科技部補助專題研究計畫成果報告
期末報告

論日計酬制腦中風急性後期照護之成本效益分析：前瞻性及統合性研究(第2年)

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中 文 摘 要 ： 目的：探討不同住院途徑的醫療支付系統對腦中風急性後期照護（PAC）如何影響醫療資源利用率和功能狀況。
設計，設置和患者：針對台灣南部一家醫院181名急性腦中風患者進行縱貫性前瞻性性研究設計，將患者分為兩組：轉診至區域或地區醫院的患者（第1組）和轉診至醫療中心的患者（第2組）。
介入措施：介入措施是針對腦血管疾病患者以復健功能為導向的第3至第12週PAC復健治療計畫。
測量工具：Barthal量表，口服功能性量表，日常生活活動量表，EuroQoL生活品質量表和Berg平衡量表。
研究結果：第1組（9.88天）與第2組（17.11天）相比，其腦中風發病當天和入住PAC病房的平均住院時間顯著縮短（p <0.001）。第1組（25.51天）與第2組（34.11天）相比，其PAC的平均復健時間也顯著縮短（p <0.01）。最後，第1組（2637美元）與第2組（3,450美元）相比，其平均總醫療費用顯著降低（p <0.01）。接受PAC復健治療的患者其功能狀態明顯改善（p <0.05）。但是，兩組的功能狀況並無顯著差異。
研究結論：降低PAC腦中風患者總醫療費用的最有效方法是盡量縮短病患轉介到PAC病房的住院日數，因為它大大降低了醫療成本，康復PAC應被視為中風患者的標準護理。

中 文 關 鍵 詞 ： 中風; 急性後期照護; 復健; 論日計酬; 成本效益分析

英 文 摘 要 ： Objective: To explore how post-acute care (PAC) for stroke patients delivered by per-diem payment system in varying hospitalization paths affects medical care utilization and functional status.
Design, setting and patients: A longitudinal prospective cohort study of 181 acute stroke patients in a southern Taiwan hospital and patients were separated into two groups: patients transferred from regional hospitals (group 1) and patients referred from medical centers (group 2).
Intervention: The intervention was a hospital based, function oriented, 3- to 12-weeks rehabilitative PAC intervention for patients with cerebrovascular diseases.
Measurements: Barthal Index, Functional Oral Intake Scale, Instrumental Activities of Daily Living Scale, EuroQoL Quality of Life Scale, and Berg Balance Scale.
Results: The average duration between day of stroke onset and day of admission to PAC ward was significantly (p<0.001) shorter in group 1 (9.88 days) compared to group 2 (17.11 days). The average duration of PAC was also significantly (p<0.01) shorter in group 1 (25.51 days) compared to group 2 (34.11 days). Finally, the average cost of PAC under per-diem payment was significantly lower (p<0.01) in group 1 (US$2,637) compared to group 2 (US$3,450). Functional status significantly (p<0.05) improved in patients who had received rehabilitative PAC. However, functional status did not significantly differ

between the two groups.
Conclusions: The most effective way to reduce the costs of PAC for stroke patients is to minimize the duration of their hospital stay before transfer to rehabilitative PAC. Because it substantially reduces medical costs, rehabilitative PAC should be considered standard care for stroke patients.

英文關鍵詞：Stroke; post-acute care; rehabilitation; per diem payment; cost-effectiveness analysis

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Rehabilitative post-acute care for stroke patients delivered by per-diem payment system in different hospitalization paths: A Taiwan pilot study

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Abstract

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Conclusions: The most effective way to reduce the costs of PAC for stroke patients is to minimize the duration of their hospital stay before transfer to rehabilitative PAC. Because it substantially reduces medical costs, rehabilitative PAC should be considered standard care for stroke patients.

Key words: Stroke, post-acute care, rehabilitation, per-diem payment, cost-effectiveness analysis

Introduction

According to the latest data from the World Health Organization (WHO), stroke is the second-leading cause of death in the world [1, 2]. The potentially high economic burden of stroke treatment includes long-term care costs and productivity losses [3]. In Taiwan, the total expenditure on health (TEH) is 6.61% of gross domestic product, which is a much smaller percentage compared to other developed countries (e.g. 16.9% in USA; 11.2% in Japan; 9.0% (average) in OECD) [4–6]. However, the percentage of TEH used for private healthcare is higher in Taiwan than in other countries. In the USA, up to 62.6–74.5% of stroke patients need rehabilitative post-acute care (PAC) after hospital discharge [7]. An international literature review by Kuptniratsaikul reported an average length of stay (LOS) of ~1 month for inpatient rehabilitation after stroke (e.g. 29.4 days in Thailand, 31.3 days in Ireland, 31.2 days in Switzerland, 37.1 days in Singapore) [8]. Compared to these countries, most states in the USA have a lower average LOS for stroke (e.g. 21.9 days for the state of Texas), possibly due to the higher economic burden of inpatient care for stroke in the USA [7]. That is, the effect of rehabilitative PAC on hospital LOS in stroke patients differs by country.

