CE 2.0 Contact Hours

The Impact of Early Ambulation in the Pediatric Postoperative Appendectomy Patient

Kelly Rothman, MS, BSN, RN, CPN, Cynthia Garvan, PhD, and Madalynn Neu, PhD, RN, FAAN

Abstract: The purposes of this study were to quantify the mean time to ambulate in a population of pediatric postoperative appendectomy patients at a stand-alone children's hospital and to identify the associations between mean time to ambulate with admitting floor, patient age, pain medication, occurrence of nausea and vomiting, and length of stay. For decades, it has been suggested that extended immobilization in the postoperative patient should be avoided. Scant literature is available addressing early ambulation for pediatric patients after appendectomy. In practice, we noted that patients are not routinely ambulated early. Data were gathered from a retrospective review of 300 pediatric appendectomy patient charts at a children's hospital. The mean time to ambulate was 16.05 hours (95% CI [14.14, 17.96]). The mean time to ambulate for patients placed on the surgical specialty unit was 13.48 (95% CI [11.90, 15.07]), compared with 20.36 hours for patients admitted to overflow units (95% CI [16.97, 25.36], $p < .0007$). Patients who experienced nausea and/or vomiting had a longer mean time to ambulate than those patients who did not (21.17 and 13.49 hours, respectively; $p < .0001$). Patients who received intravenous narcotics, oral narcotics, and nonnarcotic analgesics had a mean time to ambulate of 17.30, 13.03, and 11.61 hours, respectively ($p = .0661$). The Spearman's rank correlation coefficient between length of stay and time to ambulate was .47. The results of this research study suggest that early ambulation has a significant impact on length of stay. Despite ambulation being taught in basic nursing education as a crucial component of postoperative care, this nursing-driven intervention is not routinely practiced. Placing these patients on a surgical specialty unit may lead to improved patient outcomes and will provide a targeted audience for future educational interventions.

KEY WORDS: ambulation, appendectomy, early ambulation, length of stay, pediatric, postoperative outcomes, surgical specialty, walking

Kelly Rothman, MS, BSN, RN, CPN
Clinical Education Specialist, Regional Float Team, Children's Hospital Colorado, Aurora, CO.

Cynthia Garvan, PhD
Research Associate Professor, University of Florida, Gainesville, FL.

Madalynn Neu, PhD, RN, FAAN
Associate Professor, University of Colorado College of Nursing, Aurora, CO.

The authors declare no conflicts of interest.

Correspondence: Kelly Rothman, MS, BSN, RN, CPN, Children's Hospital Colorado, 13123 East 16th Ave Aurora, CO Box B475.
E-mail: kelly.rothman@childrenscolorado.org
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Ambulation is a nursing-driven intervention that is simple yet crucial to improving the recovery of the patient back to baseline functional status. The importance of early ambulation in the postoperative period has been documented in the medical literature since the 1940s (Trice, 1949). Ambulation is taught in basic nursing school education courses and textbooks as an essential nursing-driven intervention (Hoch, 2014), and this ideal is repeated in nursing research literature. Hoch states that "early ambulation is the most significant general nursing measure to prevent postoperative complications" (Hoch, 2014, p. 356).

Evidence of early ambulation is based on sound physiological processes (Trice, 1949). Patients who ambulated soon after surgery have been noted to experience less nausea, vomiting, and abdominal distention as well as less postoperative pain and often required less narcotic pain medication (Burch & Lavely, 1950). In a 2012 review of medical–surgical inpatients and the effect of early mobilization, the authors state that maintaining functional well-being, managing symptoms, and preventing hospital-associated complications are all nursing-sensitive outcomes (Pashikanti & Von Ah, 2012). They conclude that early mobilization improves functional status from admission through discharge, and patients experienced a reduced length of stay, faster recovery time, and reduced postoperative symptoms. Findings from these studies highlight the importance of promoting early postoperative movement. Burch and Lavely (1950) suggest that, as soon as a patient has expelled the surgical anesthetic, preferably within 12 hours, ambulation should begin. Leithauser, Gregory, and Miller (1966) recommend a much shorter time frame: 2–4 hours postoperatively.

This evidence also may apply in the pediatric setting, and the principles and theory of the benefits of early ambulation are safe to apply to pediatric patients. Grewal, Sweat, and Vazquez (2004) conducted a retrospective chart review and determined that 56% of appendectomy patients were discharged within 24 hours,

with no readmissions or reoperations. Given the assumption that patients were ambulating upon discharge, these findings suggest that early ambulation and accelerated convalescence are feasible in children.

