Do Closed-system Hospitals Shift Care under Case Payment? Early Experiences Comparing Five Surgeries in Taiwan

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Background: Recently, Japan, Korea, and Taiwan have adopted prospective payment systems (PPS) for healthcare. Experiences of the United States Medicare show that PPS reduces length of stay but creates incentives to shift care from regulated to un-regulated settings. In this study we investigated whether closed-system hospitals in Taiwan responded to case payment (CP) – one type of PPS, and if so, how this was managed.

Methods: Data were derived from three Taiwanese hospitals for five different surgical procedures (N = 22,327). The study period covered from October 1996 through August 1999, with CP commencing on October 1, 1997. Important dependent variables included inpatient medical claims, outpatient medical claims, and number of outpatient visits. Outpatient utilization from the period four weeks prior to admission and four weeks following discharge were merged for each patient. Ordinary Least Square (OLS) and Poisson regression were used to test the study's shifting hypotheses, controlling for gender, age, patient diagnoses, and institution attended.

Results: Length of hospital stay, amount of inpatient claims, and inpatient x-ray and lab-test claims were significantly reduced after CP. Corresponding OLS coefficients for the second year of implementation were, respectively, –.86, –.06, –.15, and –.04 ($p < 0.01$). Significant forward shifting of outpatient care, (79%), was found during the second year of CP. Despite the care-shifting effects noted herein, the average per-capita total claims reduced by 12%. Significant institutional effects were associated with the pattern of care-shifting.

Conclusions: Our results indicate that CP reduced total claims for the selected surgical procedures, even under evident forward care-shifting.

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Key words: prospective payment systems (PPS), case payment, care-shifting, closed-system hospital, health care utilization, Taiwan

Healthcare cost containment is a major problem faced by most countries today. Internationally, major efforts have been focused on designing schemes for payment to care providers who make medical decisions. One particular example is a "prospective-payment" system (PPS), which takes

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health care as a series of fixed-price "bundles" so as to build incentives for providers to reduce unnecessary care provisions. Early applications of such these PPSs were undertaken in the United States. Medicare Diagnosis-Related-Groups (DRGs) developed a system where certain medical care activities of a similar cost were grouped together and assigned appropriate lump-sum payments from insurers in advance. Evidence deriving from such a model suggests that the introduction of a PPS reduced the average length of hospital stay, but created incentives for providers to shift patient care-shift partial services from a regulated setting to an un-regulated setting.[1] The relative dimension of such a care-shifting effect would appear to have been somewhat limited for the case in the U.S. where most physicians and hospitals practice independently of each other.

Recently Japan, Korea, and Taiwan have also adopted the PPS for their national health insurance systems, although the extent and timing of the implementation varied widely between these three countries. Japan adopted Diagnosis and Procedure Combinations (DPCs) in April 2003 for 82 institutions as a part of its structural reforms for the healthcare system for major public hospitals. In Japan, the insurance system pays for acute inpatient care on a per-diem basis, with a declining fee schedule that varies with hospitals' average length of stay. This DRG-like system is applied with great limitation in Japan, however, since only % 10% of all Japanese hospitals are using an International Classification of Disease coding system as a basis for DPCs.[2] Korea developed its PPS based upon the Yale Refined DRG system and started practicing the system in February 1997. The Korean PPS was implemented on a voluntary basis, with a limited scope of nine procedures defined using 25 DRG codes. The number of participating Korean healthcare institutions was 54 in 1997, the figure increased to 798 in January 2000. The DRG fee schedule for participating Korean institutions was set, on average, to a figure 23.8% greater than the comparable fee-for-service level so as to encourage participation of health-care institutions.[3] Taiwan first applied a PPS to its national health insurance system at a comparatively comprehensive level in 1997. The number of applicable medical procedures was 22 upon PPS commencement, this being extended to 53 institutions in 2005.[4]

It would thus appear that we could learn very different lessons from the Taiwanese system as compared with that of the United States. In contrast to the open-hospital systems in the United States, the recent applications of PPS in countries such as Japan, Korea and Taiwan have tended to focus upon inpatient care that was mostly delivered within closed-system hospitals. Such experiences appear to raise the question "How would closed-from hospitals respond to the introduction of a case payment (CP) system?" In order to treat patients efficiently, the management of these hospitals can plan on when and where a specific care is to be provided to a patient, thus "un-bundling" a package of care between regulated inpatient and un-regulated outpatient departments. On the one hand, total patient care utilization may decrease due to improvements in hospital-operating efficiency.[5] On the other hand, as a consequence of cost-saving, hospitals may discharge patients earlier than would otherwise be the case, with such a practice resulting in more post-discharge re-admissions or more post-discharge use of outpatient-care. A further question thus arises, "Under such circumstances, would the introduction of a CP system reduce overall patient care utilization for closed-system hospitals?" Herein, we aim to shed some light upon the impact of the adoption of PPS for hospitals, by examining some empirical evidence relating to hospital operations in Taiwan.

