

*Full Length Research Paper*

# Post stroke special clinic in primary care: How well the patients with stroke can be managed in the community?

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**Optimal control of modifiable cardiovascular disease risk factors for patients with stroke is essential to prevent further ischemic events. The aim of this study was to evaluate the performance of the Post-Stroke Special Clinic (PSSC), a public primary care setting run by family specialists, by testing the control of blood pressure, low density lipoprotein, haemoglobin A1c if diabetic and smoking, among patients who had stroke and follow-up in PSSC. A retrospective single arm pre-post study was conducted among Chinese ischemic stroke patients who attended PSSC from 1st January, 2015 to 31st December, 2018 and had follow-up till one year after last incidence of stroke. At one year after last incidence of stroke, there were significant decrease in blood pressure, low density lipoprotein, haemoglobin A1c and the proportion of smokers compared with baseline (all  $P < 0.05$ ). There were 19 out of 326 cases had recurrent stroke within one year, yielding an annual recurrence rate of 5.8%. Findings of this study on the improvement in cardiovascular disease risk factor control and the relatively low one-year recurrence rate of stroke underlined the positive role of primary care on stroke management.**

**Key words:** Stroke, recurrence rate, family physician, primary care.

## INTRODUCTION

Stroke is a major cause of mortality and morbidity both locally and internationally. The reported cumulative risk of recurrent stroke varied from 5.4 to 17% at 1 year, and 19.4 to 41% at 5 years after the initial event (Stahmeyer et al., 2019; Modig et al., 2019; Buenaflor et al., 2017; Chen et al., 2020; Zhang et al., 2019). Patients with transient ischemic attack (TIA) or stroke simultaneously endured an increased risk of myocardial infarction and other vascular events (Gunnnoo et al., 2016). It was a significant cause of disability and a considerable disease burden (Virani et al., 2020). Strict control of modifiable cardiovascular disease (CVD) risk factors, including

cigarette smoking, hypertension (HT), diabetes mellitus (DM) and dyslipidemia, had proven to be effective in reducing the recurrence of stroke (Kernan et al., 2014). In Hong Kong, cerebrovascular accident (CVA) ranked fourth among the leading causes of mortality and accounted for over 3600 deaths in 2018 (Department of Health, 2019). A local study showed the incidence of first-ever stroke had been in decline from 1999 to 2007, which was consistent with observations from western developed countries. The incidence of recurrent stroke, on the contrary, was in a slightly increasing trend (Woo et al., 2014). Traditionally, majority of patients recovering from

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stroke had followed up (FU) in the Specialist Outpatient Clinics (SOPCs) in hospital. With our aging population, the growing disease burden of CVA would inevitably weaken the long-term management and prevention of stroke in the secondary care system. As a result, the responsibility for delivering effective secondary prevention and management of long-term problems associated with stroke was shared by primary care teams.

However, findings from a local audit on the secondary prevention of stroke conducted in a public primary care clinic in 2009 revealed that both the assessment and control of CVD risk factors for stroke patients at baseline were far from satisfactory (Chen et al., 2011). In particular, the first cycle of audit results noted that only less than half of stroke patients received their annual blood test for fasting glucose and lipid profile, and only about one-third of them achieved adequate lipid control. Even worse, only about 24% of diabetic stroke patients achieved adequate blood pressure control. Under such context and to bridge the service gaps, the Post-Stroke Special Clinic (PSSC) was established in the Department of Family Medicine and General Outpatient Clinics (Department of FM & GOPCs) of Kowloon Central Cluster (KCC) in 2009 to strengthen the collaboration between primary and secondary care for stroke management in the Hospital Authority (HA) of Hong Kong. Therefore, this study aimed to evaluate the control of modifiable CVD risk factors among patients who had follow-up in PSSC and the cumulative one-year recurrence rate.

