

# Current Patterns in the Management of Adult Stroke by Filipino Neurologists: A Nationwide Cross-Sectional Survey among Fellows of the Philippine Neurological Association

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## ABSTRACT

**Background.** Despite the availability of clinical guidelines for stroke, variation exists in the management patterns of stroke among neurologists.

**Objective.** To determine the current practice patterns of Filipino adult neurologists in stroke and their adherence to the current clinical guidelines of the Stroke Society of the Philippines (SSP).

**Methods.** Cross-sectional survey using a 3-page, 17-item questionnaire reviewed by the Stroke Council of the Philippine Neurological Association (PNA).

**Results and Observations.** From November 2013 to July 2014, 136 of 277 (49%) locally practicing board certified adult neurologists of the PNA were surveyed. Some important findings from the survey include: (1) 70% of respondents underestimated the benefit of warfarin in stroke prevention in nonvalvular atrial fibrillation (NVAF); (2) for acute ischemic stroke, although the recommended systolic blood pressure (SBP) threshold is >220 mm Hg, 43% would initiate antihypertensive therapy at SBP >180 mm Hg; (3) for acute primary intracerebral hemorrhage (ICH), 42% would start antihypertensives at SBP >140 mm Hg; (4) despite the absence of guidelines recommending the use of neuroprotectant drugs for acute stroke, 75% and 56% of neurologists have prescribed it to >80% of their patients with infarcts and ICH respectively; (5) 46% of neurologists have not experienced giving thrombolytic therapy to any of their patients with acute ischemic stroke; (6) among patients with clinically stable hemorrhagic strokes, 77% of neurologists would give antithrombotics, while 28% of them would start it 30 days after the onset of stroke; (7) only 21% of respondents have ordered carotid studies as part of their work up in >80% of their patients with ischemic strokes; and (8) 64% of respondents have requested carotid revascularization procedures for patients with significant carotid stenosis, and about 38% of these patients underwent the procedure.

**Conclusion.** The management patterns in stroke remain varied among Filipino neurologists, although the patterns show increasing adherence toward guideline recommendations. The following practices are noted: underestimation of the benefits of oral anticoagulation for stroke prevention among patients with NVAF; use of pharmacologic control of blood pressure below the recommended threshold for acute ischemic stroke; widespread use of neuroprotectant drugs despite lack of definite evidence for its use; low utilization of carotid studies in the work-up of patients with ischemic stroke and the low rate of revascularization procedures in confirmed cases of carotid stenosis; and a relative increase in experience with thrombolysis.

**Key Words:** clinical guidelines, adherence, survey, Filipino neurologist, stroke

## Background

Stroke remains as one of the leading causes of death, disability, and disease burden worldwide and in the Philippines.<sup>1-4</sup> For local healthcare practitioners, one way of addressing the problem with stroke is through an evidence-based and cost-effective approach to stroke as recommended in the clinical practice guidelines (CPGs) of the Stroke Society of the Philippines (SSP). Although these guidelines aim to improve varying geographic patterns in stroke management, there exists some gaps in the practice patterns even amongst the specialists. This can be attributed to the actual practice situation as well as the experience or knowledge of the individual clinician. However, to expect the Filipino physicians to adhere to the local guidelines, it is important to know whether the specialists (neurologists) conform to these guidelines.

The Stroke Council of the Philippine Neurological Association (PNA) has conducted earlier studies on the patterns of stroke management among the locally practicing PNA-board certified adult neurologists, in relation to the current recommendations of the SSP guidelines. To describe the current practice patterns of specialists, as follow up to previous surveys done in 2002 and 2009, this study deals with the following interventions or issues related to stroke management:

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1. Use of anticoagulation in patients for primary stroke prevention;
2. Pharmacologic control of blood pressure (BP) in acute ischemic and hemorrhagic stroke;
3. Use of thrombolytics, antiplatelets, neuroprotective drugs for acute stroke;
4. Use of diagnostic and revascularization procedures in patients with carotid stenosis;
5. Decompressive hemicraniectomy for malignant middle cerebral artery (MCA) infarcts;
6. Pharmacologic management of blood glucose in stroke patients with diabetes mellitus (DM).

