patient Satisfaction (6 months) (mean ± SD)	9.7 ± 0.5	7.8 ± 0.5	<0.01

The additional metrics summary shows that the Integrated Care Group had a mean of 4.9 days absent from school (SD = 1.4) compared to 8.7 days (SD = 2.0) for the Standard Care Group. The multidisciplinary collaboration qualitative score was higher in the Integrated Care Group, with a mean of 8.0 (SD = 0.9) versus 6.2 (SD = 1.0) in the Standard Care Group. Patient satisfaction scores for the Integrated Care Group were consistently higher at discharge (9.2, SD = 0.5), 1 month (9.4, SD = 0.4), 3 months (9.6, SD = 0.5), and 6 months (9.7, SD = 0.5), compared to the Standard Care Group's scores of 7.2 (SD = 0.4), 7.0 (SD = 0.5), 7.8 (SD = 0.4), and 7.8 (SD = 0.5) at the same respective time points. All differences were statistically significant ($p < 0.01$).

DISCUSSION

The findings of this study indicated that the integrated nursing and rehabilitation care model significantly enhanced recovery outcomes for pediatric patients undergoing appendectomies compared to standard postoperative care. The integrated care group experienced faster pain reduction, improved wound healing, and better mobility scores in the immediate postoperative period (10). These improvements are likely attributable to the coordinated efforts of a multidisciplinary team, which provided comprehensive and continuous care tailored to each patient's needs (11, 12).

The superior pain management observed in the integrated care group, with mean pain scores of 2.9 at 72 hours post-surgery, contrasted sharply with the 3.8 reported by the standard care group (13). This suggests that the inclusion of rehabilitation therapists who specialized in pain management techniques, such as physical therapy and cognitive-behavioral strategies, played a pivotal role in alleviating postoperative discomfort. Enhanced wound healing scores further underscored the benefits of an integrated approach. The mean wound

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healing score of 1.4 in the integrated care group compared favorably with the 2.3 observed in the standard care group, highlighting the efficacy of coordinated nursing care and early mobilization strategies in promoting tissue repair and reducing infection risks (13, 14).

A notable strength of this study was its rigorous design, which included random assignment to intervention groups and standardized protocols for outcome measurement. The use of validated scales and tests ensured that the findings were reliable and clinically meaningful. Additionally, the study's focus on both immediate and long-term outcomes provided a comprehensive understanding of the benefits of integrated care. By following patients for six months post-surgery, it was possible to demonstrate sustained improvements in physical activity levels and overall functional recovery, which are critical for pediatric patients' return to normal life activities (15).

However, several limitations should be acknowledged. The sample size, while adequate for detecting significant differences in primary outcomes, may have limited the ability to generalize findings to all pediatric populations. The study was also conducted in a single center, which could introduce site-specific biases and limit the applicability of results to other healthcare settings with different resources and patient demographics (16, 17). Another potential limitation was the reliance on self-reported measures for patient and family satisfaction, which might be influenced by subjective factors and recall bias (18).

The observed benefits of the integrated care model align with existing literature that advocates for multidisciplinary approaches in managing postoperative recovery. Previous studies have shown that integrated care can reduce hospital stays, improve patient satisfaction, and enhance functional outcomes (19). This study adds to the growing body of evidence by specifically demonstrating these benefits in pediatric appendectomy patients, a population that uniquely benefits from tailored and compassionate care approaches (20).

Debate remains regarding the cost-effectiveness of implementing integrated care models across diverse healthcare settings. While this study did not assess economic outcomes, the improved clinical results suggest potential cost savings through reduced complications and shorter recovery times (20, 21). Future research should include economic analyses to provide a more comprehensive evaluation of integrated care's value. Additionally, expanding the study to multiple centers could help validate findings and ensure broader applicability (22).

CONCLUSION

The integrated nursing and rehabilitation care model significantly improved recovery outcomes for children undergoing appendectomies. Enhanced pain management, faster wound healing, and better long-term functional outcomes were observed, underscoring the value of a multidisciplinary approach. Despite some limitations, these findings support the adoption of integrated care models to optimize postoperative recovery in pediatric surgical patients, promising better health outcomes and improved patient and family satisfaction.

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