

## COMPARISON OF APPENDECTOMY MEDICAL EXPENSE AND CLINICAL OUTCOME BETWEEN FEE FOR SERVICE AND PROSPECTIVE PAYMENT SYSTEM

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Since the introduction of national health insurance on March 1st 1995 in Taiwan, another 9 items (including appendectomy) were introduced into the Taiwan /prospective payment system (T/PPS). The modified T/PPS was based on those complicated appendectomy cases with secondary diagnosis or second operation where a total fee over 37,500 New Taiwan (NT) dollars was paid by National Health Insurance Bureau (NHIB) according to the real cost. The T/PPS was implemented in October 1997 due to the continuously increasing financial burden of medical expenses on the NHIB. The purpose of this study is (1) to compare the length of stay (LOS) and total medical expense of appendectomy of fee for service (FFS) and T/PPS and (2) to compare the clinical outcome of wound healing after discharge of the two systems by telephone interview. Our study investigated 100 consecutive appendectomy cases under FFS payment system and 99 consecutive appendectomy cases under T/PPS. We retrospectively analyzed LOS, operation time, and hospital cost of different items through chart review and computer data. Our results revealed that the LOS and operation time of T/PPS were significantly shorter than those of FFS (both  $p < 0.01$ ). The total hospital cost, fee for room service, treatment, pharmacy, examination and anesthesia in T/PPS were also significantly less than those in FFS (all  $p < 0.01$ , except for anesthesia  $p < 0.05$ ). There existed positive correlation between total hospital cost and LOS, operation time, fee for room service, treatment, pharmacy, examination and anesthesia both for T/PPS and FFS. To evaluate the clinical outcome of appendectomy between T/PPS and FFS, we interviewed 73 T/PPS cases and 73 FFS cases by telephone and chart review. Our results revealed that there were no significant differences in frequencies of having painful incision, clear incision wound on the day of discharge, and removal of stitches at hospital ( $p > 0.05$ ). We concluded that compared to FFS, T/PPS can decrease LOS and total hospital cost of appendectomy, and T/PPS' s clinical outcome of appendectomy in T/PPS showed no significant difference from that in FFS.

**Key words:** perspective payment system, fee for service, appendectomy

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In Taiwan, national health insurance was implemented on March 1, 1995. Over 95 % of hospitals in Taiwan have special contracts with the National Health Insurance Bureau (NHIB). Due to continuously increased medical expenses billed to the NHIB, the NHIB decided to use the Taiwan Prospective payment system (T/PPS) to provide medical service at a reasonable price. The NHIB selected diseases with simple therapeutic content, little variance, and few complications such as vaginal delivery, and Cesarean section for T/PPS. Another 9 operation procedures including appendectomy were later added to T/PPS.

In the United States, PPS based Diagnosis Related Groups (DRG) have been implemented by Medicare since 1983 [1]. Under PPS/DRG, hospitals are paid an amount based largely on flat rates per admission calculated for each of approximately 470 diagnosis related groups. The characteristics of DRG are according to patients age, gender, major diagnosis, secondary diagnosis, treatment and discharge condition. This new payment system has been successful at slowing the upward spiral of Medicare costs. However, because prospective payment contains incentives to decrease length of stay (LOS) and substitute lower cost services and procedures, concern has arisen among patients, physicians, and policymakers that, despite the introduction of monitoring by professional review organizations, the quality of care offered to Medicare patients may have declined [2].

There have been still very few studies concerning T/PPS in our country [3, 4]. The purpose of this study is to compare the difference of hospital cost and clinical outcome of appendectomy cases 6 months before and after T/PPS in an university hospital.

## MATERIALS AND METHODS

We collected 118 consecutive appendectomy cases during the 6 month period of April 1 to September 30, 1997 and 116 consecutive appendectomy cases during the 6 month period of October 1, 1997 to March 31, 1998. We got 100 valid fee for service (FFS) cases af-

ter excluding those outliers such as appendectomy combined with other disease. We also got 99 valid T/PPS cases. We retrospectively reviewed the charts of these patients and analysed the total hospital costs and other fees by telephone and computer aid. We also interviewed those discharged patients by telephone about operation incision and recovery situation after discharge. We got valid 73 cases each for T/PPS and FFS.

The payment for appendectomy by the NHIB was 30,000 New Taiwan (NT) dollars. Complicated cases with secondary diagnosis or second operation with a total fee of over 37,500 NT dollars were paid according to their real costs by the NHIB, but the frequencies of outlying cases could not be over 15 % of the total for medical center.

Students *t*- test and Chi-square test were used for comparison of PPS and FFS. Linear regression was also used for correlation studies.

## RESULTS

In T/FFS system, the frequency of outlier cases (15.3%) of appendectomy cases was not significantly different from that of outlier cases (14.7%) in T/PPS ( $p > 0.05$ ). The comparison of case numbers between T/PPS and FFS in different application amounts is shown in Table 1. 47 % of the T/PPS and 72 % of the FFS cases had requested an amount less than 30,000 NT.