## Methods

### Sampling

The nationwide cross-sectional survey was conducted from November 2013 up to July 2014 among board-certified adult neurologists of the PNA (also known as PNA fellows) actively practicing in the Philippines. Excluded in the study are child neurologists, and adult neurologists who are either retired/semi-retired, based abroad, in subspecialty (fellowship) training, those with subspecialization in child neurology, and those with less than two (2) years of practice following residency training (i.e. those who have taken oath as PNA fellow in 2012 or later).

All eligible fellows were invited to participate in the survey through personal invitations during the PNA annual and midyear conventions. Members of the PNA Stroke Council were asked to distribute and administer the questionnaires among the consultant staff of their respective hospitals. To improve the survey responder rate, the non-responders were followed-up at least twice via short message service (SMS) or electronic mails.

### Materials

The self-administered 3-page questionnaire was modified from the previous survey questions used in 2002 and 2009. The first part of the questionnaire established the practice demographics of the respondent neurologists, while the second part tested on their knowledge on current evidences or trends in stroke management. The respondents were also asked to recall on their prescribing practices and preferred management of their stroke patients (e.g. use of oral anticoagulants, actual number of patients ordered and/or given thrombolysis, carotid studies/interventions, managed for glycemic control).

### Analysis

Data were entered and analyzed using Stata Version 8 (Stata Corporation, College Station, Texas). All analyses were restricted to data, excluding the missing values. The responses were characterized by frequency distributions and standard descriptive studies.

## Results

### I. Demographic Characteristics

Out of the 277 PNA fellows who matched the eligibility criteria, 136 (49% response rate) were able to participate in the study. Eighty percent (80%) of the respondents are practicing in Luzon, majority (53%) of which come from the National Capital Region (NCR). Fourteen percent (14%) of the respondents practice in the Visayas region, while the rest (6%) come from Mindanao.

The mean duration of practice as neurologist was 15 years. Majority (40%) of the respondents have been in neurology practice for 11 to 20 years, while only a few (10%) have less than 6 years of experience as a private practitioner.

All respondents have their own private practice; thirty-two percent (32%) of which also practice in government-run institutions. More than half of the respondents are involved in the academe and/or in residency training programs (51% and 54%, respectively).

The average number of new stroke patients (either as inpatient or outpatient) seen by the respondents in a week is 9 patients. Three-fourths (75%) of the respondent neurologists encounter up to 10 new stroke patients per week, while less than 3% of neurologists get >20 new stroke patients per week.

Sixty percent (60%) of neurologists are affiliated in hospital(s) with a stroke unit, twenty seven (27) of which were named. (Table 1) The top five identified hospitals with dedicated stroke units were all located in the NCR, namely, St. Luke's Medical Center-Quezon City (17.9 %), Makati Medical Center (10.4%), The Medical City (6.6%), University of Santo Tomas Hospital (5.7%), and the University of the Philippines-Philippine General Hospital (4.7%). About the same number (61%) of neurologists reported that they have access to recombinant tissue plasminogen activator (rt-PA) drug. In addition, about 90% of the respondents have access to neurosurgical services in their respective hospitals.

### II. Patterns on Prescribing Oral Anticoagulation for Stroke Prevention

The respondents were asked to recall the approximate number of patients whom they have prescribed with oral anticoagulants (OACs) (i.e. warfarin, dabigatran, rivaroxaban) for stroke prevention during the past six months. In general, sixty two percent (62%) of neurologists have utilized OACs in no more than 15 cases in the past six months, almost one quarter (24%) of which have prescribed in the range of 9 to 12 patients. On the other hand, five (5) neurologists (4%) have not prescribed OACs to any of their patients for stroke prevention.

