Impact of a Clinical Pathway in Cases of Transurethral Resection of the Prostate

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Due to the recent dramatic increase in health care costs, costs containment for medical care has been recognized as an important issue. We evaluated the effects of a clinical pathway on hospital charges and the clinical outcome. The subjects consisted of 48 patients who underwent transurethral resection of the prostate (TUR-P) at the Department of Urology, Nerima General Hospital *via* its own clinical pathway during the two-year period from April 1998 to March 2000. The mean length of hospital stay, clinical outcome and the medical insurance charges for these patients were compared with those of 68 patients who had undergone TUR-P before the implementation of the clinical pathway. As a result of the clinical pathway implementation for TUR-P, the length of hospital stay decreased from 17.2 days to 3.8 days and the total medical insurance charges (insurance points) also decreased from 37,484.6 to 31,278.9 yen. The postoperative complications did not substantially differ before and after the implementation of the clinical pathway. These results demonstrate that the establishment of clinical pathway can improve the treatment efficiency for almost all patients. It is, however, important to take into account the individuality of patients.

Key words: Clinical pathway, benign prostatic hypertrophy, transurethral resection of the prostate.

INTRODUCTION

With growing apprehension about soaring medical costs and the viability of the health insurance system, the current health care system is being critically reviewed to reduce medical costs, and the Diagnostic Procedure Combination (DPC), which may be regarded as a Japanese version of the Diagnosis Related Group/Prospective Payment System (DRG/PPS), has been introduced at specific medical facilities since April 2003. It is considered very likely that the DPC will be introduced at other hospitals in the future.

The significance of the DPC resides in its approach that a fixed amount of medical expenses are to be paid for each disorder cared for, and healthcare professionals are required to provide efficient medical care based primarily on medical expenses suited to the purpose while maintaining the quality of medical care. Against a background of revising the health insurance system as well as in response to the demand in the field of medical practice, attention has been focused on the application to medical care of clinical pathway, which originates from a production process control tool [1, 2].

Attempts to introduce clinical pathway are being made in Japan as well at various medical facilities for the purpose of improving the quality of medical care and reducing costs. Treatment via a clinical path for benign prostatic hypertrophy (BPH) has been initiated at Nerima General Hospital to cope with the problems in the medical care status and as part of efforts to improve the quality of medical care.

This study was designed to explore the clinical effects of a clinical path formulated at our department for transurethral resection of the prostate (TUR-P) in BPH patients, in terms of the duration of hospitalization, in-lying catheterization and infusions or antimicrobial treatment, the incidence of complications, and the impact of those clinical effects on medical expense reduction from the medicoeconomic viewpoint. The study also represents an attempt to assess whether the application of the clinical path would be useful to improve the quality of medical care and reduce hospital/medical care charges.

SUBJECTS AND METHODS

The study population comprised 234 patients who had TUR-P at the Department of Urology, Nerima General Hospital, during the three-year period from January 1997 to December 2000. This population was classified into two groups: a non-clinical path (non-CP) group of 68 patients who underwent TUR-P between January 1997 and March 1998 and CP group of 146 patients who were operated via clinical path between

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April 1998 and December 2000 (Table 1).

For patients in whom a prostatic tumor was suspected prior to the operation, a prostate biopsy was performed, and TUR-P was carried out only after malignancy of the lesion was excluded based on histopathological examinations. Patients with an underlying disease were referred to the pertinent department or clinic for checkup for the disease while in the ambulatory status and, upon confirming that occurrence of variances in the practice of clinical path seemed very unlikely, were subjected to TUR-P *via* clinical path.

Clinical Path Preparation Committee composed of urologists, a pharmacist, nurses, a dietitian and a medical clerk was formed in October 1997 and formatted the Clinical Path Form based on retrospective review of TUR-P case records and the perspective of evidence-based medicine (Table 1).

For a smooth practical application of the clinical path, a clinical path scheme was provided for the intravenous infusion volume, the duration of antimicrobial treatment, examinations/laboratory tests, the duration of continuous vesicoclysis, the day of catheter removal and the day of discharge from the hospital. The day of catheter removal and that of hospital discharge were left to the physician's discretion. Medical practice beyond the prescribed period and modifications, omissions or additions of laboratory tests or drugs were dealt with as variances. To prevent malpractice, the operator was obliged to sign the Clinical Path Form on each occasion of medical practice. Drugs to be used including antimicrobial agents and parenteral solutions for infusion were limited, and efforts were made to minimize misdosing.