## MATERIALS AND METHODS

### Clinical setting

PSSC located at Central Kowloon Health Centre (CKHC), a clinic under the governance of Department of FM & GOPCs of KCC. One PSSC session was delivered weekly and it was attended by specialized Family Medicine (FM) doctors. Patients admitted to Medical Wards in the same cluster for acute stroke or TIA were referred to PSSC for further management upon discharge. Within 4 weeks after discharge, the first appointment in PSSC was booked for nurse assessment and doctor consultation. After then, regularly FU were arranged at 4 to 16 weeks' interval with check-up of risk factors. Various of well formatted community services were available in PSSC, such as Smoking Counselling and Cessation Services (SCCS) (Chan et al., 2011), Risk Assessment and Management Program (RAMP) for HT and DM (Yu et al., 2017; Wan et al., 2018), to provide one-stop, multidisciplinary services in primary care setting.

### Inclusion and exclusion criteria

The inclusion criteria were Chinese adult patients with ischemic to 31st December, 2018, and had been FU by PSSC for one year after last incidence of stroke.

The exclusion criteria were patients with hemorrhagic stroke or with other causes including valvular heart disease, autoimmune disease (e.g. systemic lupus erythematosus, antiphospholipid antibody syndrome), hereditary disease (e.g. homocysteinemia); non-Chinese ethnicities; patients with specific medical conditions stroke diagnosis as coded with International Classification of

Primary Care-2<sup>nd</sup> version (ICPC-2) K89 (transient cerebral ischemia), K90 (cerebrovascular accident) or K91 (acute cerebrovascular disease), attended PSSC from 1st January, 2015 such as pregnancy, schizophrenia, human immunodeficiency virus (HIV) infection, and acquired immunodeficiency syndrome (AIDS), post-organ transplantation, or malignancy under active treatment; the FU duration at PSSC was less than one year after last incidence of stroke or patients had FU in other GOPCs or SOPCs for the same illness.

### Outcomes

The primary outcome was the change in the control of risk factors at baseline and one year after last incidence of stroke. The secondary outcome was the cumulative one-year recurrence rate of stroke.

### Data collection and determination of variables

Patient's demographics parameters such as age, gender, smoking status, BP reading, co-morbidities and biochemical profile were retrieved from the Computer Management System (CMS) of the HA upon patients' first consultation at PSSC. In line with recommendations from the American Heart Association (AHA) for patients with ischemic stroke, the target BP control is below 130/80 mmHg (Whelton et al., 2018) and the target lipid control is lower than 1.8 mmol/l (Grundy et al., 2019). Satisfactory glycemic control among diabetes patients is defined as HbA1c being lower than 7% (ADA guideline) (American Diabetes Association, 2020). Referring to local studies, self-reported 7-days point prevalence abstinence was used to assess the success of smoking cessation (Chan et al., 2011).

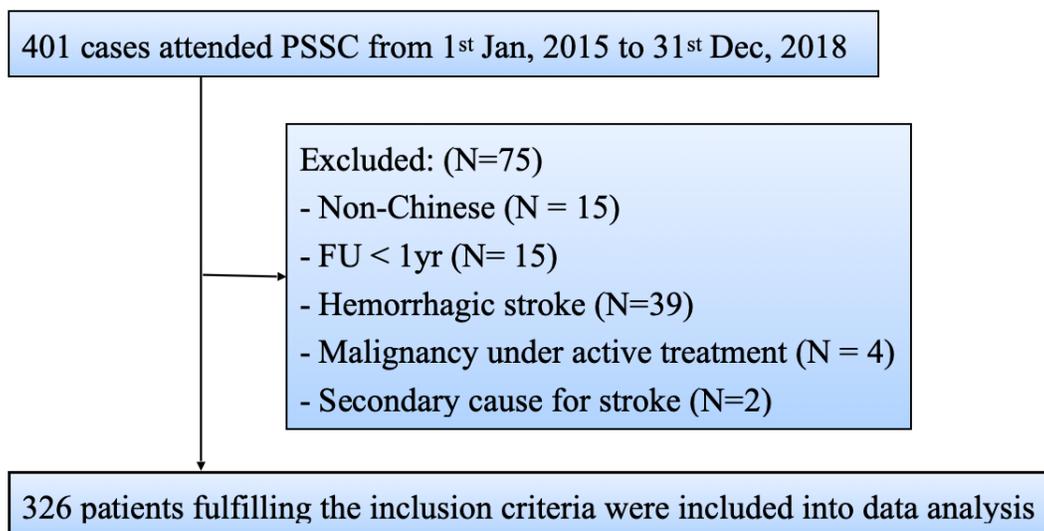
The 6S Score (Stroke Severity Score based on Six Signs and Symptoms) (Racosta et al., 2014) ranging from 0 to 15 score was used to assess the severity of stroke based on six clinical signs and symptoms. A higher score indicates a greater severity of stroke, a cutoff of 0-2 for mild, 3-5 for mild to moderate, 6-8 for severe and above 8 for very severe.