Case payments in Taiwan

The prospective payment system considered in this study, the CP system, is a part of the Taiwanese National Health Insurance Bureau (NHIB) payment scheme. The national insurance started in March 1995. A typical hospital in Taiwan generates about half of its overall revenue from its outpatient department. Physicians and hospitals are, by and large, highly integrated in Taiwan in terms of management, governance, and risk-sharing, and most hospitals operate almost entirely within a closed-system. As such, hospitals typically employ physicians, design physician-payment schedules, recruit assistants, and share information with physicians. In addition, medical doctors are typically required on boards which design and direct management strategies for such institutions Most of the small hospitals in Taiwan are run exclusively by physicians.

Commencing in 1997, the NHIB adopted case payments for 22 major medical procedures. Most of

these 22 procedures necessitated inpatient stays, and included surgical procedures such as appendectomies, Caesarean sections, and prostatectomies. For each such procedure, the NHIB and medical associations negotiated and defined basic and optional care options that included separate and defined lists of tests, examinations, and medical treatments. The specific payment levels for these defined medical procedures were calculated from the national average charges for such procedures. For each procedure, hospitals are paid a fixed amount by the NHIB according to an accredited classification of hospitals. Around one half of the total numbers of such procedures feature a "65% execution" requirement. This 65-%-requirement calls for a penalty when less than 65% of the basic items are executed during the care period for a specific patient. In order to reduce the financial risk born by hospitals, some specified medical procedure features a threshold for the fee-for-service (FFS). For each of these procedures, the top 10 to 15% % of patients whose medical-cost claims are so high above the specific CP thresholds that their hospitals are allowed to be reimbursed on a fee-for-service basis. Meanwhile, all outpatient care is still reimbursed on a FFS basis. Surgery-related examinations within a 2-week interval around a patient hospital episode are included in the CP payment without any extra payment being generated.[6,7]

The partial change in the payment system that arose in Taiwan in 1997 constituted the basis for a natural experiment to test the effects of the introduction of a CP system within an integrated physician-hospital setting. While the financial incentives for hospitals appeared to be similar to those underpinning DRGs in the United States, it appeared to be easier to shift some medical tests to the outpatient sector where physicians are employed by the hospitals and when they work in both outpatient and inpatient departments at the same organizations. Some evidence to date suggests that the introduction of a PPS reduced the average length of patient hospital stay and inpatient-care utilization,[6,7] however, as best we are aware, the potential care-shifting effects of the PPS introduction have not been carefully examined. Doubts have been expressed with regards to the PPS's overall cost-containment effects due to the potential increases in readmission and surgery volumes that may arise under such as system.

The shifting effects under PPS

Earlier researchers concluded that the PPS have created substantial, although one-time, reduction in the length of stay and corresponding utilization. Several types of shifting have been identified.[1] On a national level, Russell and Manning[8] found that inpatient surgeries were shifted to outpatient settings, but the net effect was a decrease in the total Medicare expenditures. Hadley et al.[9] analyzed the Annual Survey of Hospitals and found that PPS increased annual outpatient visits more than 10%, but reduced the number of impatient discharges by 8 to 9%. Newhouse and Byrne[10] reported the shift of patients from PPS-regulated hospitals to un-regulated facilities at the patient-admission stage. Menke[11] used linked Part-A and -B data from 1983 through 1986 from four states to show large increases in outpatient expenditures at the patient level. Outpatient expenditures 7 days around a hospital episode increased 50 to 186% for two-thirds of the DRGs investigated, although the relative magnitude was rather small in dollar terms. Mitchel et al.[12] used the same database to show that decreased hospital outpatient visits following introduction of PPS were offset by increased office visits, with each changing by about 21%. Wickizer et al.[13] reported another type of cost containment scheme, namely "utilization review", a scheme which was associated with modest, but measurable, substitution of outpatient for inpatient care. Outpatient expenditures increased by about 20% or US$9 on average.

