

The Effects of the Critical Pathway for Inguinal Hernia Repair

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This study was conducted to develop a case management program using the critical pathway (CP) as an intervention method for patients with an inguinal hernia for a herniorrhaphy, and to determine the effects of the CP on the period of hospitalization, medical costs, the rates of postoperative complaints, patient satisfaction and the nurses' job satisfaction.

One hundred patients (60 in the experimental group, 40 in the control group) who were admitted to a general hospital in Seoul for inguinal herniorrhaphy were enrolled in this study. The results showed that the period of hospitalization and the postoperative hospital stay were significantly reduced in the CP group. In addition, the total medical cost, was lowered significantly by use of the CP for patients undergoing an inguinal herniorrhaphy. The rates of postoperative complaints, patients' satisfaction and the information on the treatment were enhanced after implementing the CP.

These results suggests that the CP may be a useful tool for enhancing the health care outcome by decreasing the period of hospitalization, overall medical costs and by improving the quality of care, all of which can benefit the patients, the patients' family, caregivers and the hospital.

Key Words: Critical pathway, inguinal herniorrhaphy

INTRODUCTION

The Critical Pathway (CP) is a standard measurement, which is planned on a time based schedule for patient management procedures.

Each and every stage of treatment can be standardized using the CP. This can prevent unnecessary diagnosis work-up, repetition and delays in patient management. In effect, the overall quality of care can be improved, and may give patients a higher level of satisfaction by maintaining the continuity and progression of therapy. From a nurse's standpoint, the CP makes it easier to explain the procedures of a treatment to patients beforehand, as each step is laid out and scheduled.

The CP is looked upon as a great method to supplement the weaker points of Diagnosis Related Groups (DRG). In an attempt to reduce the problem of increasing medical fees, the government temporarily applied the DRG to patients with any of five specific diseases for a one year period beginning from 1 February 1997. However, the problems of downgraded medical services and the restriction of optional treatment became an issue. To reevaluate such issues, four more conditions including hernia, were added to the list from February 1999.

The treatment procedures for a hernia can be predicted and the surgical information on a patient can be shared with other medical staff. This allows easier management of a particular disorder and increases patient satisfaction as well as reducing the overall cost. Unfortunately, even with these merits, the efficient management of hernia patients and the construction of a planned outline for hernia treatment have not been investigated properly. As there is a paucity of intensive research on inguinal hernia repair, there is a need to develop a standard CP for managing

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inguinal hernia repair patients and to apply it in order to analyze its effect and validity.

The aim of this study was to develop and apply a CP for adult inguinal hernia repair patients and to determine the efficacy of the CP by analyzing the satisfaction level of patients and nurses, the treatment cost, the number of hospitalization days and the post-operation complaints after surgery.

MATERIALS AND METHODS

Subjects

One hundred patients at a general hospital

located in Seoul who had received inguinal hernia repair treatment were divided into two groups. Sixty patients were treated using the CP and the other 40 patients were treated without.

The selected subjects were patients who were over 17 year of age, were able to understand the self-reporting survey sheet and were treated only for inguinal hernia repair. All patients with chronic symptoms were excluded in order to obtain a reasonable outcome.

A high degree of homogeneity in the patients' general characteristics between the CP and non-CP groups (Table 1) was shown using a Fisher's exact test.

Table 1. Homogeneity of the Patients' General Characteristics between the CP and Non-CP Groups

