—Report on Experiments and Clinical Cases—

Evaluation of the Clinical Pathway for Laparoscopic Cholecystectomy and Simulation of Short-term Hospitalization

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Abstract

The effectiveness of the clinical pathway for laparoscopic cholecystectomy was evaluated, and the efficiency of medical care was analyzed. The duration of hospitalization and the number of National Health Insurance (NHI) points for medical service fees were compared between 86 patients treated after introduction of the clinical pathway (pathway group) and 56 patients treated before introduction of the clinical pathway (pre-pathway group). In the pathway group, variance from the pathway occurred in 24 patients (27.9%) due to postponement of discharge in 7 patients, to earlier discharge in 5 patients, and to insertion of a bile duct catheter in 5 patients. Total and postoperative hospitalization times were significantly shorter in the pathway group than in the pre-pathway group (8.0 ± 1.6 vs 13.7 ± 9.0 days, $p< 0.0001$, 5.4 ± 1.1 vs 6.5 ± 2.2 days, $p<0.0001$, respectively). In the pathway group, the total number of NHI points was lower and the number of points per day was higher. By simulation, the total number of NHI points for the 5-day pathway (discharge on postoperative day 3 or earlier) was significantly lower than that for the current 7-day pathway. Moreover, the weekly profit per bed with the 3-day pathway (discharge on postoperative day 1) was more than twice that with the current pathway. The results suggest that the clinical pathway for laparoscopic cholecystectomy is beneficial for patients and useful for the introduction of diagnosis procedure combination in our hospital.
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Key words: clinical pathway, laparoscopic cholecystectomy, short-term hospitalization, medical service fees, diagnosis procedure combination

Introduction

Clinical pathways are comprehensive systematized patient care plans for specific procedures and have recently become popular in Japan. Laparoscopic cholecystectomy is a common procedure in the field of digestive organ surgery because it allows rapid recovery after surgery. Many medical facilities have introduced clinical

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pathways for laparoscopic cholecystectomy[1]. We have also used a pathway for laparoscopic cholecystectomy since May 2004 and have accumulated experience with many cases[2]. In this study, we evaluated the clinical pathway and investigated its problems by comparing cases treated with the pathway and cases were treated before the pathway was introduced. We also simulated the medical care efficiency with the goals of shortening hospitalization and decreasing medical service fees.

Patients and Methods

The pathway for laparoscopic cholecystectomy at our hospital is indicated for independently active patients without choledocholithiasis or concomitant diseases that affect surgery. Emergency surgery is not included in the indication. The pathway for laparoscopic cholecystectomy consists of a flowchart for patients and a pathway for the medical care staff[2]. The flowchart for patients briefly explains the degree of resting, meals, cleanliness, and excretion along with the time-course using illustrations. Discharge is planned for postoperative day 5. The necessity and content of preoperative examination, examination on admission, surgical content, duration of hospitalization, and complications were explained at the outpatient clinic, and informed consent was obtained before the day of surgery.

The pathway for the medical care staff is presented as an overview, setting the time and work on the horizontal and vertical axes, respectively, and the series of tasks from the day of examination at the outpatient clinic until the day of discharge can be confirmed. Many check boxes are used for each task to make checking directions and nursing records easier and simpler.

The subjects were patients who were found at the outpatient clinic to have gallstones and were admitted for surgery. Eighty-six patients who underwent laparoscopic cholecystectomy with the clinical pathway from May 2004 through April 2007 (pathway group) and 59 patients treated from January 2003 through April 2004 before the pathway was introduced (pre-pathway group) were enrolled in this study. Variance from the clinical pathway in the pathway group was analyzed. The variables investigated were the total and postoperative durations of hospitalization, the number of National Health Insurance (NHI) points for medical service fees, and the number of NHI points per day.

Furthermore, we simulated the medical care efficiency of short-term hospitalization. First, the daily NHI points during hospitalization were calculated in the pathway group. Next, the numbers of NHI points for periods shortened from the current 6-night 7-day hospitalization (discharge on postoperative day 5) to a 2-night 3-day hospitalization (discharge on postoperative day 1) were calculated, and the profit per bed of the shortened hospitalization period was simulated.

Results

There were no significant differences in mean age, male/female ratio, or duration of operation between the pre-pathway group and the pathway group (**Table 1**).