In Taiwan, the National Health Insurance (NHI) system is an important social welfare policy and is widely recognized as one of the best universal healthcare systems in the world [9–11], because it provides affordable yet high quality care with wide freedom of choice and with easy access to ambulatory care. Polls show that public satisfaction with the system is very high (e.g. 83.1% in 2016) [11]. As the Taiwan population ages and as in-hospital care by specialists increases, rising medical expenditures are a growing concern. Because the Taiwan healthcare system has limited referral requirements, patients in Taiwan feel free to visit their preferred physicians at community clinics or hospital out-patient departments [11]. In large cities in Taiwan, stroke patients who require PAC after admission to a medical center must often wait for a rehabilitation bed to become available. Patients who are denied a rehabilitation bed at a medical center often feel helpless because they are unaware that adequate care may be available at a local hospital. A study by Cotté FE *et al.* reported that the three highest costs of treating stroke patients were informal care cost, initial hospitalization cost and rehabilitation cost [12]. After acute treatment, care and rehabilitation costs are a potentially huge burden [13]. Medical costs for stroke are related to socioeconomic status [14]. After a stroke event, inequality in socioeconomic status and survival increase markedly over time [15]. Therefore, local hospitals can play an important role by providing efficient and effective post-stroke rehabilitative care with a lower cost burden and a greater convenience for stroke patients and their families.

Payment systems may affect the behaviors of health providers and medical outcomes [16]. Spending on hospital services has contributed to increased total healthcare expenditures in most countries in Europe and in the developed world [17]. Diagnosis-related groups (DRGs)-based payment is increasingly used for treating stroke in the USA and other countries [5, 18]. Different payment systems and treatments may also lead to differences in medical resources utilization [18, 19]. Theoretically, the per-diem reimbursement method should reduce daily expenditure but can increase LOS in the hospital [20]. Per-diem hospital costs may also be affected by patient age, major diagnostic group, risk, legal problems, activities of daily living (ADL) ability and the presence of psychotic or affective symptoms. In Europe, the currently implemented per-diem payment system is mainly used for inpatient treatment of mental disorders [20, 21]. No published studies have discussed per-diem reimbursement for inpatient stroke service.

Many countries are attempting to build a comprehensive and integrated system for short- and long-term healthcare. The Taiwan government chose to focus on stroke for its first national PAC project. A 2014 pilot study of PAC for cerebrovascular disease (PAC-CVD) in stroke patients revealed several deficiencies in current treatment, including prolonged hospital stay, high hospital readmission rate, limited availability of in-patient stroke rehabilitation programs and poor coordination between medical centers and local hospitals. In this PAC-CVD project, the inpatient stroke rehabilitation program had five major differences from the current implementation policy. First, the reimbursement was per-diem but not fee-for-service. Second, the daily-implemented PAC rehabilitation programs were not limited to one physical therapy, one occupational therapy and one speech therapy treatments. Patients could receive more intensive and more frequent rehabilitation programs. Third, every patient should have his or her functional status re-evaluated every 3 weeks and these medical records should be sent to the NHI system. Fourth, no matter which hospital accreditation level (medical center, regional hospital or district hospital) was used, the payment was all the same. Fifth, patients could transfer smoothly to local hospitals under the assistance of the case manager. Therefore, the objective of this study was to explore how a per-diem payment system affects medical utilization during PAC for stroke patients in Taiwan.

Materials and Methods

Study design and sample

The study population included all stroke patients admitted to the PAC ward of a Taiwan hospital between March 2014 and September 2016 (defined as ICD-9-CM codes 433.x, 434.x, and 436.x for ischemic stroke and codes 430 and 431 for hemorrhagic stroke, International Classification of Diseases, Ninth Revision, Clinical Modification). The inclusion criteria were (i) acute stroke; (ii) admission to the PAC ward within 30 days after day of stroke onset and (iii) Modified Rankin Scale (MRS) level 2–4. This study of human subjects received the institutional review board approval before the survey was initiated. The patients were separated into group 1 (transferred from regional hospital) and group 2 (referred from the medical centers). During the sample selection period, 188 patients were eligible for participation and were interviewed before and after PAC. Seven cases were excluded due to insufficient inpatient training days within 7 days. Subjects were referred from neurology, neurosurgery, geriatrics or medical ward. None was referred from rehabilitation ward.