In fact, care-shifting, either forward or backward, may be a signal of efficient care provision by hospitals. One major purpose of a PPS is to care for patients in a more efficient way.[3] In so doing, hospitals may adopt specific clinical pathways to help medical personnel keep necessary steps in check.[14] Variations in utilization is thus likely reduced. The pressure towards efficiency may differ between hospitals, with the for-profit hospitals likely being tempted to substitute outpatient care for expensive inpatient care.[15] Further, care-shifting typically signals hospital behavioral changes.[10]

Unfortunately, most studies relating to the shifting of care tended to focus on expenditures, except for Menke[11] and Mitchel et al.[12] While the two studies agreed that Medicare PPS increased outpatient utilization, they appeared to not agree with regards to PPS's effect upon total care savings, and the authors

provided little insight into the actual pattern of care-shifting. Thus, we are unable to determine whether outpatient utilization prior to surgery, or that subsequent to surgery, or both increased due to the introduction of PPS. Previous researchers also failed to provide details with regards to the relative magnitude and pattern of care-shifting under closed-system hospitals. However, knowing how a PPS works under the closed-system will help policy makers to assess potential savings offered by a PPS, and to more accurately evaluate the likely consequences for patients. Thus, herein, we ask and attempt to answer the following questions. Firstly, Do closed-system hospitals shift care under a CP? Secondly, if CP-elicited care-shifting does occur, what are the patterns and relative magnitude of such care-shifting? Lastly and particularly, Will the CP-elicited care-shifting effect be greater than that found in open systems?

METHODS

Data source

The data used herein are claims data with detailed utilization records from three teaching hospital branches of the Chang Gung Memorial Hospital, Taiwan. These three hospitals are nonprofit and operate under one administration center that purchases medicines and equipment for all three hospitals. These three institutions differ in scale, outpatient dependency, and occupancy rates, as shown in Table 1. Hospital A, located in the north of the island, is the largest medical center and features the highest occupancy rate. Hospital B is a smaller medical center located in the south of Taiwan, and it features the lowest average occupancy rate (90.5%). Hospital C is the smallest and is the most outpatient-dependent hospital of the three, as judged on the basis of average visits per bed (98) or per admission (32.4). The differences in the relative scale and in the relative importance of the outpatient department imply that their costs for inpatient and outpatient care may differ significantly. Together, the three hospitals account for a significant proportion of the national pool of hospital claims made to the Taiwan's National Health Insurance (NHI) program, from 8.1% to 9.73%, depending upon the number of inpatient discharges or outpatient visits as shown in the last column of Table 1.

Sample

The study sample period continued from October 1996 through August 1999. Patients who had undergone selected surgical procedures and were discharged during the time period were included. Claims data were longitudinal at the patient level. Each patient's corresponding outpatient utilization data within 4 weeks of admission to 4 weeks subsequent to discharge were merged from the hospitals' outpatient claims. Five surgical procedures: appendectomy, hemorrhoidectomy, herniorrhaphy, laparoscopic cholecystectomy and prostatectomy, were selected based upon their implementation date and also upon the number of patients treated. All such procedures had been paid for by case payments from October 1997, and all procedures featured an average frequency of at least 50 procedures per month. Exclusions included outliers whose medical utilization were at the top 10 to 15% of the current monthly claims and exceeded the FFS floor. Appendectomy was assumed to feature the lowest probability of shifting care forward because patients suffering appendicitis usually come through the emergency department. A brief overview of procedure selection criteria and relevant regulations are shown in Table 2. Of the five procedures, Herniorrhaphy, Laparo-

Table 1. Inpatient and Outpatient Capacities by Hospitals, 1997

	A	B	C	NHI annual hospital figures	Estimated % of annual NHI hospitals
Beds	3814	1817	693	72669*	8.70*
Average monthly visits	336000	148000	68000	6814000*	8.10*
Average occupancy rate	94.7%	90.5%	91.2%	63.06%†	147.65†
Average monthly discharge	11000	5300	2100	2270000*	9.73*

Source: *: National Health Insurance Annual Statistical Report; †: Health and Vital Statistics.