Characteristics		CP group (N=60)	Non-CP group (N=40)	χ^2 or t	p
		Mean \pm SD N(%)	Mean \pm SD N(%)		
Sex	Male	54 (90.0)	39 (97.5)		.238*
	Female	6 (10.0)	1 (2.5)		
Age(year)	17 - 39	7 (11.7)	7 (17.5)	2.13	.345
	40 - 59	23 (38.3)	10 (25.0)		
	60 - 86	30 (50.0)	23 (57.5)		
	Mean \pm SD	58.6 \pm 14.1	57.2 \pm 17.5		
Level of education	Primary	7 (15.6)	2 (6.5)	.42	.647
	Middle	5 (11.1)	2 (6.5)		
	High	13 (28.9)	12 (38.7)		
	University	20 (44.4)	15 (48.4)		
Religion	Catholic	15 (25.4)	13 (32.5)	4.74	.191
	Christian	14 (23.7)	5 (12.5)		
	Buddhist	3 (5.1)	6 (15.0)		
	None	27 (45.8)	16 (40.0)		
Duration of symptom (day)	Mean \pm SD	473.5 \pm 904.2	503.5 \pm 999.3	.14	.885
Location of Hernia	LIH	21 (30.0)	16 (40.0)		.883*
	RIH	36 (40.0)	22 (55.0)		
	BIH	3 (5.0)	2 (5.0)		
Recurrency	No	52 (86.7)	35 (87.5)	.01	.903
	Yes	8 (13.3)	5 (12.5)		

LIH, Left inguinal hernia; RIH, Right inguinal hernia; BIH, Both inguinal hernia.

*Fisher's exact test.

Research design

A randomized comparison group of a pretest-post test experimental design was used to verify the effects of the developed CP on inguinal hernia repair patients.

Initially, the control group was selected out from a group of patients the CP had not been applied. To prevent possible contamination of the control group, the experiment group was selected at a separate time frame.

Both groups were treated in a designated ward with the same health care professionals including the surgeon from the same surgery team so that all variables which that could affect the a patients' recovery could be controlled.

New CP development

The CP development method used in by Anders et al.,¹ Lyda and April,² Willis et al.³ was used to develop a new CP for inguinal hernia repair patients. The development procedure included a conceptual framework, a pre-investigation, and a suggestion of a preparatory CP as well as a means of verifying the tool's adequacy by experts in the field.

After determining the conceptual framework, a preparatory CP based on the medical services that were provided to the patients was designed by reviewing the patients' medical records. In order to test it's the adequacy of the CP, the prepared CP was reviewed by a surgeon, a professor in nursing, two apprentice doctors, a head nurse and two nurses with more than 5 years experience.

A final CP for a 3-day hospitalization schedule was created after implementing the necessary amendments. To apply the developed CP for clinical use, the doctors' prescriptions were standardized and were given to the medical staff. These prescriptions and other related aspects of the treatment were inputted into the hospital's OCS (Order Communication System. Therefore, the prescriptions could be given to patients equally even if there was a change in the doctor in charge during therapy.

Applying the developed CP

To utilize and give full understanding of the developed CP to the staff in a limited amount of time, individual instructions were given to the nurses, the doctors in charge and the apprentice doctors.

A thorough explanation was given to the patients in order for them to have a complete understanding of the situation. The developed CP was then used to treat the inguinal hernia repair patients.

Measurements

Length of stay

The total days of hospitalization time and the number of hospital days after surgery were calculated using the patients medical records.

Average medical cost

Categories that were unrelated to the CP such as food charges and telephone fees were not included in the subjects' medical cost analysis. Changes in the medical insurance rates were taken into account in order to analyze the relative charge and to derive the total charge and average daily charge.

Post operation complaints

Data for post operation complaints were collected using the patients' medical records.

When investigating the medical records, the researcher used the a prepared checklist based on the pre observant results. The checklist included the complaint categories of urinary difficulties, wound pain, headaches, constipation, nausea/vomiting, fever, chest pain, and scrotum hematoma.

Patient satisfaction

Using a survey sheet, the patients were asked to measure their subjective satisfaction level. The survey sheet, which was designed based on books and references, comprised of nine questions in four different subjects; surgery, the length of stay, the explanation of the therapy and the nursing service. The categories were measured on a scale of 1 to 5. A higher score would indicate a higher

level of treatment satisfaction.

