Combination of Acute Stroke Unit and Short-Term Stroke Ward with Early Supported Discharge Decreases Mortality and Complications after Acute Ischemic Stroke

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Background: *The stroke unit has been established as a standard care for stroke. However, it has not been widely established in developing countries due to the lack of understanding and limited resources.*
Objective: *To compare the complications and mortality of stroke patients admitted in the stroke unit and short-term ward with those admitted in the general medical ward.*
Material and Method: *The authors prospectively collected data of acute stroke patients who were admitted after the set up of the stroke unit and stroke short-term ward in 2003, and compared with the data of those who were admitted in a general medical ward in 2001. All acute stroke patients who presented within seven days of the onset were admitted and those who had final diagnosis of ischemic stroke or transient ischemic attack (TIA) were studied. Patients in the stroke unit were taken care of by a multidisciplinary team approach under clinical guidelines and a care map. The short-term ward is a part of the general medical ward and stroke patients were treated by a multidisciplinary team followed by homecare treatment. The endpoints were mortality rate, neurological and medical complications during admissions, and the mean length of stay.*
Results: *Seven hundred and ninety-four patients were studied. Three hundred and eighty-seven patients were admitted in 2001 and 407 patients in 2003. Among patients presented 2003, three hundred and one cases were treated in the acute stroke unit whereas 106 were admitted in the short-term ward. There was no difference in stroke risk factors and stroke subtypes between the two groups, except for dyslipidemia and cigarette smoking, which were more prevalent in patients admitted in 2003. Patients in the stroke unit and the short-term ward had significantly less mortality than those in the general medical ward (8.9 and 2.1%). Overall complications in the stroke unit and the short-term ward were 16.8%, compared to 26% of those admitted into the general medical ward. Significantly less brain edema, hemorrhagic infarction, urinary tract infection, pneumonia, and pressure sore were also observed. The length of hospital stay of the patients admitted in 2001 and 2003 was 11.26 and 8.09 days, respectively.*
Conclusion: *Combination of organized acute stroke unit and short-term ward with early supported discharge reduces the mortality and complications of ischemic stroke patients during admission as well as the length of stay when compared to the general medical ward. The present study reassures that the combination is useful for hospitals in developing countries, which have limited number of beds in their stroke units.*

Keywords: *Stroke Unit, Complications, Acute ischemic stroke, Early supported discharge*

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Stroke is a very common neurological problem throughout the world. Various treatments have been tested to improve the outcomes and reduce stroke mortality[1]. Since the past decade, stroke unit has been established as a standard care of stroke[2]. Admission to the stroke unit has shown to reduce effectively the mortality and morbidity in both the acute and long-term periods after a stroke[3-6].

Among developing countries, the setup of a stroke unit has been reported in only a few countries[7]. In Thailand, however, the concept of stroke unit is still not generalized and to date, only a few tertiary care centers have successfully established the acute stroke unit. The major reasons behind this phenomenon are the lack of understanding of general physicians and limited resources.

In King Chulalongkorn Memorial Hospital, which is one of the leading university hospitals in Bangkok, Thailand, the authors have established an acute stroke unit since 2002. However, only 11 beds in the acute stroke unit were available; the authors treat several hundred acute ischemic stroke patients each year. Therefore, the authors managed to set up another short-term ward for mild stroke patients. With the two separate wards, the authors were able admit all acute stroke patients. The authors believe that this new concept of the stroke care is a practical model for hospitals with limited resources for stroke unit. Here the authors report our experience of acute stroke care before and after the establishment of our stroke unit and short-term ward.

Material and methods

The authors prospectively collected data of acute stroke patients who were admitted after the set up of the stroke unit and the stroke short-term ward during January and December 2003 and compared with the data of those who were admitted before the establishment of the stroke unit between January and December 2001. At the hospital, all acute stroke patients who presented within seven days of the onset were admitted and those who had a final diagnosis of ischemic stroke or transient ischemic attack (TIA) were studied. Baseline data of all cases including age, sex, stroke risk factors, types of investigations, types of stroke by Oxfordshire community project classification[8], and pathophysiology by modified TOAST criteria[9] were collected. Regarding the study of the efficacy of treatment, mortality rate, neurological and medical complications, and the mean length of stay were used as selected endpoints.