Table 2 reveals comparisons of mean age, LOS, operation time and frequencies of outpatient follow up after discharge between T/PPS and FFS. It shows that LOS and operation time in FFS were significantly longer than those in T/PPS (both  $p < 0.01$ ). The male frequency in FFS (59.0 %) reveals no significant difference from that in T/PPS (55.6 %). The frequency of general anesthesia in FFS shows significant difference from that in T/PPS (72.0 % vs 53.5 %,  $p < 0.01$ ).

Table 3 shows comparison of fee for room service, treatment, pharmacy, examination (laboratory, radiograph and ultrasonography), operation, anesthesia and

Table 1. Comparison of case number, frequency and mean hospital cost in different application amount groups

	< 30000			30000-37500			> 37500		
	no.	%	mean	no.	%	mean	no.	%	mean
FFS	47	47.0	26316	28	28.0	33721	25	25.0	51040
T/PPS	71	71.7	25713	25	25.3	32494	3	3.0	44995

FFS: fee for service, T/PPS: Taiwan/prospective payment system

Table 2. Comparison of patient age, length of stay, operation period and frequencies of outpatient follow up

	FFS n = 100	T/PPS n = 99	p value
Age (yr)	30.8 ± 18.4	28.8 ± 17.0	NS
Length of stay (d)	6.63 ± 3.21	4.37 ± 1.47	< 0.01
Operation time (min)	97.5 ± 41.6	75.8 ± 32.3	< 0.01
OPD F/U (times)	1.52 ± 1.47	1.34 ± 1.37	NS

total hospital cost between T/PPS and FFS. The results show that except for operation cost, all the other costs in FFS were significantly higher than in T/PPS (all  $p < 0.01$ , except for anesthesia fee,  $p < 0.05$ ). The percentage decreases in fee for room service, treatment, pharmacy, examination, anesthesia and total hospital cost after the implementation of T/PPS were 35.1%, 33.5%, 34.3%, 25.3%, 9.2% and 19.0%, respectively.

The correlation result between total hospital cost and other variables in T/PPS and FFS is shown in Table 4. Except for the operation fee in T/PPS and the age in FFS, there existed positive correlations between total hospital cost and all other variables in T/PPS and FFS.

The comparison between operation wounds condition after discharge in T/PPS and FFS is shown in Table 5. There were no significant differences between T/PPS and FFS in the frequencies of post-appendectomy pain, removal of stitches at the hospital, the day of removing stitches and resuming normal activity. Thus, there have been no significant differences of

Table 4. Correlation studies between total hospital costs and different variables in T/PPS and FFS

	T/PPS	FFS
Length of stay	0.715	0.740
Operation time	0.619	0.383
Age	0.298	0.131*
Fee for		
Room rate	0.649	0.873
Treatment	0.536	0.790
Pharmacy	0.697	0.876
Examination	0.506	0.820
Operation	0.181*	0.262
Anesthesia	0.594	0.500

\*  $p > 0.05$

Table 3. Comparison of different hospital cost between T/PPS and FFS

	FFS n = 100	T/PPS n = 99	P value
Room rate	4376 ± 2528	2939 ± 1142	<0.01
Treatment	1155 ± 975	768 ± 760	< 0.01
Pharmacy	6850 ± 5337	4504 ± 2441	<0.01
Examination	2451 ± 1639	1830 ± 996	<0.01
Operation	9564 ± 1811	9634 ± 456	NS
Anesthesia	6920 ± 1813	6295 ± 1606	<0.05
Total	34571 ± 12158	28010 ± 4724	<0.01

clinical outcome between T/PPS and FFS since the implementation of FFS.

## DISCUSSION

In recent years there have been several studies concerning T/PPS in our country. Liao *et al.*[3] reported that with the implementation of T/PPS, total medical expenses for TURP decreased from 52,830 to 40,640 (23.1%). With the same operation, Chang *et al.*[4] reported that the amplitude of the total medical expense decrease was significantly lower than that of Liao *et al.* In our study, the percentage decreases in total hospital cost, room rate, treatment, pharmacy, examination and anesthesia were 19.0%, 35.1%, 33.5%, 34.3%, 25.3% and 9.2%, respectively. In the United States, since the implementation of DRG-PPS, there was 20% decrease in Medicare in 1990. [5]

Besides the decrease in medical expense, there was also a decrease in LOS after the T/PPS. For TURP

Table 5. Comparison of clinical outcome of appendectomy between T/PPS and FFS

	FFS	T/ PPS	p value
Post-appendectomy pain freq	32/73	23/73	NS
Clear incision wound freq	39/44	36/42	NS
Removal of stitch freq	57/70	58/64	NS
Removal of stitch at hospital (d)	7.7 ± 1.5	7.6 ± 2.3	NS
Resuming normal activity (d)	11.2 ± 7.9	12.9 ± 10.9	NS

and by using clinical pathway, Liao *et al.* [3] demonstrated that the LOS decreased from 8.67 to 6.42 days (26% decrease). The percentage decrease in LOS was significantly higher than that of Chang *et al.* [4]. They explained that Chang's hospital had more restrictive price controls than Liao's hospital [4]. Our study showed that there has been a 34.1 % decrease of LOS since the implementation of T/PPS. In the United States, with the implementation of PPS, the LOS decreased from 10.0 days in 1983 to 8.5 days in 1989 [6]. For pneumonia, congestive heart failure, acute myocardial infarction, stroke and total hip fracture, the average LOS was 14.4 days in 1982 and 11.0 days in 1986 [7].