Although several randomized trials have demonstrated the efficacy of adjusted-dose warfarin in reducing the overall risk of stroke in patients with nonvalvular atrial fibrillation (NVAF) by as much as 64% compared to placebo, seventy

**Table 1.** Demographic Characteristics of Participating PNA Fellows

Variable	Frequency (%)	Total (N)
<b>Response Rate</b>	136 (49.1%)	277
<b>Area of Neurology practice</b>		136
National Capital Region (NCR)	72 (52.9%)	
Luzon (outside NCR)	37 (27.2%)	
Visayas	19 (14.0%)	
Mindanao	8 (5.9%)	
<b>Duration of practice as neurologist</b>		136
<6 years	17 (12.5%)	
6-10 years	29 (21.3%)	
11-20 years	54 (39.7%)	
>20 years	36 (26.5%)	
<b>Estimated number of NEW stroke patients per week</b>		130
1-10	97 (74.6%)	
11-20	30 (23.1%)	
21-30	2 (1.5%)	
>30	1 (0.8%)	
<b>Access to Stroke Unit(s)</b>	82 (60.3%)	136
<b>Available thrombolytic drug (i.e. rt-PA) in area of practice</b>	83 (61.0%)	136
<b>Available neurosurgical service in area of practice</b>	123 (90.4%)	136
<b>Practices in hospitals with a Stroke Unit</b>		107
St. Luke’s Medical Center, Quezon City	19 (17.7%)	
Makati Medical Center	11 (10.3%)	
The Medical City, Pasig City	7 (6.5%)	
University of Santo Tomas Hospital	6 (5.6%)	
University of the Philippines – Philippine General Hospital	5 (4.7%)	
University of the East Ramon Magsaysay Memorial Medical Center	4 (3.7%)	
Manila Doctors Hospital	4 (3.7%)	
Chong Hua Hospital, Cebu City	4 (3.7%)	
Cebu Doctors’ Hospital	4 (3.7%)	
Baguio General Hospital	4 (3.7%)	
San Juan de Dios Educational Foundation, Inc. Hospital	4 (3.7%)	
The Medical City, Iloilo	4 (3.7%)	
Asian Hospital and Medical Center	3 (2.8%)	
Metropolitan Medical Center, Manila	3 (2.8%)	
Cagayan De Oro Polymedic General Hospital	3 (2.8%)	
Cardinal Santos Medical Center	3 (2.8%)	
Davao Doctors’ Hospital	3 (2.8%)	
Far Eastern University – Nicanor Reyes Medical Foundation	3 (2.8%)	
St. Luke’s Medical Center, Global City	2 (1.9%)	
Jose Reyes Memorial Medical Center	2 (1.9%)	
Butuan Doctors’ Hospital	2 (1.9%)	
Davao Medical School Foundation	2 (1.9%)	
Philippine Heart Center	1 (0.9%)	
Mount Carmel Diocesan General Hospital, Quezon Province	1 (0.9%)	
Lorma Medical Center, La Union	1 (0.9%)	
Baguio Medical Center	1 (0.9%)	
Manila Central University – Filemon D. Tanchoco Medical Foundation	1 (0.9%)	

percent (70%) of the respondents underestimated the benefit of warfarin in stroke prevention in NVAf, with about half of them estimating the benefit of warfarin to be not more than 30%.<sup>5</sup> The rest of the respondents (30%), on the other hand, were able to approximate the benefit of warfarin in stroke prevention in atrial fibrillation (SPAF). (Table 2)

**Table 2.** Estimated Risk Reduction for First-ever Stroke by Oral Anticoagulation using Warfarin Compared to Placebo among Patients with Nonvalvular Atrial Fibrillation (NVAf)

Estimated Risk Reduction	Frequency	Percent (%)
0-15%	10	8.3
16-30%	33	27.3
31-45%	15	12.4
46-60%	26	21.5
>60%	37	30.6
<b>Total</b>	<b>121</b>	<b>100</b>

The neurologists were asked to provide reason/s for not prescribing OACs in patients with NVAf who are otherwise eligible to receive anticoagulation. The top three reasons provided (in descending order) are as follows: uncertainty of good follow-up (34%), fear of bleeding complications due to anticoagulation (22%), and the expensive assays of the prothrombin time-international normalized ratios (PT-INR) (16%). The other reasons for not giving oral anticoagulation are presented in Table 3.

