A randomized trial of rocking-chair motion on the effect of postoperative ileus duration in patients with cancer recovering from abdominal surgery

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Abstract
Patients who undergo abdominal surgery experience a phenomenon commonly called postoperative ileus (POI). Standard of care requires patients to get out of bed, sit in a chair, and begin ambulating the first postoperative day. No evidence supports standard care activities reduce POI duration. Rocking-chair motion has shown promise in reducing POI duration. Sixty-six participants were randomized into 2 groups. The experimental group (n = 34) received standard care plus the rocking-chair intervention; the control group (n = 32) received standard care. Participants in the experimental group had shorter duration of POI, no effect on medication use, and time to discharge.

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1. Introduction

Postoperative ileus (POI) is a form of gastrointestinal dysfunction that commonly occurs after abdominal surgery and results in absent or delayed gastrointestinal motility. POI is hypothesized to be the body’s sympathetic-induced response to overstimulation and stress imposed by large abdominal incisions, extensive manipulation of the bowel, and dissection of abdominal lesions (Holte & Kehlet, 2002; Le Blanc-Louvry, Costaglioli, Boulon, Leroi, & Ducrotte, 2002; Luckey, Livingston, & Tache, 2003, Miedema & Johnson, 2003; Schuster & Montie, 2002). POI presents as absent, abnormal, or disorganized motor function of the stomach, small bowel, and colon resulting in the accumulation of gas that cannot be dissipated causing abdominal distention, nausea, vomiting, and severe pain that can last for up to 7 days after surgery, complicating a full and timely recovery. Patients often describe the period immediately after surgery, prior to the resolution of POI, as the most uncomfortable part of their post abdominal surgery recovery experience. Both patients and clinicians eagerly anticipate the passage of flatus, commonly known as “surgeon’s music,” a sign that POI is resolving (Prasad & Matthews, 1999).

Recognized since 1899, minimal progress has been made toward the prevention and treatment of POI (Bayliss & Starling, 1899). Studies suggest there are multiple contributing causes of POI. Multiple factors have been reported to contribute to its onset and persistence and include activation of inflammatory mediators, secretion of gastrointestinal hormones, various forms of anesthesia during surgery, opiates given for pain control, previous abdominal surgery, surgery time, anesthesia time and American Society of Anesthesia (ASA) physical status classification have all been implicated. To date no specific interventions that prevent and successfully resolve POI have been discovered (Luckey et al., 2003; Miedema & Johnson, 2003). Physicians and nurses have had little to offer their patients other than reassurance that POI will resolve over time and bowel function will return (Matros et al., 2006).

One noninvasive postoperative standard-of-care intervention that is believed to resolve POI is having the patient get out of bed, sit in a chair, and walk beginning the first day after surgery, increasing the duration of each daily until passage of flatus or stool occurs (Waldhausen & Schirmer, 1990; Waldhausen, Shaffrey, Skenderis, Jones, & Schirmer, 1990). Evidence that these activities effectively treat POI remains unconvincing. However, there is consensus other positive benefits occur for the postoperative patient to...
include reducing pulmonary complications, deep vein thrombosis, and other negative physiological changes that occur with prolonged bed rest. A need exists for controlled studies of this and other interventions using randomized comparison treatment groups set into motion the design and conduct of this study.

A relatively new noninvasive clinical intervention that is believed to potentially reduce the duration and effects of POI is a rocking motion delivered using a rocking chair. The back and forth motion of rocking was previously found to reduce intestinal gas accumulation, abdominal distention, and pain associated with POI in abdominal surgery patients (Moore, Shannon, Richard, & Vacca, 1995; Thomas, Ptak, Giddings, Moore, & Opperman, 1990). Thomas et al., (1990) found that mothers who rocked after a cesarean birth used less pain medication, passed flatus earlier, and had a reduced length of hospital stay compared with those who did not rock in a rocking chair. Moore et al., (1995) reported similar findings among postoperative abdominal hysterectomy patients. Concomitant clinical observations and data analysis revealed that rocking in 10- to 20-minute increments for at least 60 minutes per day reported reduced gas pain scores, promoted earlier ambulation and expulsion of gas, and facilitated patient’s discharge from the hospital earlier than patients in the nonrocking group.

