



Brief Communication

# Three years of the nationwide post-acute stroke care program in Taiwan

Cheng-Yang Hsieh<sup>a</sup>, Wei-Chia Tsao<sup>b</sup>, Ruey-Tay Lin<sup>b</sup>, A-Ching Chao<sup>b,\*</sup>

<sup>a</sup> Department of Neurology, Tainan Sin Lau Hospital, Tainan, Taiwan, ROC

<sup>b</sup> Department of Neurology, College of Medicine, Kaohsiung Medical University and Department of Neurology, Kaohsiung Medical University Hospital, Kaohsiung, Taiwan, ROC

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## Abstract

Prolonged hospital stay and readmission are prevalent problems for stroke patients in Taiwan after the acute stage, partly due to the unmet need of post-acute care. In March 2014, Taiwan's National Health Insurance Administration launched a nationwide Post-Acute Care-CerebroVascular Disease (PAC-CVD) program. The Taiwan Stroke Society, coordinating 11 allied disciplines, took responsibility for the preparation and implementation of the program. As of June 2016, 6839 consecutive stroke patients were enrolled. On discharge from the PAC program, the functional status had improved in 87.5% of patients, with a significant decrease in the mean modified Rankin Scale score from 3.7 to 3.0. The rates of readmission and mortality in the PAC group were also lower than in the control group. In conclusion, the Taiwan's PAC-CVD program is an innovative and essentially effective national program of post-acute stroke care. We believe such experience should be helpful for policy makers of stroke care worldwide.

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**Keywords:** Stroke; Subacute care; Taiwan

## 1. Introduction

In Taiwan, there are ~30,000 acute stroke hospitalizations annually.<sup>1</sup> Under the mandatory National Health Insurance (NHI) program, only 2.6% of Taiwanese patients died ≤30 days after an acute ischemic stroke, compared with an average of 5.2% among the Organization for Economic Cooperation and Development countries.<sup>2</sup> Given such a low mortality rate, post-acute care (PAC), including aggressive rehabilitation to reduce disability, is important for stroke survivors.

PAC of stroke requires not only an organized, coordinated, multidisciplinary approach but also a seamless transfer from acute to chronic phases.<sup>3</sup> Previously, stroke patients might

have prolonged hospitalization or frequent readmissions into an acute-care setting, usually a tertiary referral medical center, to overcome the unmet need of PAC.<sup>1</sup> Such a prolonged hospital stay in medical centers might further lead to shortage of acute beds, overcrowded emergency rooms, and increased medical costs. Thus, the Taiwan's NHI Administration proposed a nationwide Post-Acute Care-Cerebral Vascular Disease (PAC-CVD) program to improve resource allocations and patient outcomes by transferring stroke patients at the post-acute phase in medical centers to community hospitals, including regional and district hospitals, for PAC.<sup>1,4</sup>

## 2. Methods

### 2.1. The PAC-CVD project in Taiwan

In December 2013, 129 hospitals in 39 teams covering the main and offshore islands of Taiwan were enrolled in the PAC-CVD program. By March 2014, physicians, rehabilitation

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\* Corresponding author. Dr. A-Ching Chao, Department of Neurology, Kaohsiung Medical University Hospital, 100, Tzyou 1st Road, Kaohsiung 807, Taiwan, ROC.

E-mail address: [achch@cc.kmu.edu.tw](mailto:achch@cc.kmu.edu.tw) (A.-C. Chao).

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therapists, and other paramedical professionals in the program (n = 1205) had completed a 16-h educational course organized by the Taiwan Stroke Society and the societies of the allied disciplines. Then, the PAC-CVD program formally launched in March 2014.

Overall, the Taiwan's PAC-CVD program has the following novel features in healthcare delivery. First, it provides exclusively intensive inpatient rehabilitation, that is, 1–5 times of physical, occupational, speech and language therapies per day as needed. Second, participating hospitals will receive a packaged and function-related reimbursement by day, that is, a maximal packaged imbursement of 3486 points per day (1 point ~ 0.025 US\$) covering medical expenses for stroke care, managing associated comorbidities/complications, and rehabilitation. Third, additional fees were provided for regularly evaluating several functional scales<sup>4</sup> of the stroke patients, and patients should be disenrolled from the program if there's no more functional improvement.

The patient's inclusion criteria of the PAC-CVD program are:

1. Acute stroke with symptoms onset  $\leq 30$  days.
2. Stable vital signs and neurological functional status for  $\geq 72$  h, with no or controlled complications (e.g., infection or gastrointestinal bleeding).
3. A modified Rankin Scale (mRS) score of 2–4.
4. Able and willing to undergo rehabilitation.

The basic length of stay in this program is 3–6 weeks, but could be extended to 12 weeks if needed. To measure the quality of care among hospitals, Taiwan's NHI Administration will monitor improvement in functional scales, the 14-day and 30-day acute care readmission rates after discharge from the program, as well as the mortality rate. Patients with similar mRS scores who were not enrolled in the PAC-CVD program were selected as controls.

### 3. Results

By June 2016, 6839 consecutive stroke patients were enrolled. The mean mRS score at baseline was 3.7, while less than 5% of patients had a mRS score of 2. Upon discharge, 87.5% and 83.7% of the patients functionally improved and went back to the community, respectively. Details of changes in those functional scales were listed in Table 1. The 14-day and 30-day readmission rates were 11.6% and 15.5% respectively for the PAC group, compared to 25.4% and 30.4% for the control group. The mortality rate was also lower in the PAC group (3.3% vs. 4.8%).

### 4. Discussion

Stroke patients in the PAC group had significantly better functional outcomes and less readmission or mortality,

Table 1

Comparison of various functional scales before and after the post-acute care-cerebral vascular disease project.

Scales	2014			2015		
	Before, mean	After, mean	$p^a$	Before, mean	After, mean	$p^a$
Barthel index	39.8	63.8	<0.001	39.3	63.3	<0.001
Instrumental activities of daily living	1.4	2.4	<0.001	1.4	2.3	<0.001
Modified Rankin Scale	3.7	3.0	<0.001	3.7	3.1	<0.001
EuroQol five dimensions questionnaire	10.5	8.6	<0.001	10.3	8.6	<0.001
Functional oral intake scale	5.8	6.4	<0.001	5.7	6.4	<0.001
Mini nutritional assessment	18.0	19.9	<0.001	18.3	20.2	<0.001

Note: The data was counted as of December 2015 and released publicly by Taiwan's administration of national health insurance in a forum for post-acute care.

<sup>a</sup> Compared with paired t-test.

compared with those in the control group. Nevertheless, some points should be addressed for the sustainability and expansion of PAC in Taiwan. For examples, its packaged daily reimbursement fee was about two-third of regular acute care fee per patient. Therefore, community hospitals may be less willing to expand their volume of PAC under this program. Besides, therapists complained that they had to spend more time fulfilling regularly the many required functional scales than giving rehabilitation to the patients. Thus, in 2016, the Taiwan's NHI administration decreased the number of required functional scales from fourteen to six.

Our major limitation is that we cannot assess the original patient data. Further rigorous analysis may be needed to identify factors for improving this program.

In conclusion, the Taiwan's PAC-CVD program is an innovative and essentially effective national program of post-acute stroke care. We believe such experience should be helpful for policy makers of stroke care worldwide.

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