Job satisfaction of nurses

A translated version of a measuring instrument, developed by Stamp et al.⁴ to measure the job satisfaction level of health related employees was used. The questionnaire was made up of 37 questions and the questions were answered on a scale of 1 to 5. The higher the score, the higher the satisfaction level the nurses had in caring the patients.

The confidence coefficient of the study was 0.79.

Data collection

Medical records of the selected herniorrhaphy patients from January 1999 to June 2001 were reviewed to investigate the number of hospitalization days and the number of complaints after surgery. Medical charge receipts were used to calculate the overall cost.

Survey sheets were mailed and delivered to the 100 selected subjects in July 2001 in order to gauge the patients' satisfaction level. Out of the 100, 13 were not filled in and 37 were not returned. The remaining 50 replies were used for this study. Thirty replies came from the CP applied patients and 20 came from the non-CP applied patients.

Measuring the satisfaction level of nurses also included survey sheets. Twenty nurses who implemented the CP method received survey sheets and 15 nurses who were at a different surgery ward, and were not applying using the

CP, also received the survey sheets during the same time period. There were no significant differences between the CP group and non-CP groups in terms of their demographic characteristics (Table 2).

Data analysis

The SPSS program was used to analyze the collected data. homogeneity between the CP and non-CP groups was confirmed using an unpaired t-test, a Chi-square test and a Fisher's exact test.

An unpaired t-test was used to analyze the length of stay, and the categories of the nurses' job satisfaction. The patients' satisfaction was tested using a Fisher's exact test.

RESULTS

Length of stay

The total length of stay and post-operative stay were examined. The total length of hospitalization for the CP group was 3.9 ± 1.4 days, which was significantly shorter than the non-CP group (6.1 ± 2.4 , $t=5.19$, $p=0.00$). The number of days in hospital after surgery for the CP applied group was 1.7 ± 1.1 , which is also shorter than the 3.7 ± 2.1 days for the non-CP group ($t=5.38$, $p=0.00$) (Table 3).

Table 2. Homogeneity of the Nurses' General Characteristics between the CP and Non-CP Groups

Characteristics		CP group (N=20)	Non-CP group (N=15)	χ^2 or t	p
		Mean \pm SD N(%)	Mean \pm SD N(%)		
Age (year)		29.0 \pm 3.9	28.4 \pm 4.0	.47	.635
Clinical experience (month)		71.8 \pm 46.3	61.8 \pm 54.4	.58	.561
Level of Education	3-years	13 (65.0)	5 (33.3)		.072*
	4-years	7 (35.0)	8 (53.4)		
	graduate	0 (0.0)	2 (13.3)		
Marital status	single	13 (65.0)	9 (60.0)	.09	.762
	married	7 (35.0)	6 (40.0)		

*Fisher's exact test.

Medical cost

The overall medical charge of the inguinal hernia repair patients was approximately ₩1,324,136.0 ± 117,337.7 for the CP group and ₩1,553,706.6 ± 193,337.6 for the non-CP group ($t=5.21$, $p=0.00$). The total cost was higher for the non-CP group. However, the average medical charge per day was higher for the CP group, costing ₩361,903.6 ± 83,559.2 and ₩277,439.8 ± 74,405.8 per day for the CP and non-CP patients ($t=4.07$, $p=0.00$) (Table 4), respectively.

Post-operative complaints

The number and type of postoperative complaints from patients after surgery are shown in Table 5. Although the percentage of patients who had no complaints were higher in the CP group, the value was not statistically significant ($p=0.21$). The most common complaints was wound tenderness, which made up 40.6% of the complaints

from the CP group and 41.3% of the non CP group. The next most common complaint was urinary difficulties, which consisted 12.5% and 31.0% of the complaints from CP group and non CP group respectively.