Our study demonstrated that the operation time in FFS ( $97.5 \pm 41.6$  minutes) was significantly longer than that in T/PPS ( $75.8 \pm 32.3$  minutes) ( $p < 0.01$ ). This difference was probably due to the anesthesia method. FFS had significantly higher general anesthesia frequencies (72.0%) than T/PPS (53.5). In FFS, the paid amount of general anesthesia was NT 3850, instead of NT 2750 for epidural anesthesia. Surgeons usually also favor general anesthesia for suspected complicated appendicitis, such as peritonitis or uncertain diagnosis.

In the United States, the major clinical concern about the PPS was that patients might have poorer outcomes due to cost-cutting incentives that went beyond eliminating unnecessary or marginally beneficial care to actually restricting necessary care. Specific concerns centered on the decrease in LOS that might lead to increased nursing home admissions, more permanent nursing home placements, increased hospital readmissions, or a higher mortality rate [8]. According to the study of Kahn *et al.* [9] the introduction of the PPS was not associated with a worsening of severity-adjusted mortality rates either during admission or up to 180 days following admission for the five diseases studied. The absence of a higher readmission rate after the PPS provides further reassurance that the quality of clinical care of patients did not deteriorate. The reports by Kahn *et al.* [10] and Rubinstein *et al.* [11] directly address the extent to which the introduction of the PPS was associated with changes in the care process for five diseases. Essentially, they did not find a direct negative effect on the things physicians did for the patients.

Compared with the 1981-1982 period (before the introduction of PPS), Rogers *et al.* [12-14] demonstrated that during the 1985-1986 period (after the introduction of the PPS), the incidence of sickness at admission was higher, in-hospital processes of care

were better, the number of patients discharged in unstable condition was higher, and mortality rates both 30 and 180 days following admission were lower or unchanged. In our study, the frequencies of post-appendectomy pain, clear incision wound at discharge, removal of stitches at hospital, the days of removing wound stitch, and resuming normal activity of patient all showed no significant difference between T/PPS and FFS. Thus, it seemed that there were no significant differences between T/PPS and FFS in clinical outcomes of appendectomy.

Warner *et al.* [15] demonstrated that an evidence-based appendicitis pathway decreased duration of hospitalization and cost without adversely affecting diagnosis or therapy. Clinical pathway for surgical diagnosis may prove useful as a means to minimize costs without compromising patient care.

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## 急性闌尾炎切除術論病例計酬前後 其醫療花費及臨床結果之比較

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我國自民國 84 年 3 月 1 日實施全民健康保險以來，由於醫療支出不斷增加，於民國 86 年 10 月增加闌尾切除術等九項目試行「論病例計酬」。本研究之目的即以闌尾切除術為例，比較論病例計酬支付制度實施前後對醫學中心此類病患住院天數、住院總費用等項目之差異，以及臨床結果有否改變。本研究收集南部某醫學中心自民國 86 年 4 月 1 日至同年 9 月 30 日連續性所有接受闌尾切除術之論量計酬有效個案 100 例，及自 86 年 10 月 1 日至 87 年 3 月 31 日連續性所有闌尾切除術之論病例計酬有效個案 99 例。以回溯性方法由病歷收集並分析病患性別、年齡、住院日數、手術時間、麻醉方法、出院後回門診追蹤次數及這些病例申報金額之各項費用。研究結果顯示：住院日數及手術時間在論病例計酬者均較論量計酬者統計學上有意義的減少(兩者  $p < 0.01$ )，而住院總費用、病房費、處置費、藥費、檢查

費及麻醉費，論病例計酬者亦均較論量計酬者低(除麻醉費  $p < 0.05$  外，其餘項目  $p < 0.01$ )。論病例計酬及論量計酬其總住院金額與住院日數、手術時間、病房費、治療處置費、藥費、檢查費及麻醉費均呈正性相關(所有  $p < 0.01$ )。論病例計酬者其住院日數亦與手術時間成正性相關(所有  $p < 0.01$ )。論病例計酬實施後相關醫療品質中的臨床結果，本研究以電話追蹤出院患者，得到論量計酬有效例 73 例及論病例計酬有效例 73 例，結果顯示：出院時傷口仍痛、傷口已乾、拆線地點在該醫學中心比例，在論量計酬者與論病例計酬者均無有意義之差異(所有  $p > 0.05$ )，而二者在手術後第幾天拆線及手術後第幾天回復正常工作上亦均無統計學上有意義之差異(兩者  $p > 0.05$ )。本研究結論是論病例計酬支付制度之實施的確可降低住院天數及總住院費用，但其臨床結果顯示也無差異。

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