Reismann and colleagues (2007) investigated the feasibility of "fast-track" concepts in pediatric patients, with appendectomy and other surgical procedures (Reismann et al., 2007). The fast-track concept included immediate mobilization among other interventions that would lead to a shorter length of stay. Mobilization occurred at only 2 hours postoperatively, and no complications were identified. The authors concluded that fast-track concepts and quick mobilization in the postoperative period can be safely applied to children, and in a follow-up study, they further concluded that fast-track concepts are highly effective in reducing hospital stay in routine pediatric surgery (Reismann et al., 2007, 2009). The overarching aim of these studies was to investigate the feasibility and safety of fast-track concepts in pediatric patients. Their protocol included minimally invasive techniques, such as early introduction of postoperative feeding, in addition to the early mobilization.

In 2013, another group implemented a quality improvement initiative consisting of a nursing-driven postoperative order set that included early patient mobilization. The group evaluated outcomes with uncomplicated appendicitis. They found that the nursing-driven postoperative order set, which focused on early mobilization, diet transition, and oral pain medications along with family education, led to a reduced length of stay. This evidence further suggests the impact that early ambulation can have on the nonperforated subset of the pediatric appendectomy population, although, again, this group did not focus only on ambulation as a key nursing driver (Fallon et al., 2013).

Along with an understanding of the importance of early ambulation and the effect on length of stay and patient outcomes, it may be essential to consider directing these patients to a dedicated hospital unit. Fallon and colleagues (2013) suggested streamlining patient flow to a dedicated hospital unit to further improve postoperative length of stay in pediatric appendectomy (Fallon et al., 2013). Findings from a review of studies regarding fast-track surgical concepts also suggested that nurse specialization should be given more attention when it comes to the surgical patient population (Kehlet & Wilmore, 2008).

The importance of ambulation in the postoperative surgical patient has been cited in the literature for decades, and the effect of ambulation on improving recovery and accelerating convalescence seems clear. However, surgical patients today still experience prolonged hospitalization and morbidity (Kehlet & Wilmore, 2008), and in practice, it appears as though ambulation is still not identified or acted on as a nursing priority. Providing evidence of the effect of delayed ambulation in the pediatric patient population can help to provide nurses with the information and evidence to drive their practice as well as to educate other healthcare providers that a problem does exist in delayed ambulation in the postoperative period.

The purpose of this study is to evaluate the following research questions:

I. What is the mean time to ambulate in a population of pediatric postoperative appendectomy patients at a stand-alone children's hospital?
II. Did patients ambulate sooner when admitted to the surgical specialty unit compared with when admitted to overflow units?
III. Is there an association with time to ambulate and age of patient, level of pain medication, or occurrence of nausea/vomiting?
IV. Is there a relationship between mean time to ambulate and length of hospital stay?

METHODS

Data Collection

A retrospective chart review of 416 appendectomy patients at a children's hospital in the western United States between January 1 and December 31, 2013, was completed. Approval to proceed with this work was granted by the institution's Organizational Research Risk and Quality Improvement Review Panel. These charts included all patients who received an appendectomy and were subsequently admitted as inpatients at this institution in 2013, including all cases both perforated and nonperforated. Patients were admitted to a variety of units including the surgical specialty inpatient unit, the medical specialty inpatient unit, and the oncology and bone marrow transplant unit—the latter two of which are utilized as overflow units when the surgical specialty unit is full. 300 charts were included, excluding 116 patients because of charting omissions.

The data retrieved from the chart review included patient age, acuity in the emergency department, time of admission to the inpatient unit, admitting unit, time to first ambulation, pain medications administered, nausea and vomiting, and time to discharge.

At this institution, the clinical care guideline and, therefore, standard of care for postoperative care of the appendectomy patient suggested that patients ambulate four times per day, without a suggestion of how soon after surgery this should begin (Brent et al., 2013, p. 6).

This was a retrospective chart review, and as such, no intervention or education was provided to nurses regarding suggested timeline of initial postoperative ambulation event.

Data Analysis

Data were first inspected for distributional form and outliers. To test the association between time to ambulate and binary variables (i.e., type of unit where patient was placed postsurgery and presence of nausea/vomiting), Wilcoxon rank sum tests were used. To test the association between time to ambulate and length of stay, Spearman correlational testing was used. The level of significance was set at .05. All hypotheses tests were two sided. SAS software version 9.3 (Cary, NC) was used for all statistical analyses.

RESULTS

Age of the children in the sample ranged from 2.6 to 21.7 years (M = 10.7 years, SD = 3.6 years). Length of stay ranged from 0.5 to 11 days (M = 3.1 days, SD = 2.2 days).