**Table 3.** Reasons for Not Prescribing Oral Anticoagulation in Eligible Patients with Nonvalvular Atrial Fibrillation

Reasons (choices provided)	Frequency	Percent (%)
Uncertainty of good follow-up	114	33.9
Fear of bleeding complications	75	22.3
Expensive monitoring (assays) of INR (for warfarin)	55	16.4
Difficulty in titrating warfarin doses	39	11.6
Unavailability of INR monitoring in area of practice	26	7.7
Limited experience with anticoagulation	2	0.6
Others (filled up by the respondent)		
No consent to anticoagulate	8	2.4
High cost of medication	5	1.5
Other co-morbidities/factors contraindicating anticoagulation therapy	3	0.9
Only few AF patients to anticoagulate	1	0.3
Erratic INR levels	1	0.3
Unspecified	7	2.1
<b>Total</b>	<b>336</b>	<b>100</b>

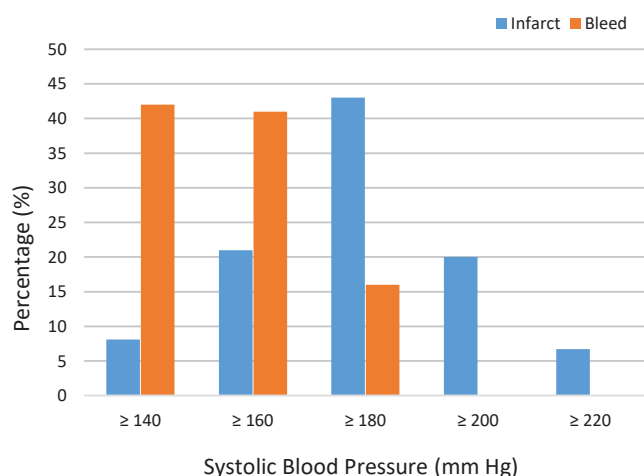
Currently, there is no recommendation with regard to the decision or time at which patients with acute ischemic stroke and NVAf, who have neuroimaging findings of mild to moderate hemorrhagic conversion, can be started or resumed on OACs. It was found that majority of neurologists (47%) will start or resume anticoagulation at approximately 14-15 days after the ictus. About eleven percent (11%) of them would have started or resumed OACs beyond two (2) weeks post-ictus but before 30 days, while approximately 22% would give OACs beyond 30 days.

### III. Patterns on the Management of Blood Pressure in Acute Stroke

For acute ischemic stroke, the current SSP guidelines recommend initiating antihypertensive therapy in the following conditions (except in the presence of cardiopulmonary or renal comorbidities or if the patient is a

candidate for receiving thrombolytic therapy): systolic blood pressure (SBP) levels above 220 mm Hg, diastolic blood pressure (DBP) levels above 120 mm Hg, or mean arterial pressure (MAP) >130. Results show that the most of the respondents (43%) will initiate antihypertensive treatment at SBP  $\geq$ 180 mm Hg. Twenty nine percent (29%) of the respondents would start antihypertensive treatment below this SBP level.