Table 2. Definitions of Cases

	65% Requirement	Allowed days	Case payment schedule in NT$ (lower bound for FFS payment)		
			A	B	C
Appendectomy		5	30000 (37500)	29000 (37500)	29000 (37500)
Hemorrhoidectomy		4	22100 (27500)	21600 (27500)	21600 (27500)
Herniorrhaphy	X	3	20500 (24000)	19900 (24000)	19900 (24000)
Laparoscopic cholecystectomy	X	7	52890 (60000)	52890 (60000)	52890 (60000)
Prostatectomy	X	8	46200 (53000)	46200 (53000)	46200 (53000)

scopic Cholecystectomy, and Prostatectomy were under the 65% requirement. Payment levels and length of stay (LOS) allowances varied between procedures. While three of the five procedures had payments slightly different across hospitals due to differences in hospital accreditation, such differences in payment levels were minimal. Patients were divided into before- and after-case payment groups. All dollar amounts referred to in this study are expressed in New Taiwanese (NT) dollar, because the exchange rate of NT dollars to US dollar fluctuated considerably during the sample period. The annual averages were US$1 for NT$27.49 to NT$33.70 between 1996 and 1998. All expenditure figures were deflated by the consumer price index's medical expenditure component.

Statistical analysis

Simple Student's *t*- tests and chi-square tests were used to examine whether there were significant differences between the before-CP and after-CP samples. Ordinary Least Square (OLS) regressions were used to test the shifting hypotheses, in particular, whether any decrease in inpatient care and increase in outpatient care had arisen. Poisson regressions were used to analyze the changes in the numbers of outpatient visits associated with the introduction of a CP. The net effects of CP upon total claims were also analyzed using OLS regressions.

RESULTS

Table 3 presents a summary of the sample characteristics. Our primary independent variables were the first-year and second-year of operation of the CP system. The first year for CP started from October 1997 and ran through September 1998 was noted as CP1. The second year of CP operation was defined as the time period spanning October 1998 through August 1999, this being the time when relevant data were last available, and was noted as CP2. Thus, we were able to extend the observation period beyond the usual 1-year period. Other independent variables included age, gender, number of diagnoses, hospitals, and procedures. There were no significant differences between the two sets of samples in terms of age and gender. However, patient health, as measured by the number of diagnoses, deteriorated slightly. Here we were unable to determine whether the deterioration was due to up-coding or due to other hospitals' dumping severe cases. We suspect both occurred. The mixture of hospitals and the mixture of procedures changed slightly but significantly between the two samples. The increase in the number of low payment procedures indicates that other hospitals may be dumping severe cases. Despite the above changes, average inpatient utilization decreased in general, with the exception of a slight increase in inpatient lab tests.

Important dependent variables were inpatient and outpatient utilization, shown in the lower part of Table 3. Inpatient utilization was measured as the amount of individual insurance claims, length of stay (LOS; in days), and claims on x-ray and lab tests. Outpatient utilization within 4 weeks of admission and discharge were summarized into the number of visits, amount of claims, and whether patients used outpatient care, before and after the surgical procedures separately. A slight increase in outpatient utilization appeared to occur during the period prior to admission, from an average 1.48 uses to 1.68 uses per patient. The increase in utilization was due to a greater number of patients using outpatient care as well as to an increase in care intensity, since the proportion of patients using any outpatient care prior to surgery increased from an average 80 to 86%, the

Table 3. Sample Characteristics

	Before case payment N = 7399	After case payment N = 14928
Patient		
Age (years)	46.9 (19.2)	47.1 (19.2)
No. of diagnoses	1.31 (0.58)	1.41 (0.77)*
female %	35	35
CP1 first year CP = 1		0.52
CP2 second year CP = 1		0.48
Hospital A = 1	0.58	0.54†
Hospital B = 1	0.28	0.31†
Hospital C = 1	0.14	0.15
Appendectomy %	18.39	20.22†
Hemorrhoidectomy %	11.88	15.04†
Herniorrhaphy %	10.95	13.24†
Laparoscopic cholecystectomy %	40.83	34.04†
Prostatectomy %	17.95	17.45
Health care utilization		
Inpatient amount $	24,978 (9,650)	25,236 (9,846)
Length of stay	4.0 (2.16)	3.46 (1.67)†
X ray $	259 (638)	216 (482)*
Lab test$	1,410 (839)	1,463 (757)*
Outpatient number of visits		
Before surgery	1.48 (1.52)	1.68 (1.57)*
After surgery	2.32 (1.62)	2.01 (1.57)*
Outpatient claims		
Before surgery $	2,267 (4,145)	2,294 (4,115)
After surgery $	3,141 (4,428)	2,351 (4,512)*
With any outpatient use		
With outpatient use before admission %	80	86†
With outpatient use after discharge %	97	91†

*: Statistically significant at .01 level by t test; †: Statistically significant at .01 level by chi-square test. Figures in parenthesis are standard deviations.