Time to Ambulate

The mean time to ambulate was 16.05 hours (Table 1). One hundred fifty-five of the total patients ambulated for the first time more than 12 hours postoperatively, and only 40 patients ambulated within 4 hours postoperatively.

Acuity

Acuity level is a value assigned within the emergency department when the patient presents with suspected appendicitis. Acuity level was evaluated to investigate the possibility that the "level of sickness" of the child might account for the outcomes experienced postoperatively. No relationship was found between acuity level and time to ambulate.

Hospital Admitting Floor

One hundred eighty-eight of the total patients were placed on the surgical specialty unit postoperatively, and 112 patients were placed on an overflow unit, which does not specifically specialize in the care of surgical patients. Patients admitted to an overflow unit had a longer mean time to ambulate than those admitted to the specialty unit (Table 2). There was a significant difference in time to ambulate and the type of unit where the patient was admitted after surgery (p = .0007).

Table 1: Time to Ambulate

Total *N*	Mean Time to Ambulate	Lower 95% CI	Upper 95% CI
300	16.05	14.14	17.96

Table 2: Hospital Admitting Floor

Overflow	Mean Time to Ambulate	Lower 95% CI	Upper 95% CI
No	13.48	11.90	15.07
Yes	20.36	16.07	24.65

Nausea and Vomiting

Patients who experienced nausea and/or vomiting had a longer mean time to ambulate compared with those who did not (Table 3). There was a significant association between time to ambulate and whether a patient experienced nausea and/or vomiting (p < .0001). Furthermore, 50% of the time, the nausea/vomiting event occurred before the ambulation, and 50% of the time, it occurred after the ambulation episode.

Pain Medications

Patients requiring narcotic pain medication had a longer mean time to ambulate than those who did not (Table 4). The nonnarcotic medication classification included acetaminophen, ibuprofen, and ketorolac. The oral narcotic medication classification was used to indicate oxycodone. The intravenous narcotic classification included morphine and hydromorphone. The relationship between time to ambulate and the reception of pain medication was not statistically significant but showed an increasing trend relationship (p = .0661).

Age

The Spearman's rank correlation coefficient between age and time to ambulate was −.18, indicating a weak negative relationship between those two variables.

Length of Stay

The correlation coefficient between length of stay in days and time to ambulate was .47, indicating a moderate positive relationship between those variables.

DISCUSSION

The purposes of this study were to quantify the mean time to ambulate in a population of pediatric postoperative

Table 3: Nausea and Vomiting

Nausea/ Vomiting	Mean Time to Ambulate	Lower 95% CI	Upper 95% CI
No	13.49	11.61	15.37
Yes	21.17	16.97	25.36

Table 4: Pain Medications

Pain Medication	Mean Time to Ambulate	Lower 95% CI	Upper 95% CI
Nonnarcotics	11.61	7.64	15.58
Oral narcotics	13.03	8.98	17.07
Intravenous narcotics	17.30	14.94	19.66

appendectomy patients and to identify the associations between time to ambulate and admitting floor, age, and patient outcome factors including pain medications administered, occurrence of nausea and vomiting, and length of stay. Patients who underwent appendectomy at a stand-alone children's hospital ambulated for the first time an average of 16.05 hours after surgery. Patients who were admitted to the surgical specialty unit ambulated significantly earlier than those patients who were admitted to an overflow unit. Patients who ambulated earlier experienced nausea and/or vomiting significantly less often than those who ambulated later. The mean time to ambulate for the patients who received intravenous narcotic pain medications was longer than the total group average, indicating perhaps that a delay in ambulation is related to experiencing more pain. For both the nausea and vomiting and requirement for pain medications, there is potential uncertainty as to chronological or causal nature of the relationship—perhaps, patients delayed ambulation because they were nauseous, or perhaps, patients in fact experienced nausea because they delayed ambulation. There was a weak negative correlation between time to ambulate and patient age, indicating that a longer time to ambulate was loosely associated with decreasing patient age. Finally, there was a moderate positive correlation between time to ambulate and length of stay, indicating that a delay in ambulation is related to a longer length of stay.

These findings align with the suggestions made decades ago in medical and nursing literature with respect to the importance of postoperative ambulation and the effect that ambulation can have on comfort outcomes and accelerating convalescence in adults (Burch & Lavely, 1950; Trice, 1949). These results also coincide with the conclusions by previous groups that fast-track concepts are effective in reducing hospital stay in routine pediatric surgery (Fallon et al., 2013; Reismann et al., 2009). Furthermore, these findings reaffirm the suggestions by Fallon and colleagues (2013) to streamline patient flow to a dedicated hospital unit rather than an overflow unit to improve postoperative length of stay (Fallon et al., 2013).