For acute hypertensive intracerebral hemorrhage (ICH), the SSP recommends antihypertensive treatment if SBP >180 mm Hg. Acute lowering to SBP  $\approx$ 140 mm Hg is feasible and probably safe based on the results of INTERACT and ATACH Phase II clinical trials. The final results of the two trials were not yet available during the 5<sup>th</sup> edition of the SSP Guideline. In cases of acute ICH, forty one percent (41%) of the respondents would give antihypertensive treatment at SBP  $\geq$ 160 mm Hg, while 42% would treat if the SBP  $\geq$ 140 mm Hg. Only 16% of the respondents would start at the recommended SBP threshold. Figure 1 shows the SBP levels at which the respondents would start pharmacologic BP control in patients with acute stroke.



**Figure 1.** Systolic Blood Pressure (SBP) levels at which Neurologists would Initiate Antihypertensive Therapy in Patients with Acute Stroke.

**IV. Patterns on the Use of Neuroprotective Agents in Acute Stroke**

At present, three drugs are marketed locally as having neuroprotective or neurorestorative properties, namely: Citicoline, Cerebrolysin®, and NeuroAiD™. Despite the lack of specific guidelines recommending its use in acute stroke, forty seven percent (47%) agreed and twenty eight percent (28%) strongly agreed that patients with acute ischemic stroke should receive neuroprotectant (NP) drugs. Twenty two (22) respondents (or 16%) were neutral on the use of NP agents in acute ischemic stroke, while 12 neurologists (or 8.9%) have answered either “disagree” or “strongly disagree” on this notion.

When the neurologists were asked to estimate the percentage of their patients whom they have ordered neuroprotectants, about 75% have used these drugs in more than 80% of their patients with acute ischemic stroke, while 3% have not prescribed these drugs in such cases. On the other hand, fifty-six percent (56%) of the respondents have used NP drugs in more than 80% of their patients with acute hemorrhagic strokes, whereas 8% of neurologists did not.

Although the clinical trials of each NP drug did not show significant difference in the functional outcomes of patients with stroke, most Filipino neurologists have been using NP drugs in their stroke patients (97% for acute ischemic strokes and 92% for acute hemorrhagic strokes). The top three reasons for using NP drugs include good experience with these drugs (39%), the lack of a better drug to give (31%), and the clinician’s perceived evidence of efficacy warranting its use in stroke (21%). The other reasons for using NP drugs are listed in Table 4.

**Table 4.** Reasons for Prescribing Neuroprotectant Drugs in Patients with Acute Stroke

Reasons for Prescribing Neuroprotective Agents (choices provided)	Frequency	Percent (%)
Clinician’s good experience with its use	83	39.0
No other (better) drug to give	65	30.5
Evidence of efficacy warranting its use	44	20.7
Influence of pharmaceutical companies	6	2.8
Others (specified)		
Anecdotal evidence	6	2.8
Other patients who received neuroprotectant drugs seemed to do better	3	1.4
As opted by the patient/other patient factors	2	0.9
Based on the drug’s mechanism of action	2	0.9
Unspecified	2	0.9
<b>Total</b>	<b>213</b>	<b>100</b>

**V. Patterns on the Management of Patients with Carotid Stenosis**

Carotid artery stenosis is an established modifiable risk factor present in 15 to 20% of ischemic cases.<sup>6</sup> The current SSP guidelines recommend the use of carotid studies (e.g., carotid duplex/Doppler ultrasound [CDUS]) in both symptomatic and asymptomatic patients who are at risk for significant carotid disease. The respondents were asked to estimate the percentage of their patients whom they have ordered carotid ultrasound as part of the diagnostic work-up during the past 5 years. Twenty-one percent of the neurologists have ordered carotid studies in more than 80% of their patients with ischemic stroke, while 18% have ordered the procedure in approximately half of their patients. Only one respondent did not order carotid studies during this period.