Before 2002, acute stroke patients were treated mostly in the general medical wards and some of them were admitted in the general neurological ward. There were eight general medical and a neurological wards where stroke patients could be admitted according to their availability. At that time, there were guidelines for some aspects of treatment such as protocol for computerized tomography (CT) scan, aspirin treatment, and general stroke care, etc. However, there was no organized multidisciplinary stroke care team and patients were taken care of mainly by internists under neurology consultation.

After the establishment of acute stroke unit in 2002, all acute stroke patients were admitted to this unit as the first priority. The total number of stroke unit beds is eleven and four of them are designated as semi-intensive care beds where close monitoring and respiratory support are available. However, with the large number of stroke patients and the limitation of the number of beds in the stroke unit, some patients had to be admitted outside the unit. Therefore, another short-term ward as part of general medical ward was organized to take care of mild stroke patients.

At the acute stroke unit, the authors intend to treat moderate to severe strokes and some milder cases. A well-organized multidisciplinary stroke care team that included neurologists, internists, stroke nurses, physiatrists, psychiatrists, nutritionists, and social services was formed. The team makes round and discussions regularly, at least once a week. The treatment program is standardized with regard to the diagnostic evaluation, monitoring, acute management, and early rehabilitation using clinical practice guidelines and stroke care map. The criteria for stroke unit admissions were all acute ischemic stroke patients whose onset was less than seven days, patients with unstable neurological conditions such as progressing symptoms, patients with repeated transient ischemic attacks, and patients who need special work up for stroke etiology. In case of unavailability of a bed in the stroke unit, patients with mild stroke such as patients with suspected lacunar infarction with stable neurological conditions would be admitted in the short-term ward.

The short-term ward is a specialized unit that is part of the general medical wards. In this ward, it is recommended that the length of admission should not exceed 3-4 days. Therefore, patients admitted in this ward were the ones with mild symptoms and signs. They also required appropriate investigations and management within a limited time frame. Patients who were suitable for admission in the short-term ward were

patients with good consciousness, had mild deficit (NIH stroke scale less than 8) and clinically stable. The short-term ward precluded patients without known risk factors for stroke whom extensive work up for stroke etiology may be needed. In case of clinically worsening conditions or patients who needed further investigations, they could be transferred from the short-term ward to the acute stroke unit. In the present study, those who were relocated to the stroke unit were analyzed as they were in the stroke unit group. In the short-term ward, patients were also taken care of by a multidisciplinary team that comprised of internists, consultant neurologists, physiatrists, stroke nurses, social services, and Red Cross volunteers. Clinical guidelines and stroke-care paths were used for investigations and acute treatment, which had to be done promptly for early discharge. Patients were also prepared for early rehabilitation and long-term care including risk factor management and secondary prevention. After discharge, the patients were taken care of under a homecare program that is managed by a multidisciplinary team and includes neurologists, physiatrists, nurses, and Red Cross volunteers. In this program, the stroke nurses and specially trained Red Cross volunteers visit the patients at their homes according to the schedules. The efficacy of the homecare treatment in the hospital was reported earlier[10].

The endpoints of this study were the rate of complications and mortality during the admission. The mean length of stay (LOS) was also recorded. Neurological complications include brain edema, hemorrhagic transformation, and recurrent stroke. Systemic complications were predefined as gastrointestinal hemorrhage, urinary tract infection, pneumonia, symptomatic deep venous thrombosis, pressure sore, pulmonary embolism, and acute coronary syndrome.

Regarding the definitions of complications, brain edema was defined as symptomatic brain edema that requires medical or surgical treatment. Hemorrhagic transformation of infarction was diagnosed in patients who had clinical worsening and repeated CT scans of the brain showed evidences of hemorrhagic lesion. A recurrent ischemic stroke was diagnosed when patients developed a new onset of focal neurological deficit lasting more than 24 hours during the admission period that was not the complication of the presenting stroke. Gastrointestinal hemorrhage was defined as any evidence of bleeding from the gastrointestinal tract. Urinary tract infection was diagnosed when patients had clinical symptoms (dysuria/foul urine and fever) or positive urine culture. Pneumonia was diagnosed if the patients had inspiratory crackles and fever or radiographic evidence or purulent sputum. Deep venous thrombosis and pulmonary embolism were diagnosed by clinical and imaging evidences. Acute coronary syndrome was diagnosed in patients with clinical symptoms together with compatible electrocardiogram and/or laboratory results.