The multidisciplinary stroke team included neurologists, physiatrists, physical therapists, occupational therapists, speech therapists, psychologists and nurses. The PAC rehabilitation program prescribed by the physiatrist was a complex program of universal activities that were performed in at least three sessions per day. Each patient received 1 hour of therapy (physical therapy, occupational therapy or speech and swallowing therapy) during each session. The programs, which were selected according to the condition of the patient, included facilitation, passive range of motion exercise, strengthening, therapeutic exercise, bed mobility training, balance training, functional electric stimulation, training under suspension, ambulation training, training using devices, transfer training, ADL activity training, functional training, coordination training, posture training, speech training and swallowing training. The rehabilitation area and facility were recently established at this hospital. Therefore, the PAC patients were not mixed with patients in the out-patient department.

Measuring instruments

Functional status was evaluated by Barthal Index (BI), Functional Oral Intake Scale (FOIS), Instrumental ADL (IADL), EuroQoL Quality of Life Scale (EQ5D) and Berg Balance Scale (BBS). The BI score was used to measure the level of functional disability by indicating the ability to perform certain activities in daily life (e.g. dressing, external care and going up and down stairs) [22]. The BI consists of 10 items, with the maximum score implying complete independence. The minimum score is 0, indicating that a patient is totally dependent. The FOIS was used for assessing the functional oral intake of stroke patients with dysphagia [23]. The FOIS was classified in seven swallowing function levels. The level ranged from nothing by mouth (level 1) to total oral diet with no restriction (level 7). The IADL is most useful for identifying how a person is functioning at the present time and for identifying improvement or deterioration over time [24]. Historically, women were scored on all eight areas of function; men were not scored in the domains of food preparation, housekeeping and laundering. The EQ5D examines the patient's view on mobility, self-care, usual activities, pain or discomfort, and anxiety or depression as part of a total health state. Each part is awarded ≤3 points, the score representing no problem, some problem or extreme problem (1, 2 or 3, respectively) [25]. A Taiwan version of the EQ5D has been validated as a reliable and valid tool for measuring health-related quality of life in patients in Taiwan [26, 27]. The BBS is a scale of functional balance [28]. It is a 14-item test and each item is rated from 0 (i.e. poor balance) to 4 (i.e. good balance). The perfect score is 56. Additionally, the Chinese version of these measures has been validated and extensively used in both clinical practice and research.

The following patient data obtained by records review were tested as independent variables in this study: gender, type of stroke, days between stroke onset and admitted to PAC ward, LOS in PAC ward, and total treatment cost during PAC ward stay.

Statistical analysis

The unit of analysis in this study was the individual stroke patient. Descriptive statistics were tabulated to depict the stroke patient demographics. To reflect changes in real dollar value, all dollar values were converted to their equivalent 2016 values; New Taiwan Dollar (NTD) values were then converted to USD values at the average exchange rate over the 3-year period of 2014–2016 (31 NTD: 1 USD).

Longitudinal data were characterized by repeated observations of the same patients with a high variability between patients but low variability within patients. The generalized estimating equations (GEE) approach was developed to correct for repeated outcomes within the same subject. Total score of each functional status measure was used as a dependent variable as a function of time and effective covariates, which included age, gender, type of stroke, stroke history and lengths of stay after PAC. Restated, these effective predictive variables were included in the GEE approach as covariates because they were statistically significant in the multivariable models and are considered consistent predictors of functional status in much of the literature as well. The GEE procedure under XT gee in Stata, version 12.0, was employed for statistical analyses in this study.

Results

Table 1 compares the group 1 (transferred from the regional hospital) and group 2 (referred from the medical centers) in terms of study characteristics. Group 2 had a significantly younger mean age ($P < 0.001$), but gender did not significantly differ. In both groups, the majority of patients had suffered from infraction stroke. But the percentage of patients with hemorrhagic stroke was significantly higher in group 2 compared to group 1 ($P < 0.01$). According to the score of MRS and BI, disease severity did not significantly differ ($P > 0.05$). The average duration from day of stroke onset to day of PAC ward admission was significantly ($P < 0.001$) shorter in group 1 (9.88 days) compared to group 2 (17.11 days). The average duration of PAC was also significantly ($P < 0.01$) shorter in group 1 (25.51 days) compared to group 2 (34.11 days). The average cost of treatment in PAC ward under per-diem payment was significantly ($P < 0.01$) lower in group 1 (US$2637 dollars) compared to group 2 (US$3450 dollars).