1.1. Theoretical basis for intervention

A key physiologic factor in the development of POI is the body’s response to the stress of surgery (Desborough, 2000). This surgical stress response is not limited to patients who undergo abdominal surgeries. Other surgical procedures such as hip replacement and thoracic surgeries also are implicated as stimuli for the surgical stress response and POI that is associated with abdominal dysfunction, dysmotility, and disorganization of neural stimuli that normally are responsible to coordinate propulsion within the gastrointestinal tract (Behm & Stollman, 2003). Although the exact physiological mechanisms that are influenced by rocking motions are not well known, theorists and researchers hypothesize that the gentle, rhythmic, repetitive motion of rocking stimulates the vestibular nerves to send signals of pleasure and alertness to the Reticular Activating System, which is the body’s “flight or fight” response center (De Marco-Sinatra, 2004; Moore et al., 1995). The gentle rhythmic, repetitive motion of rocking is hypothesized to have a modulating effect on the stress response, thereby mediating the symptoms of POI, and is an important theoretical foundation for this study. No recent studies have further explained or tested the rocking intervention in both genders or in patients with cancer recovering from abdominal surgery.

1.2. Purpose

The purpose of this study was to test the effect of a nurse-derived intervention, rocking-chair motion on POI duration, total pain medication received, and time to discharge in patients with cancer recovering from abdominal surgery. This article reports the results of the effectiveness of the rocking-chair intervention in both genders of patients with cancer recovering from abdominal surgery.

1.3. Research questions

Three research questions were evaluated. Does the rocking intervention reduce the mean time in days to passage of first flatus compared to standard care? Does the rocking intervention reduce the total mean pain Morphine Equivalent Dose (MED) medication in milligrams received compared to standard care? Does the rocking intervention reduce the mean time in days to hospital discharge compared to standard postoperative care compared to standard care?

2. Methods

2.1. Design

This study was conducted between July 2005 and February 2007 at The University of Texas M. D. Anderson Cancer Center. A posttest-only randomized control trial design was chosen with measurement taken each day after abdominal surgery until passage of first flatus. A pretest randomized trial was not plausible owing to the subjects having to undergo surgery prior to measurement of the dependent variables: time to first flatus, postoperative pain medication received, and time to discharge. The study was approved by the institutional review board, and informed consent was obtained from each patient prior to enrollment.

2.2. Inclusion criteria

Patients who were 21 years and older, scheduled to undergo abdominal surgery for gastrointestinal cancers, scheduled to receive postoperative patient-controlled epidural or intravenous analgesia, cognitively intact, able to read and speak English, able to tolerate rocking or sitting in a chair, and able to ambulate were eligible to participate in the study.

2.3. Setting and sample

The study was conducted on a 32-bed surgical oncology unit composed of two separate 16-bed pods. Power calculation was based on the primary end point of time to first passage of flatus used by Disbrow, Bennett, and Owings (1993) in their study of the effects of specific instructions on POI duration, pain medication used, and time to discharge. Given the similarities in aims and research questions between the Disbrow et al. (1993) study and this study, SPSS Sample Power 2.0 (Borenstein, Rothstein, Cohen, Schoenfeld, & Berlin, 2000) software was used to perform the sample size calculations by setting the criterion for significance at .05, two-tailed tests (an effect in either direction was accepted), and power at 0.80. A total sample size of 54 participants was determined necessary to yield...
statistically significant results (27 in the intervention group and 27 in the control group).

2.4. Procedures

Patients scheduled to undergo abdominal surgery for gastrointestinal cancer were screened by the primary investigator during preoperative evaluation clinic visits. After completing written consent, eligible patients were randomly assigned to the intervention (rocking) or control (nonrocking) group. Study participants, nurses, and surgeons were blinded to group assignment until the first day after surgery. To reduce interaction bias, we placed intervention and control patients on separate 16-bed pods, and each pod could care for a control or intervention patient.

The control group received standard care that included walking and sitting up out of bed in a nonrocking chair beginning the first day after surgery. The experimental group received care that included walking and rocking in a rocking chair beginning the first day after surgery. The rocking intervention group had their nonrocking chair removed and replaced with a rocking chair upon arrival to the inpatient room. Only nonrocking chairs were available in the nonrocking group rooms. Intervention and control subjects were instructed to sit in the rocking and nonrocking chairs and begin to ambulate around the triangle-shaped pod beginning the first day after surgery and increase the frequency and duration of each activity each day. Nurses and surgeons were instructed and reminded of the activities for each group, and a sign was placed in the patient’s chart as to group assignment. Time in rocking and nonrocking chairs and number of laps ambulated were recorded by participants, and the nurses on a datasheet for each 24-hour period.

2.5. Data collection

The principle investigator collected all data. Demographic data and surgical characteristics collected included age, gender, ethnic group, marital status, and diagnosis, type of surgical procedure, anesthesia time, surgical time, and history of previous abdominal surgery.