Patient satisfaction

The results of the comparison of the patients' satisfaction were categorized in terms of the operation, the length of hospitalization, the explanation of the treatment and the nursing service (Table 6). Ninety percent of the patients from the CP group and 80.0% from the non-CP group were satisfied with the operation. 86.1% of the patients from the CP group and 95.0% from the non-CP group were satisfied with their length of hospital stay. Contentment regarding the explanation of the treatment procedures was 80.0% for the CP group and 75.0% for the CP group patients. However, no statistically significant differences were observed between the two comparison groups.

Table 3. Comparison of the Length of Stay between the CP and Non-CP Groups

LOS	CP group (N=60)	Non-CP group (N=40)	t	p
	Mean ± SD	Mean ± SD		
Overall LOS (day)	3.9 ± 1.4	6.1 ± 2.4	5.19	.000
Post-op LOS (day)	1.7 ± 1.1	3.7 ± 2.1	5.38	.000

LOS, Length of stay.

Table 4. Comparison of the Medical Costs between the CP and Non-CP Groups

Charge (won)	CP group (N=60)	Non-CP group (N=40)	t	p
	Mean ± SD	Mean ± SD		
OMC	1,324,136.0 ± 117,337.7	1,553,706.6 ± 193,337.6	5.79	.000
AMCD	361,903.6 ± 83,559.2	277,439.8 ± 74,405.8	4.9	.000

OMC, Overall medical charge; AMCD, Average medical charge per day.

Table 5. Postoperative Complaints During Hospitalization

Characteristics	CP group (N=60)	Non-CP group (N=40)	χ^2	p
	N (%)	N (%)		
No	36 (60.0%)	19 (47.5%)	1.51	.218
Yes	24 (40.0%)	21 (52.5%)		

Table 6. Comparison of the Patients' Satisfaction between the CP and Non-CP Groups

Criteria	Degree	CP group (N=30)	Non-CP group (N=20)	<i>p</i>
		N(%)	N(%)	
Operation	Good	27 (90.0)	16 (80.0)	.331*
	Moderate	2 (6.7)	4 (20.0)	
	Bad	1 (3.3)	0 (0.0)	
Length of stay	Good	26 (86.1)	19 (95.0)	.636*
	Bad	4 (13.3)	1 (5.0)	
Explain of treatment	Good	24 (80.0)	15 (75.0)	.736*
	Bad	6 (20.0)	5 (25.0)	
Service of nursing care	Good	24 (80.0)	14 (70.0)	.454*
	Moderate	5 (16.7)	6 (30.0)	
	Bad	1 (3.3)	0 (0.0)	

*Fisher's exact test.

Table 7. Job Satisfaction of the Nurses in the CP and Non-CP Groups

Characteristics	CP group (N=20)	Non-CP group (N=15)	<i>t</i>	<i>p</i>
	Mean \pm SD	Mean \pm SD		
Job satisfaction	2.8 \pm 0.2	2.9 \pm 0.3	1.01	0.315

Job satisfaction of the nurses

The job satisfaction level (on a scale of 1 to 5) of the nurses in the CP group was rated at 2.8 ± 0.2 while that of the non-CP group was 2.9 ± 0.3 , showing no significant difference ($t=1.01$, $p=0.31$) (Table 7).

DISCUSSION

Patients from the CP group had a significantly shorter overall length of stay and a shorter post-operation stay. Although there has not been a domestic study of a CP application on inguinal hernia repair patients, the outcomes from this

study compare well with those conducted in the United States. Willis et al. showed that the hospitalization rate for the CP group was rated at 15% while the non-CP group stood at 36%.³ Chang et al. also reported that the hospitalization period for an inguinal hernia repair could be reduced by using a CP.⁵

The CP method is not only effective in treating inguinal hernia repair patients but it has also been shown to be effective in treating coronary artery bypass graft patients, with an average reduction in the number of post-operative hospitalization days of 1.1 day.⁶ Furthermore, it was reported that the total length of hospitalization was reduced from 5.5 days to 4.9 days after applying a CP to patients undergoing urinary operations.⁷