In Table 2, it shows that rehabilitative PAC significantly improved MRS, BI, FOIS, EQ5D, IADL and BBS ($P < 0.05$). However, Table 3 shows that the two groups did not significantly differ in MRS, BI, FOIS, EQ5D, IADL or BBS ($P > 0.05$).

Discussion

Compared to group 1, group 2 had a higher percentage of patients with hemorrhagic stroke. The likely explanation is that hospitals in small cities rarely have neurosurgeons on duty at night. Therefore,

Table 1 Comparison of patient characteristics between group 1 ($N = 137$) and group 2 ($N = 44$)

Variables	Group 1		Group 2		*P*-value
	N	%	*N*	%	
Gender					
Female	52	38	13	30	0.312
Male	85	62	31	70	
Type of stroke					
Infarction	121	88	31	70	0.005
Hemorrhagic	16	12	13	30	
Age	65.55		56.48		<0.001
Days before PAC[a]	9.88		17.11		<0.001
LOS[b] in PAC	25.51		34.11		0.003
Cost in PAC	$2637		$3450		0.007

[a]PAC, post-acute care.
[b]LOS, length of stay.

Table 2 Improvements in various measures of functional status after rehabilitative PAC

Measure	Mean difference	(95% C.I.[a])	*P*-value
MRS[b]	−0.873	(−0.991, −0.755)	<0.001
BI[c]	24.475	(21.672, 27.278)	<0.001
FOIS[d]	−0.420	(−0.618, −0.222)	<0.001
EQ5D[e]	−1.961	(−2.250, −1.673)	<0.001
IADL[f]	1.464	(1.282, 1.646)	<0.001
BBS[g]	16.700	(14.613, 18.787)	<0.001

[a]CI, confidence intervals.
[b]MRS, modified Rankin Scale.
[c]BI, Barthel index.
[d]FOIS, functional oral intake scale.
[e]EQ5D, EuroQoL quality of life scale.
[f]IADL, instrumental activies of daily living.
[g]BBS, Berg balance scale.

Table 3 Comparison of improvement in various measures of functional status after rehabilitative PAC between group 1 ($N = 137$) and group 2 ($N = 44$)

Variables	Group 1 Mean	Group 2 Mean	Mean Difference (95% C.I.[a])	*P*-value[b]
MRS[c]	−0.861	−0.909	−0.047 (−0.323, 0.227)	0.998
BI[d]	24.890	23.180	1.708 (−4.838, 8.256)	0.101
FOIS[e]	0.321	0.727	−0.406 (−0.865, 0.053)	0.963
EQ5D[f]	1.978	1.909	0.069 (−0.605, 0.743)	0.687
IADL[g]	1.409	1.636	−0.228 (−0.652, 0.196)	0.352
BBS[h]	16.314	17.930	−1.616 (−6.518, 3.285)	0.735

[a]CI, confidence intervals.
[b]Adjusted for gender, type of stroke, age, days before PAC, days in PAC, and cost of PAC.
[c]MRS, modified Rankin Scale.
[d]BI, Barthel index.
[e]FOIS, functional oral intake scale.
[f]EQ5D, EuroQoL quality of life scale.
[g]IADL, instrumental activies of daily living.
[h]BBS, Berg balance scale.

most patients who require surgery for intracranial hemorrhage (ICH) at night are usually transferred to medical centers in large cities for surgery and then sent back after their condition stabilizes. Group 2 patients also tended to be younger. In this case, the likely explanation is that patients who are young tend to have a better prognosis and are more likely to return to work after rehabilitation. Therefore, hemorrhagic patients in group 2 were more likely to be referred for further rehabilitative PAC as an in-patient rather than as an out-patient. The relationship between age and stroke type has been studied in other countries. For example, a 5-year study in Sweden found that stroke patients with ICH tended to be younger at the time of stroke compared to those without ICH. At each level of functional disability, stroke patients with ICH consumed more county-level resources and consistently incurred higher overall healthcare costs [29]. Another 5-year study performed in Singapore similarly reported that stroke patients with ICH required significantly longer acute care and rehabilitation and had a significantly longer total LOS [30].