Laparoscopic cholecystectomy was performed without serious complications in all patients of both groups. Variance from the clinical pathway was noted in 24 of the 86 patients (27.9%) in the pathway group: 7 cases of postponement of discharge at the patient's request, 5 cases of earlier discharge at the patient's request, 5 cases of bile duct tube insertion, 3 cases of postponement of discharge due to abdominal pain, 3 cases of postponement of discharge due to additional treatment for other diseases, and 1 case of delayed removal of drain due to hemorrhage (**Table 2**).

Both the total duration of hospitalization and the duration of postoperative hospitalization were significantly shorter in the pathway group (8.0 ± 1.6 days [mean ± SD] and 5.4 ± 1.1 days, respectively) than in the pre-pathway group (13.7 ± 9.0 days and 6.5 ± 2.2 days, respectively; **Fig. 1a**). The total number of NHI points was lower in the pathway group (55,046 ± 7,395 points) than in the pre-pathway group (78,762 ± 47,672 points), but the number of NHI points per day was higher in the

Table 1 Characteristics of the patients

Characteristic	Path group	Pre-path group
No. of patients	86	59
Age (mean ± SD)	52 ± 16	55 ± 19
Gender (male/female)	41/45	28/31
Surgical duration (min)	93 ± 28	96 ± 36
Intraoperative bleeding (mL)	<50	<50

Table 2 Variance in the path group

Postponement of discharge	7 (29.2%)
Earlier discharge	5 (20.8%)
Bile duct tube insertion	5 (20.8%)
Abdominal pain	3 (12.5%)
Other diseases	3 (12.5%)
Delayed removal of drain due to hemorrhage	1 (4.2%)
Total	24/86 (27.9%)

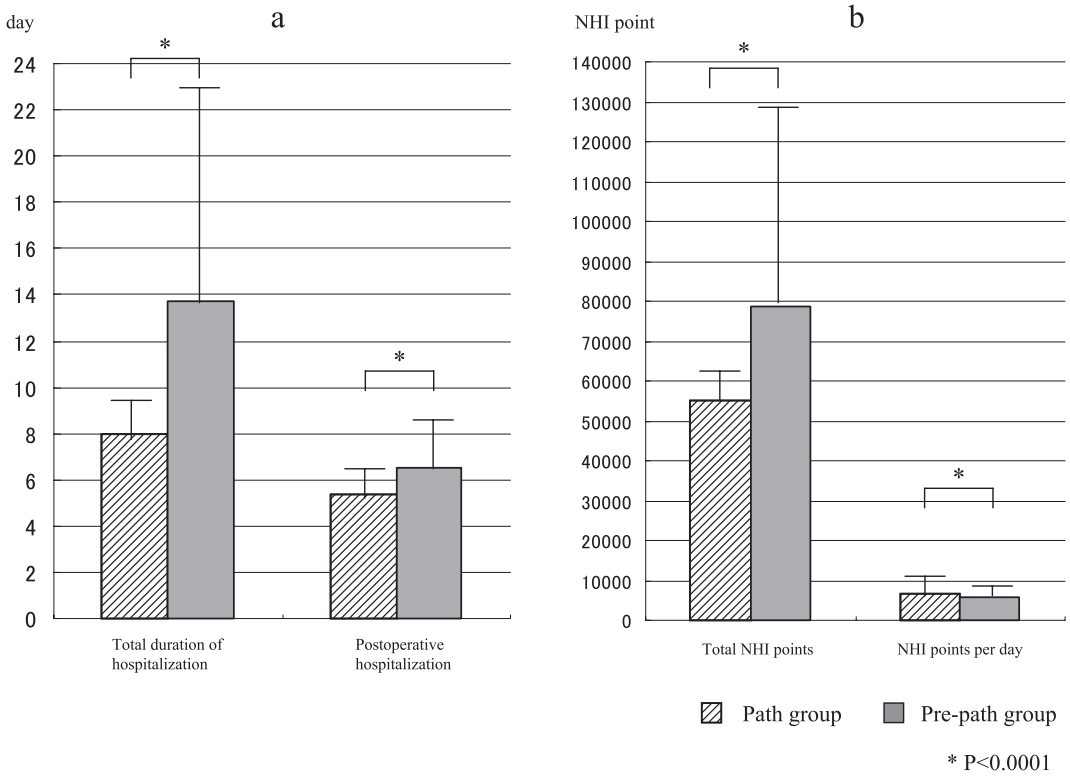

Fig. 1 **a**: The total duration of hospitalization and the duration of postoperative hospitalization were significantly shortened in the pathway group. **b**: The total number of NHI points was lower in the pathway group, but the number of NHI points per day was higher.

pathway group (6,880 ± 924 points) than in the pre-pathway group (5,749 ± 3,480 points; **Fig. 1b**).