To secure objective evaluation, the number of days of hospitalization, medical care benefit points, intravenous infusion and antimicrobial drug charges, imaging diagnosis fee, urinalysis and hematological/blood biochemical tests, the review data were statistically analyzed between the CP group and the non-CP group using unpaired *t* test. Because the National Health Insurance Reimbursement was revised during the study period (April 2000), the reimbursement points effective prior to the revision were converted to the revised points, and hospital charges exceeding insurance coverage (for a private room) were excluded to maintain the consistency of efficacy assessments of the clinical path.

RESULTS

Primary objectives of the practical application of the clinical path consisted of (1) improvement in quality of medical cases, (2) reduction in the number of days of hospital stay, and (3) reduction in medical expenses, in association with improved efficiency of medical care. Factors that would affect these objectives included patient background characteristics, clinical effects such as the incidence of postoperative complications and duration of indwelling catheterization, the number of days of hospitalization, operation charges, intravenous infusion and antimicrobial drug charges, imaging diagnosis fee, and examinations/laboratory tests.

Table 1 shows patient background characteristics before and after the introduction of the clinical path. There was no statistically significant difference between the two groups. Table 2 depicts the clinical effects of the introduction of the clinical path observed, such as reductions in the duration of hospitalization, indwelling catheterization and intravenous infusions and antimicrobial treatment. The application of the clinical path resulted in decreases in the duration of hospitalization by 3.3 days, in the duration of indwelling catheterization by 1.2 days, and in the duration of intravenous infusions and antimicrobial treatment by 1.2 days.

In Table 3, the National Health Insurance Reimbursement points and constituent variables thereof were compared between the CP group and the non-CP group. The mean of the National Health Insurance Reimbursement points was 31,278.9 points for the CP group and 37,484.6 points for the non-CP group, demonstrating a 17% reduction for the CP group with a statistically significant intergroup difference. When constituent variables for the National Health Insurance Reimbursement were compared between the two patient groups, there were statistically significant decreases in (1) hospital/operation charges by 18%, (2) imaging diagnosis fee by 38%, and (3) laboratory test fee by 15% for the CP group. Nevertheless, a 22% increase in (4) infusion/drug charges was noted for the CP group. This was inferred to be ascribable to the fact that new quinolones were prescribed for two weeks until the day of re-checkup after discharge.

An investigation into the cause of variances revealed that there were a total of 43 occurrences of variance,

Table 1 Comparison of the pre- vs. post-clinical path introduction cases

	Pre-introduction (Jan/97 - Mar/98)	Post-introduction (Apr/98 - Mar/00)
No. of patients	68	148
Age	58 to 91 years (mean: 76.3 years)	58 to 86 years (mean: 75.8 years)
Resected tissue weight	3.5 to 72 g (mean: 27.2 g)	3.0 to 88 g (mean: 33.4 g)
Anesthetic procedure	Epidural: 62 General: 3 Systemic: 1	Epidural: 139 General: 6 Systemic: 1

Table 2 Comparison of the pre- vs. post-clinical path introduction clinical effects

	Pre-introduction (Jan/97 - Mar/98)	Post-introduction (Apr/98 - Mar/00)
Duration of hospitalization	10 to 22 days (mean: 17.2 days)	9 to 17 days (mean: 13.8 days)
Duration of indwelling urethral catheterization	3 to 8 days (mean: 5.4 days)	4 to 8 days (mean: 4.1 days)
No. of days infusions and/or antimicrobial drugs given	3 to 14 days (mean: 6.2 days)	5 to 7 days (mean: 5.0 days)
Postoperative complications	Postoperative hemorrhage: 3 patients Epididymitis: 3 patients Perforation: 1 patient	Diarrhea: 3 patients Epididymitis: 2 patients Postoperative hemorrhage: 1 patient Attacks of asthma: 1 patient Confinement reaction: 1 patient

Table 3 Comparison of the National Health Insurance Reimbursement variables between the pre- vs. post-clinical path introduction cases