### Sample size and statistical analysis

A retrospective single arm pre-post study was conducted in this research. Based on a local study of the improvement of HT control in GOPC setting (Yu et al., 2017), the standard deviation of the change in Bp control was around 3.7. The minimum sample size for our pre-post study is 301 with the level of significance ( $\alpha=0.05$ ), the power of the test ( $\beta=0.2$  power of the test 80%) and the effect size ( $d=0.6$ ) (Chow et al., 2008). To allow room for case exclusion and assume a 15% dropout rate, 401 people were needed. In our preliminary data review, there were approximately 400 new cases booked in PSSC during 1st January, 2015 and 31st December, 2018. In view of relatively small sample size, all new cases were included in the data collection, and analyzed using computer software (namely, SPSS version 23 for Microsoft Windows, Chicago [IL], US). Paired t test was used for comparing the continuous variables and Chi-square test was used for comparing the categorical variables. All statistical tests were two sided, and a P value of less than 0.05 was considered statistically significant. For patients who passed away before one year after last incidence of stroke, the latest blood tests were used for comparison.

## RESULTS

A total of 401 cases had attended PSSC during the study



**Figure 1.** Flow chart of cases recruitment for the study.  
Source: Author

**Table 1.** Comparison of baseline characteristics between patients with and without recurrent stroke after one year.

Variable	Cases with recurrent stroke after one year (N=19)	Case without recurrent stroke after one year (N=307)	P value
Age	60.53 ± 9.87	63.59 ± 11.19	0.245
<b>Gender</b>			0.043
Male	10 (52.6%)	227 (74.2%)	
Female	9 (47.4%)	80 (25.8%)	
<b>Smoking status</b>			0.749
Smoker	2 (10.5%)	51 (16.6%)	
Ex- or nonsmoker	17 (89.5%)	256 (83.4%)	
<b>Stroke status</b>			0.008
First-ever stroke	14 (73.7%)	288 (93.8%)	
With previous history of stroke	5 (26.3%)	19 (6.2%)	
SBP (mmHg)	118.21 ± 12.51	125.21 ± 13.32	0.055
DBP (mmHg)	69.71 ± 9.90	72.28 ± 9.67	0.332
LDL (mmol/L)	1.77 ± 0.68	1.82 ± 0.58	0.781
HbA1c (%)	6.23 ± 0.12 (DM patients N=3)	Stroke status (DM patients N=78)	0.513

Continuous values were expressed as mean ± SD. Categorical values were expressed as absolute values and percentage in total cases.  
SBP = Systolic blood pressure, DBP = diastolic blood pressure  
Source: Author

period. There were 75 cases excluded as shown in Figure 1. Among the 326 cases included in the data analysis, their average age was  $62.42 \pm 11.13$ , and the mean 6S Score was  $1.32 \pm 1.28$ . Eighty-nine patients (27.3%) were female and 237 (72.7%) ones were male. The majority of patients were non-smoker and no

previous history of stroke with 66.6 and 92.6%, respectively. Other demographic characteristics and biochemical profile at baseline are summarized in Table 1.