The NHI points accrued on the day of surgery accounted for 72% of all points (**Fig. 2**). When the duration of hospitalization was reduced by 1 day from 6 nights and 7 days to 2 nights and 3 days, the total number of NHI points decreased, but the points per day increased. There were significant differences in the number of points between the 7-day pathway (discharge on postoperative day 5) and the 5-day pathway (discharge on postoperative day 3 or earlier; **Fig. 3**). The weekly profit per bed and the total number of points (121,872 points) for 3 patients treated with a 3-day pathway (discharge on postoperative day 1) were more than twice those for 1 patient treated with the current 7-day pathway (48,588 points; **Fig. 4**).

Discussion

Clinical pathways have been introduced to improve perioperative management, to systematize nursing care, to reduce medical expenses, to shorten hospitalization, and to increase patient satisfaction. The effects of pathways for laparoscopic cholecystectomy have been reported[3–5]. Variance

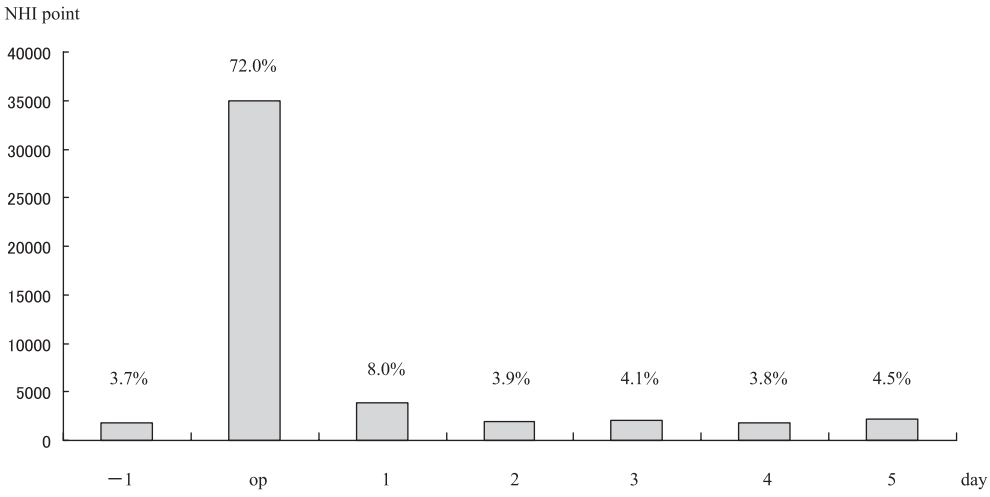

Fig. 2 The mean number of NHI points per day during the hospitalization period. NHI points on the day of surgery accounted for 72% of the all points.