A study of a Taiwan population of stroke patients with ICH reported that patients discharged within 22 days had an average LOS of 7.3 days [9]. In hospitals without rehabilitation wards or chronic care wards, stroke patients must be discharged from the acute care ward and transferred to hospitals with PAC facilities. The group 1 patients in our study spent an average of 10 days in the acute care ward before being transferred to the PAC ward. In contrast, the group 2 patients spent an average of 17 days in PAC before transfer. Possible explanations for the difference include the following [7, 9]: (i) patients treated in medical centers require more time to stabilize because they usually have more comorbidities and higher severity of stroke; (ii) due to lack of available PAC beds in regional hospitals, patients must wait for PAC beds or transfer to hospitals with available PAC beds; (iii) patients have greater confidence in hospitals that operate on a larger scale and have better facilities; therefore, patients are willing to wait for beds in rehabilitation wards of medical centers; (iv) patients establish good relationships with therapists who provide bedside rehabilitation programs in medical centers; (v) family members initially have difficulty reaching a consensus regarding PAC and (vi) neurologists and neurosurgeons in medical centers are unfamiliar with recent research in PAC. Studies show that PAC quality is not significantly associated with PAC patient volume [31]. Patients are transferred to PAC rehabilitation units as early as possible to maximize rehabilitation efficacy, to maximize the potential for functional restoration, and to minimize costs [30]. Early and intensive physical therapy, occupational therapy and speech therapy are also important for successful rehabilitation of stroke patients. The Taiwan NHI system ensures that all hospitals that provide PAC receive the same reimbursement, regardless of care quality or hospital accreditation level.

The mean duration of PAC in our study was 25.5 days in group 1 and 34.1 days in group 2. The average hospital stay for acute care before PAC was 9.8 days in group 1 and 17.1 days in group 2. Few studies have discussed the inpatient rehabilitation after acute stroke in Taiwan [9, 10]. Lee reported that stroke patients had a mean LOS of 22.2 days, but inpatient rehabilitation utilization was only 34.0% [32]. Lin reported that stroke patients in Taiwan had an average rehabilitation ward LOS of 34.7 days [33]. Chen reported that stroke patients had an average LOS of 23.3 days in the acute ward and an average LOS of 25.3 days in the rehabilitation ward [11]. The LOS for stroke patients tends to be longer in Taiwan compared to other countries [9]. As the time after referral from the medical center decreases, total LOS and total cost are expected to decrease [33]. Our experience shows that case managers usually cooperate to ensure an efficient transfer of patients from acute care wards to PAC wards.

Our study showed that rehabilitative PAC significantly improved MRS, BI, FOIS, EQ5D, IADL and BBS. However, these values did not significantly differ between groups 1 and 2. Whereas the current NHI system in Taiwan limits patients to one session of therapy (physical, occupational or speech therapy) per day, the rehabilitation delivered to PAC patients in this study depended on their tolerance. The Japanese medical insurance system implemented an intensive PAC-program after 2000. Studies by Sonoda [34] and Miyai [35] have reported that duration (hours) of therapy is significantly associated with stroke rehabilitation outcome. For example, as duration of therapy increases, motor function at discharge increases whereas LOS decreases. Another study by Turner showed 'strong evidence' that highly intensive PAC programs are associated with early functional gains [36]. Our study found that patients who could tolerate rehabilitation programs of the highest intensity had the best outcomes in terms of complications prevention and time required for recovery of function. The per-diem reimbursement system avoided the financial burden of fee-for-service reimbursement [20, 21]. The training program was efficient and economical.

For this national PAC-CVD pilot project, the MRS level of the stroke patient was the main criterion for participation. Only patients with MRS levels 2–4 were eligible for transfer to hospitals with PAC wards. A study by Dewilde concluded that MRS level is a major determinant of medical resource use [37]. A study by Deutsch *et al.* reported that PAC delivered in the intensive inpatient rehabilitation facilities obtained better outcomes compared to PAC delivered in the skilled nursing facilities [38]. However, outcomes did not significantly differ in patients with minimal motor disabilities or in patients with major cognitive disabilities [39]. To maximize efficiency in the use of limited healthcare resources, indications for inpatient rehabilitation of subjects with MRS 2–4 must be clearly established. For delivering intensive rehabilitative PAC in these patients, hospitals are more suitable than nursing home. Our study results also revealed that early and intensive stroke rehabilitation effectively and efficiently obtained good outcomes. A collaborative effort by a multidisciplinary team was another important contributor to good outcomes.