Each day the investigator met with each subject in each of the groups until passage of first flatus. Participants were provided a pen and pad and instructed to record the date and time they passed first flatus from the rectum after surgery. This self-estimate assessment method was chosen because a previous study found high correlation between carbon dioxide levels expelled from the rectum and self-report of date and time of first flatus passage in abdominal surgery patients (Yukioka, Bogod, & Rosen, 1987). Total opioid pain medication (milligrams) received was obtained every 24 hours from each patient’s Patient Controlled Analgesia (PCA) or epidural infusion pump. Nonmorphine opioids (Fentanyl and Dilaudid) were converted to MEDs in milligrams. PCA intravenous opioids were Morphine Sulfate, Fentanyl, or Dilaudid. Epidural opioids were Fentanyl and Dilaudid. Date and time of the end of surgery were obtained from the operative record and used as a starting point for measurements of time to first flatus and time to discharge. Times of discharge were obtained from the institutional discharge system.

2.6. Data analysis

Data were analyzed using SPSS 12.0 statistical software. Statistical analysis of demographic and clinical characteristics was summarized using descriptive statistics. The two intervention groups were compared with respect to various demographic and clinical characteristics using the appropriate statistical t tests for interval data and chi-square analyses for ordinal data. To examine group differences in the duration of POI (time to first passage of flatus), pain medication use (total doses in milligrams used per 24 hours), and postoperative patient recovery time (time to discharge), we used the two-sample t test if assumptions of normality (Levene’s test) and homogeneity of variance on the dependent variable were upheld (Field, 2005). Descriptive statistics were used to summarize each outcome (time to first flatus, total pain medication used, and time to discharge). If assumptions underlying the two-sample t test were violated, appropriate nonparametric tests were run for the involved variables (Mann-Whitney U). A significance level of .05 was used.

3. Results

3.1. Sample

A total of 66 patients (n = 32 nonrocking and n = 34 rocking) completed the study. Attrition consisted of 2 rocking

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rocking, n (%)</th>
<th>Nonrocking, n (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients</td>
<td>34 (51.5)</td>
<td>32 (48.5)</td>
<td></td>
</tr>
<tr>
<td>Median age ± SD</td>
<td>56.2 ± 10.1 years</td>
<td>54.8 ± 11.4 years</td>
<td>.600</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (41.0)</td>
<td>19 (59.0)</td>
<td>.218</td>
</tr>
<tr>
<td>Female</td>
<td>20 (59.0)</td>
<td>13 (41.0)</td>
<td></td>
</tr>
<tr>
<td>Ethnic group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White non-Hispanic</td>
<td>26 (76.0)</td>
<td>27 (85.0)</td>
<td>.875</td>
</tr>
<tr>
<td>African American</td>
<td>2 (6.0)</td>
<td>1 (3.0)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>3 (9.0)</td>
<td>2 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>3 (9.0)</td>
<td>2 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>5 (15.0)</td>
<td>3 (10.0)</td>
<td>.757</td>
</tr>
<tr>
<td>Married</td>
<td>27 (79.0)</td>
<td>25 (78.0)</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>1 (3.0)</td>
<td>2 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>1 (3.0)</td>
<td>2 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colon cancer</td>
<td>20 (59.0)</td>
<td>22 (69.0)</td>
<td>.752</td>
</tr>
<tr>
<td>Liver cancer</td>
<td>4 (12.0)</td>
<td>4 (12.0)</td>
<td></td>
</tr>
<tr>
<td>Sarcoma</td>
<td>5 (14.0)</td>
<td>3 (10.0)</td>
<td></td>
</tr>
<tr>
<td>Gastric cancer</td>
<td>2 (6.0)</td>
<td>2 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>3 (9.0)</td>
<td>1 (3.0)</td>
<td></td>
</tr>
</tbody>
</table>
patients who could not continue rocking due to dizziness and returned to surgery due to internal bleeding. Both were included in the analysis based on intent-to-treat guidelines and the fact that both passed flatus after rocking during the 24 hours prior to removal from the study.

### 3.2. Subjects’ characteristics

Demographic characteristics of the study participants are shown in Table 1. There were no significant differences between groups in age, gender, ethnicity, marital status, and diagnosis. Overall, male participants in this study were significantly older (mean age = 59.09, SD = 9.85) than female participants (mean age = 52.03, SD = 10.38; t(64) = 2.832, p < .006), but this demonstrated only a small effect size (d = 0.33).

### 3.3. Surgical characteristics

Surgical attributes of the study participants are presented in Table 2. There were no significant differences between the study groups in surgical procedure types or ASA status categories. Participants in both arms of this study, overall, had high incidence of previous abdominal surgeries; however, there were no significant differences between the groups.