This study showed that the average overall medical cost for the CP group patients was ₩1,324,136.0, which is approximately 17% lower than the non-CP group (₩1,553,706.6). In contrast, there was a 30% increase in the average daily medical charge when the CP was applied. In another study, the medical charge was reduced by 10.4%, and average medical charge per day increased by 16.1% after applying a CP to hysterectomy patients.² Furthermore, the CP method yielded similar results for lumbar microdisectomy patients where the total medical charge reduced by 16.3% and the medical charge per day was increased by 32.5%.⁸

Recently, patients have tended to prefer general hospitals. As a result, patient accommodation is becoming an increasingly difficult task. This is particularly so when the number of patients with complicated disorders requiring a lengthy period of hospitalization is increasing. Hence, efficient and cost effective patient management can be reinforced by developing and applying a CP. The results of this study demonstrate that a CP can save time and cost for patients, as well as for medical staff and can also be financially advantageous to the hospital.

Postoperative complaints from patients were investigated and the percentage of patients who did not report any complaints was higher in the CP group. Sixty percent of patients from the CP group left the hospital without any particular complaints, while only 47.5% patients from the non-CP did the same. However, this value was not statistically significant ($p=0.218$). In hysterectomy patients, there were no differences in the number of associated illnesses that occurred between the CP and control group.⁹ Similar results were reported by Moon (2001), where no differences were found in the number of patients who developed other related illnesses.⁸ In this study, information on an associated illnesses, including a re-occurrence, could not be investigated because the CP group post operation observation period lasted for only 5.8 months and the non-CP group were observed for 14.7 months. Not only did the observation period differ but so did the observation periods, which were insufficient for proper research. Therefore, a further study on the associated illnesses, including a re-

occurrence, is required.

The methods used for investigating the patient satisfaction in each report differ. However, most studies report that a CP application improves the level of patient satisfaction. This means that additional education of nurses and the use of case managers have a positive effect on the satisfaction level.^{10,11} Even though validity a CP is questionable, because each medical foundation uses different procedures to measure the quality of nursing services, the patients opinions are regarded as an important aspect.¹²

No noticeable differences in the level of job satisfaction from the nurses were found in this study. Park reported that the job satisfaction level tended to increase after a CP application and the quality of nursing also improved.¹³

Currently, in the United States, different CP methods are being developed by different medical installations for self-application purposes. Numerous studies on the positive effect of CP methods are being published. Domestically, the focus on developing a CP began in the late 1990s and several studies of CP applications have since been reported. More extensive studies aimed at proving the effect of a CP are expected in the near future.

Many studies have reported the efficacy of CP methods in terms of the length of hospitalization and the medical cost. It is recommended that in future studies, aspects of patient and medical staff satisfaction be taken into account. Furthermore, the whole process should be reviewed in order to determine the cause of the problem in cases where a CP application does not bring about suitable results, to determine whether the problem lies with the patients, the medical staff or the hospital facilities.¹⁴ In order to improve the efficiency in developing and applying new CPs, there needs to be a larger number of case managers who are capable of administering a CP in real therapy situations.

Thus far, a CP has promoted an improvement in the treatment quality and cost efficiency through straightforward and cohesive patient management. The results of this study have highlight the significance of a CP treatment.

However, a CP developed for a specific type of patient cannot be applied universally. In addition,

since each and every patient is different, medical staff should not overlook the individual patient's characteristics. The opinion on the utility of a CP may change, but whatever the case may be, on going research should be conducted in order to ascertain the influence of a CP routine.

In conclusion, the following suggestions have been made: (1) studies on a health managers job efficiency, job satisfaction and quality improvement should be carried out, (2) A an appropriate measurement tool or a guiding index for precisely measuring a patients satisfaction level, needs to be developed, (3) a CP focusing on hospitalized treatment should coincide with home nursing and, (4) a CP should be constantly applied and reviewed for different situations in order to validate its effectiveness.

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