In Taiwan, stroke patients with prolonged hospital stay constitute only 10.4% of all stroke patients. However, they constitute 38.9% of the total person-hospital bed days and 47.8% of the total in-hospital medical expenses [9]. Besides surgical intervention and mechanical ventilation use, rehabilitation need for physical/ADL dependency and speech/swallowing problems is a major cause to delay discharge from the hospital [10, 38]. Although the Taiwan government recognizes the great importance of PAC-CVD, limited stroke patients are transferred successfully from medical centers to local hospitals initially. The reimbursements under per-diem are not as good as fee-for-service payment and some local hospitals are not well prepared yet. The success rate in transferring the strokes to local hospitals is growing finally. Programs for PAC for patients with other injuries, including spinal cord injury, traumatic brain injury, cardiopulmonary disease and bony fracture are scheduled to begin at the mid-year of 2017. Recent experience in delivery of PAC-CVD by Taiwan hospitals has yielded valuable data that would be an important contribution to the literature.

Study Limitations

Although all research questions were adequately and satisfactorily addressed, several limitations are noted. This study only collected data for acute stroke patients for 30 days after stroke onset. This study only analyzed patients treated in a single district hospital that lacked a rehabilitation ward. However, the number of PAC-program stroke patients treated at this hospital was among the highest of all district hospitals in south Taiwan. Additionally, due to the lack of a true control group, as well as the ideal age difference between the two treatment groups, the obtained results can be due to the age difference and pre-post general trends. Further studies are needed to compare a PAC group and a control group in other regions of Taiwan and under current NHI regulations.

Conclusions

In conclusion, PAC rehabilitation was an effective training for stroke rehabilitation. This study focused on stroke patients who had a short LOS at a regional hospital before undergoing PAC rehabilitation. Early rehabilitation was important for successful restoration of the health, confidence and self-care ability of these patients. A qualified local hospital with physiatrists is the preferred site for delivery of rehabilitative PAC. There is a significant pre-post difference with the per-diem payment program. However, it is not clear that such a difference can be actually attributed to the program or due to the study design.