Table 4. Multiple Regression Analyses of Inpatient Utilization

	(1) Length of stay	(2) Log ($ inpatient)	(3) Log ($ x ray)	(4) Log ($ lab test)
Case payment year 1	–.60*	–.02*	–.07*	.04*
	(.03)	(.002)	(.03)	(.01)
Case payment year 2	–.86*	–.06*	–.15*	–.04*
	(.03)	(.002)	(.03)	(.01)
Age	.01*	.0003*	.01*	.001*
	(.001)	(.000)	(.001)	(.000)
Gender female = 1	–.05	–.01*	.002	.003
	(.02)	(.002)	(.03)	(.01)
No. of diagnoses	.41*	.05*	.02	.11*
	(.02)	(.001)	(.02)	(.003)
Hospital B	.11*	.04*	–.16*	.01*
	(.02)	(.002)	(.02)	(.005)
Hospital C	.40*	.001	–.03	.0003
	(.03)	(.003)	(.03)	(.006)
Hemorrhoidectomy	–1.38*	–.21*	4.21*	.16*
	(.03)	(.003)	(.03)	(.006)
Herniorrhaphy	–1.66*	–.40*	4.03*	.33*
	(.04)	(.003)	(.04)	(.008)
Laparoscopic cholecystectomy	.20*	.56*	4.42*	.74*
	(.04)	(.004)	(.04)	(.008)
Prostatectomy	.21*	.32*	4.62*	.79*
	(.05)	(.004)	(.05)	(.01)
Intercept	3.975*	10.09*	.10*	6.74*
	(.04)	(.003)	(.04)	(.008)
Adjusted R-square	.3150	.8416	.5632	.5125

*: Statistically significant at .01 level. Figures in parenthesis are standard errors.

average claims also increasing from $2267 to $2294. Outpatient utilization subsequent to discharge, however, decreased on all counts.

OLS regression results indicate that case payment effects are large and significant. The estimated OLS coefficients during the first year were –0.6, –0.02, –0.07, and 0.04, respectively, as shown in Table 4. All inpatient claims decreased continuously into the second year of CP, with the reductions being greater in the second year of CP. Estimated OLS coefficients were –0.86, –0.06, –0.15, and –0.04, respectively. The lab test expenditures were an exception to this trend, the claims rising in the first year of CP then decreasing during the second year of CP. Compared with the FFS period, average inpatient stay decreased by 0.6 day during the first year of CP, and 0.86 days during the second year. Column (2) shows that total inpatient utilization also dropped significantly, by 2% during the first year of CP, and 6% during the second year, following Wickizer's calculations.[13] The drop was smaller than the 14% reported in Korea.[3] Inpatient X-ray claims [column (3) in Table 4] decreased by as much as 15% during the second year. Translated into simulated inpatient utilization, these figures indicate that expected length of stay decreased between 12 to 19% during the first year post CP, with an additional 6 to 11% reduction during the second year, for a 40-year-old male who

had undergone appendectomy in hospital A with no complications and other diagnosis. Significant differences were noted between hospitals and procedures, as captured by the procedure- and hospital-specific dummy variables. Despite significant differences between the hospitals' LOS, the major differences in inpatient expenditures were associated with the differences across procedures rather than differences between hospitals.

On the outpatient side, we analyzed outpatient utilization pre-admission, post-admission, and also total utilization, separately. Table 5 summarizes Poisson regression results for the number of outpatient visits. Column 1 shows that outpatient visits within 4 weeks prior to admission increased significantly during the second year of CP. Column 2 reveals that outpatient visits within the 4 week period subsequent to discharge increased during the first year but declined during the second year, which was indicated by the coefficient –0.44. As a result, the total outpatient visits within 4 weeks of a hospital episode increased during the first year, but decreased during the second year of CP. The estimated coefficients were 0.05 and –0.15, as is shown in column 3. This simultaneous decline in inpatient care and increase in outpatient care is consistent with the care-shifting hypothesis, especially when the increase in visits was concentrated during the pre-admission period, allowing for x-rays and tests to be undertaken and completed prior to admission.