Statistical analysis

Complications and mortality rate were compared between patients admitted in the combination of the stroke unit and short-term ward and those admitted in a general medical ward. Continuous variables were compared by independent *t* test. Categorical variables were compared by Chi-square test. Statistical significance was defined as a level of 0.05 by a two-tailed test. SPSS 10.0 statistical software was used for all analyses.

Results

Seven hundred and ninety-four patients were studied. There were 387 patients admitted in 2001 prior to the establishment of the stroke unit and 407 patients admitted in 2003. Among the patients who presented in 2003, three hundred and one cases were treated in the acute stroke unit whereas 106 were admitted in the short-term ward. Baseline characteristics in the two studied groups are shown in Table 1. There were no differences in stroke risk factors and stroke subtypes between the two groups except for dyslipidemia and cigarette smoking, which were more prevalent in patients admitted in 2003. More patients with TIA were admitted in 2003. For investigations, CT scan was the most commonly used brain imaging in both studied periods. The percentage of patients receiving CT scan increased in 2003. Patients in 2003 received more carotid duplex ultrasound and MRI than patients in 2001.

Patients in the stroke unit and short-term ward had significantly less mortality than those in a general medical ward. A reduction of mortality rate from 8.9 to 2.1% was observed. Logistic regression analysis showed that the odds ratio for death was 4.8 with 95% confidence interval between 2.20 and 10.51 ($p < 0.001$). The length of hospital stay in patients admitted in 2003 in the acute stroke unit or stroke short-term was significantly less than those who were admitted in a general medical ward in 2001 (8.09 and 11.26 days). The overall complications were also reduced from 26 to 16.8% in the stroke unit and short-term ward when compared to the general medical ward. Significantly less brain edema, hemorrhagic infarction, urinary tract infection, pneumonia and pressure sores were also

Table 1. Baseline characteristics of patients admitted in the general medical ward and stroke unit/short-term ward

	General medical ward n (%)	Stroke unit/Short-term ward n (%)
Male	224 (57.9)	227 (55.8)
Mean age ± SD	63.03±12.82	62.38±13.75
Risk factors		
- Dyslipidemia	101 (26.1)	216 (53.1)
- Hypertension	210 (54.3)	230 (56.5)
- Diabetes	129 (33.3)	117 (28.7)
- Smoking	66 (17.1)	93 (22.9)
- Alcohol drinking	32 (8.3)	41 (10.1)
- Atrial fibrillation	53 (13.7)	37 (9.1)
- Ischemic heart disease	33 (8.5)	34 (8.4)
- Previous stroke	78 (20.2)	85 (20.9)
Stroke etiology by TOAST criteria		
- Large vessel atherosclerosis	124 (32.0)	143 (35.1)
- Cardiac embolism	75 (19.4)	76 (18.7)
- Small vessel disease	167 (43.2)	166 (40.8)
- Other determined etiology	13 (3.4)	13 (3.2)
- Other undetermined etiology	8 (2.1)	9 (2.2)
Stroke subtypes by OCSP criteria		
- Partial anterior circulation infarction	112 (28.9)	110 (27)
- Total anterior circulation infarction	71 (18.3)	61 (15)
- Posterior circulation infarction	63 (16.3)	76 (18.7)
- Lacunar infarction	141 (36.4)	160 (39.3)
- Transient ischemic attack	6 (1.6)	31 (7.6)
Investigations		
- CT scan	351 (90.7)	394 (96.8)
- MRI	31 (8)	78 (19.2)
- Carotid duplex ultrasound	83 (21.4)	346 (85)
- Echocardiogram	61 (15.8)	113 (27.8)

Table 2. Complications between patients admitted in the general medical ward and stroke unit/short-term ward

	General medical ward n (%)	Stroke unit/Short-term ward n (%)	p-value
Overall complications	99 (25.6)	64 (15.7)	<0.001
Neurological complications			
- Brain edema	25 (6.5)	9 (2.2)	0.003
- Hemorrhagic transformation	19 (4.9)	3 (0.7)	<0.001
- Recurrent stroke	12 (3.1)	16 (3.9)	0.526
Other complications			
- Gastrointestinal bleeding	18 (4.7)	9 (2.2)	0.055
- Urinary tract infection	35 (9)	16 (3.9)	0.003
- Pneumonia	25 (6.5)	13 (3.2)	0.031
- Pressure sore	11 (2.8)	3 (0.7)	0.024
- Deep venous thrombosis	12 (3.1)	5 (1.2)	0.068
- Pulmonary embolism	5 (1.3)	1 (0.2)	0.089
- Acute coronary syndrome	7 (1.8)	5 (1.2)	0.503
Mortality	34 (8.8)	8 (2)	<0.001
Length of stay (days)	11.26±14.96	8.09±8.53	<0.001