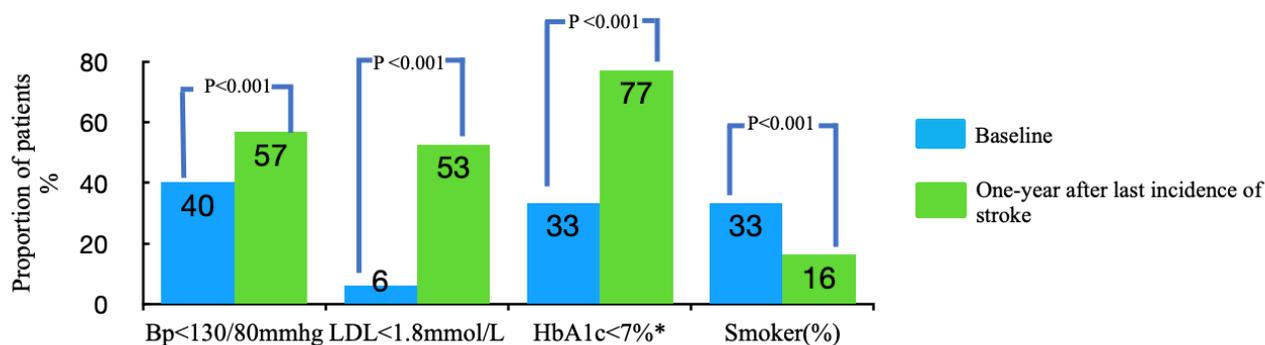
Comparisons between patients with and without recurrent stroke at baseline showed that higher proportion

**Table 2.** Comparison of major CVD risk factor control at one year after last incidence of stroke versus baseline.

Variable	N	Baseline	One year after incidence of stroke	Change to baseline	P value
SBP (mmHg)	326	130.80 ± 16.31	124.90 ± 13.34	-5.78 ± 17.57	<0.05
DBP (mmHg)	326	75.01 ± 10.99	72.17 ± 9.68	-2.81 ± 10.46	<0.05
LDL (mmol/l)	326	3.20 ± 1.03	1.81 ± 0.59	-1.39 ± 0.98	<0.05
HbA1c (%) (if diabetic)	81	8.55 ± 2.25	6.55 ± 0.84	-2.01 ± 2.25	<0.05

N = number of patient. The data were expressed as mean ± SD. SBP = Systolic blood pressure, DBP = diastolic blood pressure.

Source: Author



**Figure 2.** Comparison of the satisfactory control rates of major modifiable CVD risk factors and proportion of smokers at baseline and one-year after last incidence of stroke. All data presented with percentage. Among patients with DM only (N=81). Source: Author

of female (47.4% vs. 25.8%,  $P<0.05$ ) and patients with previous history of stroke (25.8% vs. 6.2%,  $P<0.05$ ) were in the recurrent stroke group.

### Primary outcomes

The average BP, LDL and HbA1c were all significantly reduced at one year after last incidence of stroke when compared with baseline (all  $P<0.05$ ) (Table 2).

Among 109 smokers, 51.4% of them (N= 56) successfully quit smoking. The proportion of smokers reduced from 33% at baseline to 16% after one year ( $P<0.05$ ). At one year after last incidence of stroke, the satisfactory control rates for BP and LDL was 57 and 53%, respectively. For diabetic patients (N=81), the satisfactory glycemic control rate was 77%. Improvement in these parameters all reached statistical significance compared with baseline levels ( $P<0.05$ ) (Figure 2).