	Pre-clinical path introduction	Post-clinical path introduction	% change	p
Duration of hospitalization (days)	17.2	13.8	−19	0.014
Hospital/operation charges (yen)	28722.1±8066.4	23515.1±3647.8	−18	0.02
Infusion/drug charges (yen)	3102.0±4731	2985.3±1550.8	−4	0.61
Dosing fee (yen)	1136.1±522.6	1382.8±718.9	22	
Imaging diagnosis fee (yen)	1897.7±486.1	1170.3±1337.2	−38	0.0005
Laboratory test fee (yen)	2626.7±695.8	2225.2±792.4	−15	0.04
Total amount (yen)	37484.6±10495.7	31278.9±5518.1	−17	0.02

Values are means±standard deviation except for the duration of hospitalization.

and the most frequent was additional examinations/ laboratory tests performed in 18 patients (Table 4). Eventually, it was in 110 (74.32%) of 148 patients that the application of the clinical path was feasible as intended at the outset, partly because multiple variances occurred in the same patient.

There was no intergroup difference in postoperative complications, and none in either group had any serious intercurrent illnesses. Eight of the patients to whom the clinical path was applied had complications, including diarrhea in three patients, epididymitis in two patients, and postoperative hemorrhage, attacks of bronchial asthma and detention reaction in one patient each (Table 2). The complications resolved in response to appropriate corrective measures in all these patients.

DISCUSSION

Critical path is a production process control tool that was developed in the late 1950s and aimed to reduce the duration of work. In the background to the development of critical path were circumstances where it had to be utilized in order to accurately and efficiently advance the complex process of rocket development for the Apollo Program in the1960s) [1-4].

The history of clinical path development in medical care has a profound bearing on the introduction of the DRG/PPS adopted in 1983 in the United States as a measure to optimize medical costs. A nurse at the New England Medical Center named K. Zanker was the first to prepare and implement care maps and a clinical path in 1985, not only for pursuit of hospital efficiency for the DRG/PPS but also because of a lack of records commonly available to other healthcare professionals, and because she keenly felt the limitations of nursing care management) [5]. It should thus be noted that clinical path is primarily intended not solely to reduce medical costs and the duration of hospitalization but to improve both the medical record

Table 4 Number of clinical path variances occurred

Variance	Occurrence
(1) Additional tests	18
(2) Reduction in infusions	6
(3) Reduction in parenteral antimicrobial doses	6
(4) Increase in infusions	4
(5) Increase in parenteral antimicrobial doses	3
(6) Prolonged indwelling catheterization	3
(7) Prolonged duration of hospital stay	3
Total	43

keeping and medical care duties.

Review of the literature published by various investigators on the significance of clinical path has led to a definition that "clinical path represents a method or tool to provide a systematic medical care service believed to be best by all healthcare professionals through delineation of the results anticipated from treatment given during the period of hospitalization allocated to each disorder and depiction of the treatment course in terms of a time-series") [1, 2, 7-9]. To follow this definition, it is important to formulate a clinical path so as to permit achievement of the respective anticipated effects, because the purpose of introducing a clinical path varies by profession, affiliated division/unit and standpoint. In other words, the desired endpoints should include the practice of evidence-based medicine based on improvements in the quality of medical care and improved efficiency and standardization of the management, duties and medical care safety measures. Specifically, a clinical path should cover preventive measures against malpractice and complications from the physician's standpoint, delineation of paramedical clinical care processes and practice/duties of nursing plan mainly with the nursing staff, and achievement of cost reduction through reduced duration of hospital stays and improvement in efficiency of duties on the part of business administration staff. Clinical path, as above, is not merely intended to reduce medical costs but also aims to contribute to improved quality of medical care through the clear definition of responsibilities shared among all healthcare professionals and comprehension of overall medical care.

Application of the clinical path prepared at Nerima General Hospital for TUR-P by way of systemic implementation of the medical care practice specified on the Clinical Path Form enables the provision of quality-guaranteed medical care services conforming to the set of certain rational criteria for the qualitative aspect of medical care, which have hitherto been entrusted to the experience and capability of the medical care staff. A parallel system was constructed to prevent malpractice by communizing information among healthcare professionals, keeping all medical practices under surveillance, generally standardizing the drugs prescribed, and making pre- and post-medical practice checkups and signing the form compulsory. As a re-

sult, the application of the clinical path brought forth not only a medicoeconomic effect but also a reduction in misdosing and omission of examinations/tests, hence lessening the potential risk of malpractice.