Table 3. Comparison of patients admitted in the stroke unit and short-term ward

	Stroke unit n (%)	Short-term ward n (%)	p-value
Male	185 (61.5)	42 (39.6)	<0.001
Mean age ± SD	62.12±14.23	63.12±12.30	0.519
Risk factors			
- Dyslipidemia	164 (54.5)	52 (49.1)	0.336
- Hypertension	170 (56.5)	60 (56.6)	0.982
- Diabetes	84 (27.9)	33 (31.1)	0.528
- Smoking	70 (23.3)	23 (21.7)	0.743
- Alcohol drinking	30 (10)	11 (10.4)	0.904
- Atrial fibrillation	31 (10.3)	6 (5.7)	0.153
- Valvular heart disease	15 (5)	4 (3.8)	0.612
- Ischemic heart disease	29 (9.5)	5 (4.7)	0.116
- Previous stroke	57 (18.9)	28 (26.4)	0.103
Stroke etiology by TOAST criteria			
- Large-artery atherosclerosis	113 (37.5)	30 (28.3)	<0.001
- Cardioembolism-Small	65 (21.6)	11 (10.4)	
- Vessel occlusion	102 (33.9)	64 (60.4)	
- Stroke of other determined etiology	12 (4.0)	1 (0.9)	
- Stroke of undetermined etiology	9 (3)	0 (0)	
Stroke subtypes by OCSP criteria			
- Partial anterior circulation infarction	83 (27.6)	23 (21.7)	<0.001
- Total anterior circulation infarction	60 (19.9)	0 (0)	
- Posterior circulation infarction	54 (17.9)	17 (16)	
- Lacunar infarction	104 (34.6)	66 (62.3)	
Transient ischemic attack	16 (5.3)	15 (14.2)	<0.001
Length of stay (days)	9.91±9.25	2.93±0.98	<0.001
Death	8 (2.7)	0 (0)	0.090

observed. Comparisons of mortality, length of hospital stay and complications are shown in Table 2.

When patients in the acute stroke unit and short-term ward were compared, a significantly higher number of patients with mild stroke, especially those with lacunar infarction, were admitted in the short-term ward. However, there were no differences in the stroke risk factors between the two groups. The mean length of stay of patients in the stroke unit and the short-term ward were 9.91 and 2.93 days, respectively. As expected, a significantly higher mortality rate was observed in patients admitted in the stroke unit. None of the patients in the short-term ward died. The baseline characteristics, length of stay, overall complications, and mortality rate of patients in the stroke unit and the short-term ward are demonstrated in Table 3.

Discussion

The concept of organized stroke unit has been widely accepted as a standard approach of stroke care. The 1995, the Pan European Consensus Meeting on Stroke Management, prepared by World Health Organization Europe and the European Stroke Council in collaboration with four other professional societies, strongly emphasized the need of stroke units and set the target that all stroke patients should be treated in the organized stroke care in 2005[2]. However, until recently, the number of stroke units is still far behind the target and is unevenly distributed throughout the world[11-14].

In Thailand, only a few organized stroke units have been established in tertiary medical centers[15]. However, the development is still in progress and more units are expected in the near future. One of the major obstacles for the treatment in stroke unit in the developing country like Thailand is the imbalance between the resources and the large number of patients. With the limitation of number of stroke unit beds and personnel, the authors managed to set up two different types of wards: acute stroke unit and short-term wards followed by a homecare program.

The authors report the experience on the

management of acute stroke patients in the combination of an acute stroke unit and a short-term ward. In this setting, patients with moderate to severe stroke have priority to be admitted in the stroke unit. However, with the high demand of acute stroke patients, the authors were not able to admit all strokes in the stroke unit. According to the Cochrane review of organized inpatient (stroke unit) care for stroke, mild stroke patients did not appear to benefit from stroke unit care in terms of a reduced risk of death or death or institutional care[16]. Therefore, the authors opted to admit mild stroke patients in the short-term ward.