Table 5. Poisson Regression Analyses of Outpatient Visits

Dependent variables	(1) visits 4 weeks before	(2) visits 4 weeks after	(3) visits 4 weeks before and after
Case payment year 1	.01	.08*	.05*
	(.01)	(.01)	(.01)
Case payment year 2	.17*	–.44*	–.15*
	(.01)	(.01)	(.01)
Age	.004*	.002*	.002*
	(.0003)	(.0003)	(.0002)
Gender female = 1	.05*	.01	.03*
	(.013)	(.01)	(.01)
No. of diagnoses	.06*	.08*	.07*
	(.007)	(.01)	(.004)
Hospital B	.03*	.07*	.06*
	(.01)	(.01)	(.01)
Hospital C	.08*	.38*	.26*
	(.02)	(.01)	(.01)
Hemorrhoidectomy	.60*	.13*	.27*
	(.02)	(.01)	(.01)
Herniorrhaphy	.59*	–.37*	–.01
	(.02)	(.02)	(.01)
Laparoscopic cholecystectomy	1.02*	–.18*	.31*
	(.02)	(.02)	(.01)
Prostatectomy	1.11*	–.15*	.36*
	(.03)	(.02)	(.02)
Interceptq	–.47*	.69*	.95*
	(.02)	(.02)	(.01)
Log likelihood	–34158	–36593	–45676

*: Statistically significant at .01 level. Figures in parenthesis are standard errors.

From our investigation, however, outpatient utilization not only significantly differed across procedures, but also differed significantly across hospitals, in contrast to inpatient utilization presented in Table 4. While all procedures revealed greater levels of outpatient care prior to surgeries than was for those undergoing appendectomies, when compared with the largest hospital A, the two smaller hospitals appeared to use significantly more unregulated outpatient care. This may be because undertaking care-shifting is easier in a smaller setting than in a larger setting, or because the smaller hospitals were more inefficient at providing care, thus allowing for more-significant levels of improvement for smaller institutions. The difference of outpatient utilization between hospitals cannot be entirely explained by their tendency of providing more outpatient care, since historically only hospital C was more dependent on outpatient care.

Similar patterns emerged when outpatient claims were considered. The first row of Table 6 (columns 1 to 3) shows that outpatient claims prior to and subsequent to hospital admission increased during the first year of CP, as expected. The most striking results were found to exist in outpatient claims prior to and following surgeries during the second year of CP. This shows strong evidence of care-shifting which warrants some time for reflection upon the impact. The estimated OLS coefficients during the first year of CP operation were 0.04, 0.08, and 0.06, and during the second year of CP, 0.79, –1.17, and –0.61. While outpatient visits prior to surgery increased by about 79% during the first year

Table 6. Multiple Regression Analyses of Outpatient and Total Utilization

Dependent variables	(1) Log ($ outpatient) 4 weeks before	(2) Log ($ outpatient) 4 weeks after	(3) Log ($ total outpatient)	(4) Log ($ total inpatient + outpatient)
Case payment year 1	.04	.08*	.06*	–.02*
	(.04)	(.03)	(.02)	(.003)
Case payment year 2	.79*	–1.17*	–.61*	–.12*
	(.04)	(.03)	(.02)	(.003)
Age	.01*	.01*	.01*	.002*
	(.001)	(.0001)	(.0004)	(.0000)
Gender female = 1	.15*	.08	.07*	.001
	(.04)	(.03)	(.02)	(.003)
No. of diagnoses	.12*	.23*	.19*	.07*
	(.03)	(.02)	(.01)	(.002)
Hospital B	.24*	.15*	.17*	.04*
	(.4)	(.03)	(.02)	(.003)
Hospital C	.14*	.56*	.36*	.03*
	(.05)	(.03)	(.02)	(.004)
Hemorrhoidectomy	2.21*	–.27*	–.44*	–.26*
	(.07)	(.03)	(.02)	(.004)
Herniorrhaphy	1.57*	–1.18*	–1.21*	–.49*
	(.06)	(.04)	(.03)	(.005)
Laparoscopic cholecystectomy	2.25*	–.81*	–.42*	.43*
	(.07)	(.04)	(.03)	(.005)
Prostatectomy	2.87*	–.37*	–.17*	.24*
	(.08)	(.05)	(.03)	(.006)
Intercept	3.44*	7.10*	8.03*	10.25*
	(.07)	(.04)	(.03)	(.005)
Adjusted R-square	.153	.168	.202	.737

*: Statistically significant at .01 level. Figures in parenthesis are standard errors.

of CP, outpatient visits subsequent to surgery decreased by as much as 117% compared with the FFS period. The combined effect is that the case payment system was associated with a modest 6% increase in total outpatient claims during CP year 1, but was associated with a sharp 61% decrease during CP year 2. Average total claims decreased more during year 2, whereas outpatient visits following discharge decreased, indicating that pre-mature discharge is unlikely to be a problem within the 3-hospital system. While some outpatient care appeared to be shifted forward, this effect is out-weighted by a reduction in the amount of care given following discharge. As a result, total inpatient and outpatient claims under a CP system reduced significantly as shown in Table 6 column 4. Despite apparent inpatient to outpatient care shifting during year 1, total claims decreased 2%, controlling for other variables. The care-shifting effects were stronger during year 2, a time when care-shifting appeared to concentrate during the pre-admission period and all other claims decreased significantly. These results indicate that it does take some time for hospitals to adjust their operational protocol converting from a FFS system to a CP system.