### 3.4. Surgery and anesthesia duration

Durations of surgery and anesthesia in hours for each group are summarized in Table 3. The rocking group participants experienced slightly lengthier anesthesia times than nonrocking participants, and the difference was not significant (t(64) = −1.284, p = .204, d = 0.15). The rocking participants also experienced slightly lengthier surgical times than nonrocking participants. Again, this difference was not significant (t(64) = −1.089, p = .280, d = 0.13).

### 3.5. Time to first flatus

The time-to-first flatus data are presented in Table 4. The rocking group passed flatus an average 0.7 days (16.8 hours) earlier than the nonrocking group. The nonrocking group, on average, experienced significantly longer time to passage of first flatus as compared with the rocking group (t(64) = −3.542, 95% confidence interval [CI] = 0.3174−1.1383, p = .001, d = 0.40). Therefore, a significant difference and effect size between means of the rocking and nonrocking group time to first flatus were identified.

### 3.6. Total pain medication received

Data for both the rocking and nonrocking groups are presented in Table 5. Analysis of total pain medication received revealed nonnormality for both groups (nonrocking, D(32) = .298, p < .001; rocking D(34) = .335, p < .001). However, Levene’s test for homogeneity was not violated (F(1, 64) = .243, p = .624), and therefore, the variances were assumed to be equal. The total pain medication received was, on average, greater for the nonrocking group as compared with the rocking group, and this difference was not statistically significant.

### 3.7. Time to discharge

Time-to-discharge data are presented in Table 6. The time-to-discharge data with the outliers included indicated that the nonrocking group experienced essentially the same time in the hospital as compared with the rocking arm. Therefore, there was no significant difference between the means of the rocking and nonrocking groups in time to discharge from the hospital (t(64) = .206, p = .837, d = 0.02).

### 3.8. Time in rocking/nonrocking chairs

Time (hours) spent in rocking and nonrocking chairs is presented in Table 7. There were no significant differences in
time in chair for either group except for Day 3 when the nonrocking group spent more time in the chair \((t(64) = 2.108, p = .039, CI = 0.0673–2.4996)\).

### 3.9. Laps ambulated

Laps ambulated by the rocking and nonrocking groups are presented in Table 8. Number of laps ambulated around the triangular shaped pods were not significantly different for either the rocking or nonrocking participants.

### 4. Discussion

#### 4.1. Conclusions

The goal of this randomized trial was to explore the effects of rocking-chair motion on POI duration, total pain medications received, and time to discharge among patients with cancer recovering from abdominal surgery. There were no differences in age, marital status, and ethnicity between the two groups. Surgical characteristic data revealed the rocking group experienced longer surgical and anesthesia times. However, the differences were not significant and demonstrate that these characteristics may not actually contribute to the prolonged POI duration. Both the groups had high percentages (rocking 88% and nonrocking 78%) having had previous abdominal surgery. However, this did not affect the duration of POI.

A significant difference between group means for time to first flatus provides support that the rocking-chair motion reduced the duration of POI in this group of study participants. The nonrocking group in this study, on average, used more pain medication than the rocking group. However, a lack of significance did not support rocking motion reduced pain medication use compared to previous research. Time-to-discharge data were nonsignificant and indicated the nonrocking and rocking groups experienced essentially an equal number of postoperative days in the hospital. Again, the data from this study were contrary to previous research reporting reduced time to discharge of at least 1 day.

Participants in both groups spent the same amount of time in the rocking and nonrocking chairs except for Day 3 when the nonrocking group spent more time in the chair \((t(64) = 2.108, p = .039, CI = 0.0673–2.4996)\).

#### 4.2. Limitations

Limitations of this study include the small sample size, wide variation in diagnoses, surgical procedures, variation in types of pain medications used, and routes of administration. Therefore, the results of this study must be interpreted with caution.

#### 4.2. Implications for nursing

The standard of care that was challenged in this study has rarely been evaluated in a randomized clinical trial. This study does makes a contribution to evidence-based practice due to its statistically and clinically significant findings, as well as the limitations discussed herein may be used as guides for the design and conduct of future, more rigorous investigations. Generalization beyond this patient population is limited to patients with cancer recovering from abdominal surgery. Rocking in a rocking chair after surgery was readily accepted by the intervention group. A key factor identified is that the rocking motion had no effect on surgical incision site pain. Participants consistently voiced the rocking motion relaxed them, although relaxation was not measured.
4.4. Implications for future research

The results of this study indicate the feasibility of a nursing-derived intervention, rocking-chair motion, as a therapy to reduce duration of POI in patients with cancer recovering from abdominal surgery. Future research to further explore the use of rocking-chair motion on POI duration is warranted. Rocking-chair motion may provide abdominal surgery patients earlier relief from POI, the most difficult part of the postoperative recovery process, and improve short-term postoperative quality of life.

References