To the authors' knowledge, this is the first study to evaluate the efficacy of the combination of a stroke unit and a short-term ward with early supported discharge. The present study confirms that with a well-organized stroke care system, the combination of the stroke unit and the short-term ward can significantly reduce mortality and complications. This combination also reduced the length of stay of stroke patients, thus more patients could be treated in the hospital. In a meta-analysis of 19 trials, lower death rate was found in patients admitted in the stroke unit with the odds ratio of 0.85 (95%CI 0.69-0.98)[5]. The present study found that the rates of both neurological and medical complications were significantly less after the establishment of the stroke unit and the short-term ward when compared to the general medical ward. The complication rates were comparable to those of previous reports with the rate in 2001 close to the higher end of the range and the rate after stroke unit and short-term ward comparable to the lower end of the range[17]. Previous studies have found a strong association between post stoke complications and poor recovery [18]. Moreover, previous randomized trials indicated that the cause of death that were most likely to be prevented by stroke unit care were those classified as complications of immobility especially infection and thromboembolism[19].

The present study represents the general population of the stroke patients since all acute ischemic strokes who presented within seven days of onset were included. Although we serve as a tertiary care hospital, most of the patients presented to the hospital by themselves. The authors are aware that there may be some changes in the management during years of the study. However, during the study period, there have been no newly developed interventions or medications that may lead to a dramatic improvement of stroke outcome[20,21]. The characteristics of the patients who were admitted in 2001 and 2003 were mostly similar. There were no differences in the patients' age, stroke subtypes by TOAST and OCSP criteria, and most of their risk factors. Only the number of patients with dyslipidemia and cigarette smoking were significantly higher in patients admitted in 2003. A higher number of patients with TIA were also observed in 2003. However, when TIA patients were excluded, the statistically significance outcomes were still observed. The authors believe that the positive findings in the present study were mainly attributable to the more organized stoke wards which comprises of a multidisciplinary team approach, application of clinical practice guidelines, more appropriate investigations, earlier and more intensive mobilization and rehabilitation, and prompt detection as well as correction of fever, infections, hyperglycemia, hypotension and other medical problems.

In conclusion, the present study serves a model for acute stroke care in developing countries like Thailand where the limitation of the number of beds in stroke unit is a problem. Patients with moderate to severe stroke have a priority to be admitted in the stroke unit whereas mild strokes can be admitted in a well-organized short-term ward followed by a homecare program. The present study demonstrated that a combination of an organized acute stroke unit and a short-term ward is associated with lower mortality and complication rates during hospitalization when compared to a general medical ward and is feasible for our population. In addition, more stroke patients could be admitted due to the reduction of the length of stay and increased the turnover rate of stroke beds.

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การศึกษาการรับผู้ป่วยที่มีภาวะสมองขาดเลือดเฉียบพลันไว้ในหอผู้ป่วยโรคหลอดเลือดสมองโดยเฉพาะร่วมกับหอผู้ป่วยระยะสั้น สามารถลดอัตราการตายและการเกิดภาวะแทรกซ้อน เมื่อเทียบกับการรับไว้ในหอผู้ป่วยทั่วไป

นิจศรี สุวรรณเวลา, ณัฐพงษ์ อื้อเศรษฐศักดิ์, กัมมันต์ พันธุมจินดา, กฤษณา พิรเวช, ชัยชน โลว์เจริญกูล

ภูมิหลัง: *การรับผู้ป่วยที่มีภาวะสมองขาดเลือดไว้ในหอผู้ป่วยโรคหลอดเลือดสมองโดยเฉพาะถือเป็นการรักษามาตรฐานในปัจจุบัน อย่างไรก็ตามหอผู้ป่วยโรคหลอดเลือดสมองนี้ ยังไม่ได้มีการจัดตั้งอย่างแพร่หลายโดยเฉพาะในประเทศกำลังพัฒนา*

วัตถุประสงค์: *เพื่อศึกษาผลของการดูแลผู้ป่วยที่มีภาวะสมองขาดเลือดที่รับไว้ในหอผู้ป่วยโรคหลอดเลือดสมองโดยเฉพาะและหอผู้ป่วยระยะสั้นเพื่อลดปัญหาจำนวนเตียงที่จำกัดในหอผู้ป่วยโรคหลอดเลือดสมอง*