DISCUSSION

Our results provide evidence of care-shifting under a case payment scheme within closed-system hospitals. As a consequence of the introduction of a CP system, patient LOS decreased significantly. Such a decrease is consistent with the results found in reports from the United States,[1,16] Korea[3] and Taiwan.[17] Outpatient care prior to surgery increased 79% during CP year 2. With an average outpatient claim of NT$2000, such an increase is equivalent to an increase of about NT$1600, or US$46 for a representative patient, the largest shift in dollar terms so far.

Despite this observed shift in care, the overall impact of the case payment is encouraging. Total claims decreased an average 12% during the second year of CP implementation. In addition to the decrease in total claims, the outcomes measured by post-surgery outpatient visits also showed improvement. The average number of visits decreased from 2.32 to 2.01, and the probability of any outpatient use decreased from 97% to 91%, similar to that reported by Lin et al.[18]

The differences in the relative magnitude of care-shifting between our study and that reported in previous studies arises partly from the fact that a number of past studies did not distinguish between outpatient care received prior to admission and outpatient care received subsequent to discharge. Therefore, earlier results were typically a net of offsetting effects. However, the large amount is not equivalent to the highest shift in the proportion. Some question why the forward shift in care not pro-

portionally greater. After all, Menke[11] reported some outpatient charges increased as much as 186%, without the integration of the closed-system hospitals. We believe that the reason lies in the difference in initial conditions. Our sample hospitals already had large outpatient volumes and high average occupancy rates, features which may increase the difficulty of shifting care. In particular, a clinical-care pathway for prostatectomy had been introduced at Hospital A as early as 1995,[14,19] a situation which may help explain the significant institutional differences apparent from our investigations, and also the lower percentage of outpatient care-shifting, as identified in our study.

We suggest here, that our study adds important information to the existing literature in that, despite the same ownership for study hospitals, uniform purchase costs, and physician fees design, different hospitals still demonstrate significant differences in their general utilization and in their care-shifting decisions, including the specific timing of the adoption of clinical-care pathways. These findings imply that ownership[6] or payment level[20] alone cannot fully explain the responses of hospitals to the CP system. In order to better understand the full effects of payment incentives, we need to know more about hospital cost structures and their consequences.

Limitations

The study was limited in several perspectives. Firstly, by simply calculating the outpatient care within the 4 weeks prior to and subsequent to hospital episodes, we may have included outpatient care unrelated to surgeries. Our underlying assumption was that the probability of including unrelated outpatient visits was the same before and after the implementation of a case payment system. So far, there has been no evidence to suggest that they differ in any way. Secondly, outpatient visits outside the sample hospitals was not examined. Similar limitations apply where institution effects are concerned. Despite the limitations above, it is clear that hospitals can shift care in a systematic way and still reduce overall utilization.