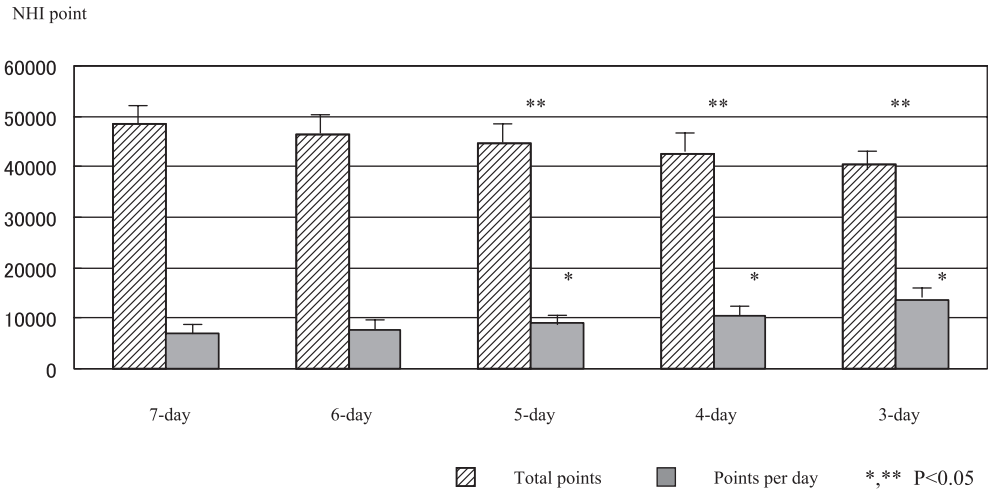

Fig. 3 Total number of NHI points and the number of points per day during the hospitalization period. When the duration of hospitalization was reduced by 1 day from 6 nights and 7 days to 2 nights and 3 days, the total number of NHI points decreased, but the number of points per day increased. There were significant differences in the number of points between the 7-day pathway (discharge on postoperative day 5) and the 5-day pathway (discharge on postoperative day 3 or earlier) (* , * * $p<0.05$).

from the clinical pathway is generally classified as patient-related, medical care staff-related, hospital system-related, and social factors[6]. In this study, variance occurred in 24 of the 86 patients in the pathway group. All variances were due to patient-related factors, and no variance was related to the medical care staff or hospital system, showing that the staff members understood the content of the pathway.

Because discharge was postponed due to patient's request in 7 cases and was advanced in 5 cases, it may be possible to set an earlier time of discharge. Hemorrhage caused drain removal to be delayed in 1 case but resolved with conservative treatment. The time of drain removal may be altered from the current postoperative day 3 to day 1. Discharge was postponed due to bile duct tube insertion in 5 cases and to additional treatment for other diseases in 3 cases, but the variance associated with these patient-related factors was unavoidable. Variance only occurs due to complications when the pathway is well-established, i.e., only patient-related factors

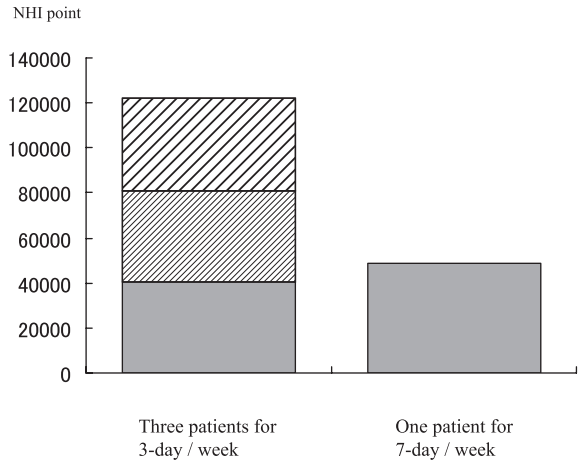

Fig. 4 The weekly profit per bed. The total number of points for 3 patients with 3-day pathway was more than twice that for 1 patient with the current 7-day pathway.

cause variance, indicating that our hospital uses an established pathway.

The introduction of the pathway in our hospital shortened the total and postoperative durations of hospitalization by 5.7 and 1.1 days, respectively, showing that the pathway was useful for reducing the hospitalization period. Before the introduction of the pathway, preoperative examination was performed after admission in some cases, and many patients were discharged on the seventh hospital day after removal of sutures, which prolonged hospitalization.

The pathway reduced the total number of NHI points, but increased the number of points per day. This finding indicates that the cost for hospitalization per patient was reduced but that the profit per bed was increased and suggests that the pathway is economically effective and increases the efficiency of medical care.

In the simulation of short-term hospitalization, the weekly profit per bed with the 3-day pathway (discharge on postoperative day 1) was twice that with the 7-day pathway (discharge on postoperative day 5). Although a marked economic effect of the shortening of hospitalization was predicted, discharging all patients on postoperative day 1 may be difficult because early discharge can be physically stressful for patients. However, for the possibility of making laparoscopic cholecystectomy a "day surgery"[7,8], the shortening of hospitalization should be investigated.

This study clarified that the introduction of the pathway shortened hospitalization and improved the efficiency of medical care and suggests that the pathway can be revised by shortening the postoperative stay. Our hospital now uses the piecework system, but the introduction of diagnosis procedure combination will be required in the near future[9]. For diagnosis procedure combination, the reduction of medical expenses, the systemization and standardization of treatment and nursing, and an increase in the efficiency of medical team care are mandatory, for which pathways are essential. The quality of medical care and the benefits to patients may be improved by repeating assessment of the pathway.

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