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References

1. Tung YC, Jeng JS, Chang GM *et al*. Processes and outcomes of ischemic stroke care: the influence of hospital level of care. *Int J Qual Health Care* 2015;**27**:260–6.
2. Prabhakaran S, Ruff I, Bernstein RA. Acute stroke intervention: a systematic review. *JAMA* 2015;**313**:1451–62.
3. Matchar DB, Nguyen HV, Tian Y. Bundled Payment and Care of Acute Stroke: What Does it Take to Make it Work. *Stroke* 2015;**46**:1414–21.
4. Wen CP, Tsai SP, Chung WS. A 10-year experience with universal health insurance in Taiwan: measuring changes in health and health disparity. *Ann Intern Med* 2008;**148**:258–67.
5. Bradley EH, Elkins BR, Herrin J *et al*. Health and social services expenditures: associations with health outcomes. *BMJ Qual Saf* 2011;**20**:826–31.
6. Lan JY. Achieving and Sustaining Universal Health Coverage: Fiscal Reform of the National Health Insurance in Taiwan. *Appl Health Econ Health Policy* 2016. (in press)
7. Kane RL, Lin WC, Blewett LA. Geographic variation in the use of post-acute care. *Health Serv Res* 2002;**37**:667–82.
8. Kuptniratsaikul V, Kovindha A, Massakulpan P *et al*. Inpatient rehabilitation services for patients after stroke in Thailand: a multi-centre study. *J Rehabil Med* 2009;**41**:684–6.
9. Lee HC, Chang KC, Lan CF *et al*. Factors associated with prolonged hospital stay for acute stroke in Taiwan. *Acta Neurol Taiwan* 2008;**17**:17–25.
10. Tseng M, Lin H. Readmission after hospitalization for stroke in Taiwan: results from a national sample. *J Neurol Sci* 2009;**284**:52–5.
11. Chen CC, Cheng SH. Does pay-for-performance benefit patients with multiple chronic conditions? Evidence from a universal coverage health care system. *Health Policy Plan* 2016;**31**:83–90.
12. Cotté FE, Chaize G, Kachaner I *et al*. Incidence and cost of stroke and hemorrhage in patients diagnosed with atrial fibrillation in France. *J Stroke Cerebrovasc Dis* 2014;**23**:e73–83.
13. Birabi BN, Oke KI, Dienye PO *et al*. Cost burden of post stroke condition in Nigeria: a pilot study. *Glob J Health Sci* 2012;**4**:17–22.
14. Chen CM, Chang CH, Hsu HC *et al*. Factors predicting the total medical costs associated with first-ever ischemic stroke patients transferred to the rehabilitation ward. *J Rehabil Med* 2015;**47**:120–5.
15. Kaur P, Kwatra G, Kaur R *et al*. Cost of stroke in low- and middle-income countries: a systematic review. *Int J Stroke* 2014;**9**:678–82.
16. Cheng SH, Chen CC, Tsai SL. The impacts of DRG-based payments on health care provider behaviors under a universal coverage system: a population-based study. *Health Policy* 2012;**107**:202–8.
17. Cylus J, Irwin R. The challenges of hospital payment systems. *Euro Observer* 2010;**12**:1–3.
18. Peltola M, Quentin W. Diagnosis-related groups for stroke in Europe: patient classification and hospital reimbursement in 11 countries. *Cerebrovasc Dis* 2013;**35**:113–23.
19. Guidetti D, Spallazzi M, Baldereschi M *et al*. Post-stroke rehabilitation in Italy: inconsistencies across regional strategies. *Eur J Phys Rehabil Med* 2014;**50**:335–41.
20. Jian W, Guo Y. Does per-diem reimbursement necessarily increase length of stay? The case of a public psychiatric hospital. *Health Econ* 2009;**18**:S97–106.
21. Fiori W, Bohnenkamp B, Schneider G *et al*. The significance of the principal diagnosis in Germany's new payment system for inpatient treatment of mental disorders. *Z Psychosom Med Psychother* 2014;**60**:25–38.
22. Wolfe CD, Taub NA, Woodrow EJ *et al*. Assessment of scales of disability and handicap for stroke patients. *Stroke* 1991;**22**:1242–4.
23. Crary MA, Mann GD, Groher ME. Initial psychometric assessment of a functional oral intake scale for dysphagia in stroke patients. *Arch Phys Med Rehabil* 2005;**86**:1516–20.
24. Lawton MP. The functional assessment of elderly people. *J Am Geriatr Soc* 1971;**19**:465–81.
25. Rabin R, de Charro F. EQ-5D: a measure of health status from the EuroQol group. *Ann Med* 2001;**33**:337–43.
26. Chang TJ, Tarn YH, Hsieh CL *et al*. Taiwanese version of the EQ-5D: validation in a representative sample of the Taiwanese population. *J Formos Med Assoc* 2007;**106**:1023–31.
27. Lang HC, Chuang L, Shun SC *et al*. Validation of EQ-5D in patients with cervical cancer in Taiwan. *Support Care Cancer* 2010;**18**:1279–86.
28. Lee WJ, Peng LN, Cheng YY *et al*. Effectiveness of short-term interdisciplinary intervention on postacute patients in Taiwan. *J Am Med Dir Assoc* 2011;**12**:29–32.
29. Lekander I, Willers C, von Euler M *et al*. Relationship between functional disability and costs one and two years post stroke. *PLoS One* 2017;**12**:e0174861.

30. Ng YS, Tan KH, Chen C *et al*. Predictors of Acute, Rehabilitation and Total Length of Stay in Acute Stroke: A Prospective Cohort Study. *Ann Acad Med Singapore* 2016;**45**:394–403.
31. Graham JE, Deutsch A, O'Connell AA *et al*. Inpatient rehabilitation volume and functional outcomes in stroke, lower extremity fracture, and lower extremity joint replacement. *Med Care* 2013;**51**:404–12.
32. Lee HC, Chang KC, Huang YC *et al*. Inpatient rehabilitation utilization for acute stroke under a universal health insurance system. *Am J Manag Care* 2010;**16**:e67–74.
33. Lin JH, Hsiao SF, Liu CK *et al*. Rehabilitation fees, length of stay and efficiency for hospitalized stroke patients: a preliminary study based on function-related groups. *Kaohsiung J Med Sci* 2001;**17**:475–83.
34. Sonoda S, Saitoh E, Nagai S *et al*. Full-time integrated treatment program, a new system for stroke rehabilitation in Japan: comparison with conventional rehabilitation. *Am J Phys Med Rehabil* 2004;**83**:88–93.
35. Miyai I, Sonoda S, Nagai S *et al*. Results of new policies for inpatient rehabilitation coverage in Japan. *Neurorehabil Neural Repair* 2011;**25**:540–7.
36. Turner-Stokes L, Pick A, Nair A *et al*. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. *Cochrane Database Syst Rev* 2015;**22**:CD004170.
37. Dewilde S, Annemans L, Peeters A *et al*. Modified Rankin scale as a determinant of direct medical costs after stroke. *Int J Stroke* 2017;**12**:392–400.
38. Deutsch A, Granger CV, Heinemann AW *et al*. Poststroke rehabilitation: outcomes and reimbursement of inpatient rehabilitation facilities and subacute rehabilitation programs. *Stroke* 2006;**37**:1477–82.
39. Chang KC, Lee HC, Huang YC *et al*. Cost-effectiveness analysis of stroke management under a universal health insurance system. *J Neurol Sci* 2012;**323**:205–15.