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REFERENCES

1. Coulam RF, Gaumer GL. Medicare's prospective payment system: A critical appraisal. Health Care Financing Review Annual Supplement 1991:45-77.
2. Ikegami N, Campbell JC. Japan's health care system: Containing costs and attempting reform. Health Affairs 2004;23:26-36.
3. Kwon S. Payment system reform for health care providers in Korea. Health Policy Plan 2003;18:84-92.
4. Bureau of National Health Insurance. The national health insurance annual statistical report. Taipei: Bureau of National Health Insurance, 2004.
5. Bazzoli GJ, Dynan L, Burns LR, Lindrooth R. Is provider capitation working? Effects on physician-hospital integration and costs of care. Med Care 2000;38:311-24.
6. Lin HC, Xirasagar S, Tang CH. Costs per discharge and hospital ownership under prospective payment and cost-based reimbursement systems in Taiwan. Health Policy Plan 2004;19:166-76.
7. Lang HC, Chi C, Liu CM. Impact of the case payment reimbursement method on the utilization and costs of laparoscopic cholecystectomy. Health Policy 2004;67:195-206.
8. Russell LB, Manning CL. The effect of prospective payment on Medicare expenditures. N Engl J Med 1989;320:439-44.
9. Hadley J, Zuckerman S, Feder J. Profits and fiscal pressure in the prospective payment system: Their impacts on hospitals. Inquiry 1989;26:354-65.
10. Newhouse JP, Byrne DJ. Did Medicare's prospective payment system cause length of stay to fall? J Health Econ 1988;7:413-6.
11. Menke T. Impacts of PPS on Medicare part b expenditures and utilization for hospital episodes of care. Inquiry 1990;27:114-26.
12. Mitchell JB, Wedig G, Cromwell J. The Medicare physician fee freeze: What really happened? Health Affairs 1989;8:21-33.
13. Wickizer TM, Wheeler JR, Feldstein PJ. Have hospital inpatient cost containment programs contributed to the growth in outpatient expenditures? Analysis of the substitution effect associated with hospital utilization review. Med Care 1991;29:442-51.
14. Chang PL, Huang ST, Wang TM, Hsieh ML, Tsui KH. Improvements in the efficiency of care after implementing a clinical-care pathway for transurethral prostatectomy. Br J Urol 1998;81:394-7.
15. Lin HC, Xirasagar S, Kao S. Association of hospital ownership with patient transfers to outpatient care under a

prospective payment system in Taiwan. Health Policy 2004;69:11-9.
16. Menke TJ, Ashton CM, Petersen NJ, Wolinsky FD. Impact of an all-inclusive diagnosis-related group payment system on inpatient utilization. Med Care 1998;36:1126-37.
17. Lin HC, Tung YC, Chen CC, Tang CH. Relationships between length of stay and hospital characteristics under the case-payment system in Taiwan: Using data for vaginal delivery patients. Chang Gung Med J 2003;26:259-68.
18. Lin HC, Xirasagar S, Kao S, Hwang CJ, See LC, Chuang YC. Association of hospital ownership with patient transfers to outpatient care under a prospective payment system in Taiwan. Health Policy 2004;69:11-9.
19. Chang WC, Lee CC, Wu HC, Yeh LS. Laparoscopy-assisted vaginal hysterectomy clinical pathway. A multivariate analysis of impact on costs and quality of care. Gynecol Obstet Invest 2003;55:231-4.
20. Hodgkin D, McGuire TG. Payment levels and hospital response to prospective payment. J Health Econ 1994;13:1-29.

封閉式醫院是否在前瞻性支付下移轉照護？台灣五項手術的初期經驗

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背 景： 近年來日本、韓國、台灣的國民健康保險紛紛採用前瞻性支付制度(PPS) 以節制醫療費用。美國Medicare 實施Diagnosis-Related-Groups (DRGs) 的經驗顯示：論病例計酬(CP) 雖然縮減住院天數，但也產生移轉照護的誘因 。本研究分析台灣的封閉式醫院是否移轉照護以因應前瞻性支付的論病例計酬。

方 法： 樣本來自 3 家醫院 5 種手術的病患，共計 22,327 人，研究期間自 1996 年 10 月至 1999 年 8 月，論病例計酬則於 1997 年 10 月 1 日開始實施。重要依變項包括住院申報費用以及術前、術後病患門診次數與申報費用，以及術前、術後 4 週內的門診次數。控制變項包括年齡、性別、實施論病例計酬的時間、診斷和機構別。我們以 Ordinary Least Square (OLS) 分析每位病患住院、門診申報費用，以 Poisson regressions 分析門診次數。

結 果： 論病例計酬之後，平均住院日、住院總費用、住院 x 光與檢驗費用顯著下降；OLS 估計CP 第2 年係數分別爲 –.86 、–.06 、–.15 、–.04 ($p < 0.01$) 。Poisson regression 估計手術前的門診次數顯著上升，而手術後的門診次數顯著下降 ($p < 0.01$)。第 2 年手術前的門診費用平均較實施前高 79%。考慮術前、術後 4 週內的門診和住院的總利用，即使有相當的照護移轉，論病例計酬仍然節省醫療的總利用約 12%，不同醫院照護移轉的幅度有顯著差異。

結 論： 台灣實施前瞻性支付 5 項手術的初期經驗顯示，論病例計酬節省醫療的總利用，並產生不同程度的術前門診照護移轉。

(長庚醫誌 2008;31:91-101)

關鍵詞： 前瞻性支付，論病例計酬，照護移轉，封閉式醫院，醫療資源利用，台灣

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