Among patients with diagnosed carotid artery stenosis, medical management remains as the primary approach in lowering the risk of stroke, particularly in local healthcare setting. Surgical interventions for both asymptomatic and



severe symptomatic carotid stenosis include carotid endarterectomy (CEA) and carotid angioplasty and stenting (CAS). In the SSP guidelines, carotid revascularization procedure is reasonable to perform in patients with asymptomatic carotid stenosis of more than 70% or in symptomatic patients with 50% to 99% stenosis. The choice of either procedure depends on the age of the patient as well as the surgical risks. In this survey, sixty four percent (64%) of the respondents have ordered either CEA or CAS within the last 5 years, which is slightly higher than data gathered from the previous survey (60.8%). The rate at which CEA or CAS have been performed in their patients, however, is only 38%. The reasons for the missed procedures among these patients were not investigated in the survey.

#### **VI. Patterns on the Use of Thrombolytic Agent in Acute Ischemic Stroke**

It is well-established that thrombolytic therapy with recombinant tissue plasminogen activator (rt-PA) can improve clinical outcomes in otherwise eligible patients whose onset of ischemic stroke is within 3 hours (or up to 4.5 hours in selected cases).<sup>7,8</sup> In the past 5 years, 61 respondents (46%) have not experienced giving rt-PA to any of their patients with acute ischemic stroke.

Fifty four percent (54%) of neurologists reported that they have ordered thrombolysis in their eligible patients with acute ischemic stroke. However, only half of these patients were thrombolized. The reasons for not prescribing or receiving rt-PA, however, were not asked in this survey.

#### **VII. Patterns on the Use of Antiplatelets in Stable Hemorrhagic Stroke**

Currently there is no recommendation as to when (or whether) to give antiplatelet agents in patients with recent but stable hemorrhagic stroke (primary ICH) and who have high risk for developing ischemic stroke. The survey revealed that majority of respondents (77%) would start or resume antiplatelets, while 31 neurologists (23%) will not. Twenty percent (20%) of neurologists would start antiplatelets after 14 days of stroke, while 28% and 16% will give on the 30th and 90th day post-stroke, respectively.

#### **VIII. Decompressive Hemicraniectomy for Malignant MCA Infarct**

The respondents were asked to state how many of their patients with malignant MCA infarct had undergone hemicraniectomy. The average number of hemicraniectomies was 5 patients for the past 5 years among those who have experience with this procedure. Sixteen neurologists (17%) reported that they did not have patients with malignant MCA infarct who have undergone decompressive hemicraniectomy.

#### **IX. Use of Vitamin Supplements for Neurologic Deficits after Stroke**

Forty-two percent of neurologists do not prescribe vitamin supplements in post-stroke patients with neurologic deficits (e.g., weakness, numbness). On the other hand, about 15% of respondents would give vitamin supplements to more than 60% of their patients.

#### **X. Patterns on the Management of Diabetes for Secondary Stroke Prevention**

Diabetes mellitus (DM) is a main modifiable risk factor for stroke and is a common comorbidity among stroke patients. The neurologists were asked to estimate the percentage of their patients with stroke whom they personally manage and/or adjust blood glucose medications. About 41% would manage or adjust medications for DM but in only less than 20% of their diabetic patients. Thirteen percent (13%) of neurologists manage DM medications in more than 80% of their diabetic patients.

#### **Discussion**

Surveys, although not controlled and with risk of biases, may reflect the preferred practices of respondents in actual real world settings. This current survey is the 3<sup>rd</sup> survey (first in 2002 and second in 2009) among Filipino Neurologists to get an idea of the preferences of local neurologists on several stroke issues, some of which do not have a definitive answer.<sup>9,10</sup> Practice guidelines are always changing depending on availability of evidences and the reference used here was the 5<sup>th</sup> edition of the SSP guideline.

Since the last survey in 2009, there have been additional 60 fellows in the PNA roster who are eligible to participate in the study based on the inclusion criteria. However, as compared with the previous study, there was a decrease in the response rate (only 49.1% this year versus 81.1% in 2009 and 60.2% in 2002).<sup>9</sup>

The demographic characteristics of the study population show that majority (80.1%) of the respondents practice in Luzon, particularly in the NCR (52.9%). This demonstrates the generally unequal distribution of specialists in the country, where most neurologists will practice in urban centers. Moreover, it can also explain the geographic variability in terms of access to other health resources (e.g., available stroke units, thrombolytic agent) and/or related specialists (i.e. neurosurgeon).