### Secondary outcomes

A total of 19 patients (10 males and 9 females) were found to have recurrent stroke within one year after last incidence of stroke, with a cumulative one-year

recurrence rate of 5.8%. For patients with first-ever stroke and previous history of stroke, the one-year recurrence rate was 4.6 and 20.8%, respectively ( $P < 0.05$ ). The types of recurrent stroke included ischemic stroke (N=11, 57.9%), TIA (N= 4, 21.1%), intracerebral hemorrhage (ICH) (N=3, 15.8%) and subarachnoid haemorrhage (N=1, 5.2%). Among 19 recurrent stroke cases, 2 patients (both first-ever stroke and non-diabetic) passed away due to ICH, with one-year mortality rate of 0.6%.

### DISCUSSION

Community post stroke clinics run by FM doctor coordinated the inputs from doctors, nurses and allied health-care workers to deliver multidisciplinary and patient-centered care to stroke patients. Its one-stop service model has provided convenient, continuous and comprehensive medical care for stroke patients to prevent the stroke recurrence.

The present study demonstrated that the CVD risk factor control was significantly improved, and the satisfactory glycemic control rate among diabetic patients was considerably higher than those reported in United States and United Kingdom (Centers for Disease Control and Prevention, 2020; Chaplin, 2017). The finding of the

present study increases the strength of recommendation suggested by AHA that the delivery of evidence-based care and enhanced quality improvement strategies in primary care optimize outcomes (Kernan et al., 2021).

Cigarette smoking was an independent risk factor for both first-ever ischemic stroke and recurrent stroke (Pan et al., 2019; Chen et al., 2019). The finding of the present study was in line with previous studies showing that the smoking cessation rate in patients after stroke or TIA were from 40 to 60% (Chen et al., 2019; Epstein et al., 2017). Given studies showed that patients with history of CVD were more likely to quit smoking than individuals without chronic diseases (He et al., 2020), the stroke cases in our study attended their first PSSC consultation within 4 weeks after acute stroke, that provided family physicians a great opportunity to deliver smoking cessation counselling and refer them to SCCS.

In the present study, the one-year recurrence rate of stroke is comparable with findings from local studies and researches in developed countries ranged from 6 to 6.8% (Cheung et al., 2007; Amarenco et al., 2018; Zhang et al., 2015), and much lower than those reported in the meta-analysis (11.1%) (Mohan et al., 2015) and from developing countries (12.8 to 17%) (Buenafior et al., 2017; Chen et al., 2020). Apart from different ethnicities, the discrepancy could also be due to the different study populations. For example, the stroke cases in our study were mainly stable cases with lower severity and relatively young. However, the stroke cases recruited in the aforementioned meta-analysis and international studies were mostly from secondary care settings, with more severe condition and much older (average age >70 years). In view of more severe stroke, elder patients over 65 years were associated with a higher recurrence rate and mortality rate (Sarhazi et al., 2018), it is not surprising to find that the recurrence rate of stroke was lower in the present study. In consonance with the current study (Kauw et al., 2018; Zhang et al., 2017), our data confirmed that patients with previous stroke had a much higher one-year stroke recurrence rate. The patients who attended PSSC were not exclusive first-ever stroke cases, thus family physicians should be more vigilant particularly for patients with prior history of stroke, and take proactive strategies to control the CVD risk factors. However, there were a few limitations in the present study. First, the study was done in one public primary care clinic in a single cluster of the HA, therefore selection bias might exist. The findings from this study may not be applicable to private or secondary care settings. Second, due to the intrinsic nature of a retrospective study without a control group, causative or temporal relationships could not be established. Further prospective cohort studies are needed to compare the risk factors control in PSSC and GOPC, to identify the possible beneficial factors for better secondary prevention of stroke. Lastly, patients who defaulted FU at PSSC before one year after last incidence of stroke (N=15) had been excluded from the data analysis, the stroke

recurrence rate in the present study might be underestimated.

## Conclusions

The evidence-based multidisciplinary and patient-centered care delivered by PSSC has positive impact on the CVD risk factors control and secondary prevention of recurrent stroke. The significant improvement in blood pressure, low density lipoprotein, haemoglobin A1c and the proportion of smokers underlined the importance role of primary care on stroke management in community settings.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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