วัสดุและวิธีการ: *ผู้รายงานได้ทำการเก็บรวบรวมข้อมูลผู้ป่วยที่มีภาวะสมองขาดเลือดในระยะเฉียบพลันที่มารับการรักษาที่โรงพยาบาลจุฬาลงกรณ์และรับไว้ในหอผู้ป่วยโรคหลอดเลือดสมองและหอผู้ป่วยระยะสั้นเมื่อปี พ.ศ. 2546 เทียบกับข้อมูลของผู้ป่วยที่มีภาวะสมองขาดเลือดที่รับไว้ในหอผู้ป่วยทั่วไปก่อนการจัดตั้งหอผู้ป่วยโรคหลอดเลือดสมองในปี พ.ศ. 2544 ในหอผู้ป่วยโรคหลอดเลือดสมอง ผู้ป่วยจะได้รับการดูแลโดยสหสาขาวิชา โดยมีแนวทางการปฏิบัติที่ชัดเจน สำหรับหอผู้ป่วยระยะสั้นเป็นส่วนหนึ่งของหอผู้ป่วยอายุรกรรมทั่วไป แต่ผู้ป่วยจะได้รับการดูแลโดยสหสาขาวิชาและมีการติดตามการรักษาต่อเนื่องถึงบ้าน ตัวชี้วัดที่ใช้ในการศึกษานี้ได้แต่อัตราการตาย ภาวะแทรกซ้อนในระหว่างอยู่โรงพยาบาล และระยะเวลาการครองเตียง*

ผลการศึกษา: *มีผู้ป่วยในการศึกษานี้จำนวน 794 ราย ผู้ป่วย 387 รายเป็นผู้ป่วยที่รับไว้เมื่อปี พ.ศ.2544 และ 407 ราย รับไว้ในปี พ.ศ. 2546 ในผู้ป่วยกลุ่มหลังนี้ 301 ราย ได้รับการรักษาในหอผู้ป่วยโรคหลอดเลือดสมองและอีก 106 ราย รับไว้ในหอผู้ป่วยระยะสั้น เมื่อศึกษาถึงปัจจัยเสี่ยงพื้นฐานของการเกิดสมองขาดเลือดพบว่าผู้ป่วยทั้ง 2 กลุ่มไม่มีความแตกต่างกันยกเว้นการมีไขมันในเลือดสูงและการสูบบุหรี่ซึ่งพบมากขึ้นในผู้ป่วยที่รับไว้เมื่อ พ.ศ.2546 ผู้ป่วยที่ได้รับการรักษาในหอผู้ป่วยโรคหลอดเลือดสมองและหอผู้ป่วยระยะสั้นมีอัตราการตายน้อยกว่ากลุ่มที่ได้รับการรักษาในหอผู้ป่วยทั่วไป (ร้อยละ 2.1 และ 8.9) และมีอัตราการเกิดภาวะแทรกซ้อนน้อยกว่าอย่างมีนัยสำคัญทางสถิติ (ร้อยละ 16.8 และ 26) โดยพบว่าการเกิดสมองบวม เลือดออกซ้ำในสมอง การติดเชื้อในระบบทางเดินปัสสาวะ การติดเชื้อในปอด และการมีแผลกดทับลดลงอย่างชัดเจน นอกจากนี้ระยะเวลาการครองเตียงของผู้ป่วยในปี พ.ศ. 2546 ยังสั้นกว่าผู้ป่วยที่รับไว้ในปี พ.ศ. 2544 (8.09 วันเทียบกับ 11.26 วัน)*

สรุป: *การรับผู้ป่วยที่มีภาวะสมองขาดเลือดในระยะเฉียบพลัน ไว้ในหอผู้ป่วยโรคหลอดเลือดสมองและหอผู้ป่วยระยะสั้นสามารถลดอัตราการตายและการเกิดภาวะแทรกซ้อนรวมทั้งระยะเวลาการครองเตียงลงได้ การศึกษานี้ยืนยันถึงความเป็นไปได้ของการจัดตั้งหอผู้ป่วยทั้ง 2 แบบในประเทศกำลังพัฒนาและแสดงให้เห็นถึงประสิทธิผลของการรักษาผู้ป่วยที่มีภาวะสมองขาดเลือดในหอผู้ป่วยเฉพาะโรคและหอผู้ป่วยระยะสั้น*