Assessments of the effect of introducing the clinical path based on objectively evaluated endpoints demonstrated decreases in the duration of hospitalization and doses of intravenous infusion and antimicrobial drugs, in response to which the medical care benefit points also decreased. When the pertinent data were analyzed to compare the pre- versus post-CP introduction values upon classifying the total medical care benefit points into five constituent categories (Table 3), it was noted that the hospital/operation charge, imaging diagnosis fee, examination/laboratory tests fee and total medical care benefit points decreased with statistical significance after the introduction of the clinical path, thus indicating the significance of its introduction (Table 3).

The data showed no difference in the incidence or types of complications between pre- versus post-CP introduction, and no serious complication was noted. Search of the literature has revealed several reports demonstrating a decrease in the incidence of postoperative complications following introduction of a clinical pathway system) [10-12]. This as well as the present findings would imply that upon the application of the clinical path, the assessments for risk factors and checking of the observation endpoints for clinical path contributed to preventing the occurrence of complications and gave impetus to initiating appropriate treatment early after onset in the present series.

Investigation into individual causes of variance showed a decrease in the use of intravenous infusions and parenteral antimicrobial agents in 32 patients, consequent on both the additional examinations/laboratory tests and favorable postoperative clinical progress, accounting for about 65% of all 48 patients with proven variances. Owing to the lack of full understanding of the significance of the clinical path on the part of healthcare staff early after its introduction, there were cases in which additional examinations/tests not specified in the clinical path were ordered while some of the examinations/tests specified in the clinical path were excluded due to favorable clinical progress. Such variances diminished substantially in consequence of improved recognition by healthcare staff of the application of the clinical path.

Variances can be distinguished into two types: negative variances which arise from changes in programmed treatment plans by adding extra medical practice, and positive variances which occur as a result of omission of some medical actions. Therefore, medical actions other than those initially prescribed, e.g., addition or omission of intravenous infusions and/or antimicrobial treatment and change in discharge date, are all to be dealt with as variances. As the Clinical Path Preparation Committee claimed that the formulated clinical path be essentially flexible, we set down the discharge day to be between the 11th and 14th hospital days and allowed catheter removal day some latitude up to the 5th day. Consequently, variances that arose from the prolonged duration of hospitalization or troubles in catheterization occurred in as few as 3 patients each. Taking into account that the mean dura-

tion of hospitalization was 13.8 days with the application of the clinical path as opposed to the prescribed maximum duration of 14 days, the variances found in the present series seem to have contained positive variances to a considerable extent. In other words, the present investigation on variances chiefly dealt with assessment of negative variances in the clinical path.

From the results of assessments of the clinical path application to TUR-P at this hospital, it can be inferred that a further reduction in the duration of hospitalization, omission of some examinations/laboratory tests and a reduction in drugs/doses would be feasible. Based on these variances, the Clinical Path Preparation Committee of this hospital continues its exploration with the aim of renovating the clinical path so as to enable reduced duration of hospitalization, omission of examinations/laboratory tests considered possible and a reduction in drugs/doses.

It was also found that a decrease in the total medical care benefit points was brought about by applying the clinical path, compared to the non-CP group. Thus, while the application of a clinical pathway at the present time point reportedly resulted in a reduced cost and a rise in profit rate) [9], it would eventually lead to a reduction in the duration of hospital stay and thereby decrease medical practice income per patient. It can be assumed that, under the existing insurance system composed of a piecework payment scheme, the number of empty beds would increase, with a consequent decrease in operating revenue of the medical institution, except for medical facilities with a reduced duration of hospitalization and a sufficient number of standby patients. However, if the GPC now under enforcement at some medical institutions is introduced at other medical facilities, it would not be too difficult to imagine that the surrounding medicoeconomic environment will undergo substantial changes. That is to say, all medical actions divergent from evidence-based medicine will function as factors impairing the profit rate, thereby pausing difficulties to the management of hospital operation.

Smooth application of the clinical path is not only of value to curtail unnecessary medical expenses but is also thought to contribute to reducing complications and promoting motivation for improved quality of medical care and for efficient operation of medical facilities) [14,15]. Nevertheless, the fear that the individuality of patients will be ignored cannot be ruled out insofar as such excessive heightening of efficiency and standardization are sought for as reductions in the duration of hospitalization and medical care costs, with emphasis on achievements and efficiency in the application of a clinical pathway. It is thus thought that we pay close attention to the question: "What is medical care designed primarily for patients?"

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