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104年度專題研究計畫成果彙整表

計畫主持人：許弘毅	**計畫編號：**104-2410-H-037-006-SS2
計畫名稱：論日計酬制腦中風急性後期照護之成本效益分析: 前瞻性及統合性研究	

成果項目					量化	單位	質化 （說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等）
國內	學術性論文	期刊論文			0	篇	
		研討會論文			0		
		專書			0	本	
		專書論文			0	章	
		技術報告			0	篇	
		其他			0	篇	
	智慧財產權及成果	專利權	發明專利	申請中	0	件	
				已獲得	0		
			新型/設計專利		0		
		商標權			0		
		營業秘密			0		
		積體電路電路布局權			0		
		著作權			0		
		品種權			0		
		其他			0		
	技術移轉	件數			0	件	
		收入			0	千元	
國外	學術性論文	期刊論文			1	篇	Wang CY, Chen YR, Hong JP, Chan CC, Chang LC, Shi HY* Rehabilitative post-acute care for stroke patients delivered by per-diem payment system in different hospitalization paths: A Taiwan pilot study. Int J Qual Health Care. 2017;29:779-784. (SSCI, IF=2.342, HEALTH CARE SCIENCES & SERVICES 18/77)
		研討會論文			1		Chiu CC, Wang JJ, Lin HF, Fan SS, Chiu HC, Huang CC, Yeh SC, Shi HY* The impact of post-acute care on medical utilization and functional status in stroke patients: A prospective cohort study in Taiwan.
		專書			0	本	
		專書論文			0	章	
		技術報告			0	篇	

		其他			0	篇	
	智慧財產權及成果	專利權	發明專利	申請中	0	件	
				已獲得	0		
			新型/設計專利		0		
		商標權			0		
		營業秘密			0		
		積體電路電路布局權			0		
		著作權			0		
		品種權			0		
		其他			0		
	技術移轉	件數			0	件	
		收入			0	千元	
參與計畫人力	本國籍	大專生			0	人次	
		碩士生			3		碩士班二年一般生2人以及一年級1人
		博士生			0		
		博士後研究員			0		
		專任助理			0		
	非本國籍	大專生			0		
		碩士生			0		
		博士生			0		
		博士後研究員			0		
		專任助理			0		
其他成果 （無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。）					無		

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1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估
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   □未達成目標（請說明，以100字為限）
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   論文：■已發表　□未發表之文稿　□撰寫中　□無
   專利：□已獲得　□申請中　■無
   技轉：□已技轉　□洽談中　■無
   其他：（以200字為限）

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性，以500字為限）
   計畫主持人比較論日計酬制腦中風急性後期照護的病人(介入組)與論量計酬制腦中風急性住院照護的病人(配對組)之成本效益，針對論日計酬制腦中風急性後期照護做一系統性、全面性及 "本土性" 探討與分析（如下），提供醫療照護者於照顧病人以及政府衛生單位於醫療資源分配與相關決策制定之參考，提高腦中風急性後期照護研究水準，改善病人的醫療療效與生活品質，這些實證研究發現，正可以支持臺灣目前正在推行的健保改革方案。
   Wang CY, Chen YR, Hong JP, Chan CC, Chang LC, Shi HY* Rehabilitative post-acute care for stroke patients delivered by per-diem payment system in different hospitalization paths: A Taiwan pilot study. Int J Qual Health Care. 2017;29:779-784. (SSCI, IF=2.342, HEALTH CARE SCIENCES & SERVICES 18/77)

4. 主要發現
   本研究具有政策應用參考價值：□否　■是，建議提供機關衛生福利部,
   （勾選「是」者，請列舉建議可提供施政參考之業務主管機關）
   本研究具影響公共利益之重大發現：■否　□是
   說明：（以150字為限）