These findings have several implications for nursing practice. Ambulation is a nursing-specific intervention that may have a significant impact on patient outcomes, including a decrease in nausea and vomiting and the requirement for pain medication. Ambulation is an action that is routine in both nursing literature and in nursing practice and an intervention that is considered a reasonable and prudent standard for nursing; ambulation therefore falls within the nurse's scope of practice (Colorado Department of Regulatory Agencies, Board of Nursing, 2015). Providing support and assistance to a patient's mobility is a fundamental nursing intervention (Doherty-King, Yoon, Pecanac, Brown, & Mahoney, 2014).

Dramatic improvements in surgical outcomes will likely require a multimodal approach, incorporating all members of the healthcare team and multifaceted interventions (Wilmore & Kehlet, 2001). Many physicians may not even realize the delay in ambulation on the unit. Identifying this delay as an issue and identifying the outcomes of this delay are key starting points. Nurses can play a primary role within the multidisciplinary approach in implementing the change in practice (Pashikanti & Von Ah, 2012). The greatest impact early mobilization has on adult medical–surgical inpatients is seen through the implementation of standardized protocols and order sets (Pashikanti & Von Ah, 2012). Working alongside our physician partners to draft postoperative order sets may help to provide clarity and consistency to the suggested time frame for initiating postoperative ambulation and therefore consistently experiencing improved convalescence of these patients.

Admitting postoperative patients to the surgical specialty unit rather than overflow units, and therefore utilizing specialty-focused nursing staff, improves patient outcomes and decreases length of stay, providing support for the development of specialized nursing in hospitals. These results stress the importance of attempting to place postoperative patients on the surgical specialty floor, despite a management decision that these are "simple" postoperative cases that can be managed on any overflow unit. Education reinforcing the importance of early ambulation would be beneficial within all units, but if patients are placed on overflow units, then education should focus in those areas where nurses are not as familiar in caring for this patient population.

"There is currently a worldwide trend to reduce the length of postoperative hospital stay in order to improve recovery after surgery, but also to contain increasing healthcare costs" (Rehberg, 2013). The results of this study suggest that the simple nursing intervention, early ambulation, can lessen length of stay and therefore reduce cost. In a changing healthcare climate, the importance

and impact of cost on healthcare delivery systems and patient outcomes cannot be overstated, and it will be increasingly important for the success of healthcare institutions to seek out and follow through on cost-saving measures.

The results of the current research study are limited mainly by the design. Data were collected in a retrospective manner via a report of charts. Therefore, the results within were dependent on the desired information being reflected in the medical record.

A valuable next step in this research path is to design and conduct a prospective intervention study to promote and then evaluate the impact of early ambulation. This intervention may also be applied to a larger subset of pediatric surgical patients, for example, those patients undergoing bowel resection or ileostomy.

Further research is warranted in investigating an educational program designed to impress on patients and parents the importance of ambulation in the postoperative period. Because of the fact that patients are discharged earlier and many surgeries are even performed outpatient, parents must assume a heightened responsibility for the encouragement of the child after surgery (Leack, 2013). Often, patients and families do not understand the importance or relevance of ambulation. Parents especially struggle in the immediate postoperative period because it is difficult to see their child in pain (Hockenberry & Wilson, 2013), and therefore, they may hesitate to encourage ambulation and activity. Nurses are essential to educating parents and family members on the importance of ambulation postoperatively so that, together as a team, we can encourage patients to get out of bed and move early on.

In addition, because of parents' integral involvement in their child's care as a member of the care team, it is important to investigate the impact that early or delayed ambulation has on patient and parent satisfaction. Patients and families, especially after an unexpected appendectomy, are frequently anxious to return home and resume work and normal routines. Early discharge to home will likely improve patient and family satisfaction and provide a positive perception of the inpatient experience as a whole (Alkhoury et al., 2012).

CONCLUSION

This study was an important first step in isolating the benefits of early ambulation in pediatric patients after appendectomy. The results herein suggest that a delay in postoperative ambulation does exist, and there is an association between this delay and admitting unit, patient outcome factors, and length of stay. To actually establish change, it will be paramount to uncover the barriers and obstacles nurses face in pursuing early ambulation. Finally, it will be important to develop and evaluate educational sessions on changing the nursing perspective and prioritizing ambulation as an early nursing-driven intervention to improve outcomes in the postoperative pediatric patient.

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