The current survey shows that 74.6% of neurologists get to see up to 10 new stroke patients in a week, which is lower than the average number of patients seen in the 2009 survey (i.e. 22 patients per week).

The benefit conferred by oral anticoagulants in the prevention of stroke among patients with nonvalvular atrial fibrillation (NVAF) has become increasingly known to the respondents. As compared with the results of previous surveys, more neurologists (30% versus 20% in 2002 and 23%

in 2009) have been able to approximate the benefit of warfarin (versus placebo) in stroke risk reduction among patients with NVAF. There was also a significant increase in the number of neurologists who have utilized oral anticoagulants for stroke prevention. In the present survey, eighty six (86) respondents (67%) claimed that they have used OACs in more than eight (8) patients in the past 6 months, as compared with 33% of the respondents in the 2009 survey. The increase utilization of oral anticoagulants is most likely due to the availability of the three novel oral anticoagulants (Dabigatran, Rivaroxaban and Apixaban) which were shown to be at least non inferior to warfarin, with lesser hemorrhagic complications and much easier to use.

Even with this increasing trend in the use of OACs, the percentage of patients prescribed with OACs for prevention of stroke in the last 6 months is relatively small compared with the average number of cases seen weekly. The common reasons given for not giving anticoagulation were unchanged from the earlier surveys, which include uncertainty of good follow-up, fear of bleeding complications, and the cost of PT-INR monitoring in warfarin. In addition, the underestimation of the clinical benefit of warfarin for stroke prevention, especially in NVAF, may be another factor for its underuse.

Another issue related to stroke prevention in NVAF is the timing of initiation or resumption of anticoagulants among patients who developed mild to moderate hemorrhagic conversion. In the present survey, the majority of respondents would start OACs at about 2 weeks after stroke, as compared to the previous survey where most neurologists would have started at 30 days post-stroke. Depending on the severity of the stroke, the size of the infarct and presence of hemorrhagic conversion on imaging, earlier resumption of an oral anticoagulant, especially the NOACs, may be beneficial.

Permissive hypertension during first few days after an acute ischemic stroke is recommended to avoid decrease in perfusion at the penumbra surrounding the infarcted tissue. In addition, aggressive BP lowering is detrimental and may result to higher rates of neurological worsening or poorer outcomes, or even death. For acute ischemic stroke, the SSP currently recommends antihypertensive therapy for SBP >220 mm Hg, DBP >120 mm Hg, MAP >130, with an additional provision for patients who are eligible for thrombolytic treatment with rt-PA or acute reperfusion intervention. Many neurologists (43%) will start BP management at SBP level of  $\geq 180$  mm Hg, which is almost similar to the responses in the previous surveys (42.2% in 2009 and 46% in 2002). The relatively lower threshold for initiating BP medication partly reflects the neurologist's concerns of family members who are alarmed with an untreated extreme elevated BP (>180 mm Hg SBP) after an acute stroke despite explanation of the rationale for permissive hypertension.

For acute hypertensive ICH, current guidelines indicate BP therapy at SBP >180 mm Hg, the rationale of which is to avoid further expansion of hematoma from potential sites of bleeding. Recent studies, however, have shown that acute BP lowering to  $\approx 140$  mm Hg is probably safe, but its clinical efficacy remains to be determined.<sup>11</sup> The present survey shows that 16% of neurologists would start antihypertensive treatment for SBP level of >180 mm Hg in hypertensive hemorrhagic stroke with the majority (42%) initiating treatment at SBP level of  $\geq 140$  mm Hg. The 5<sup>th</sup> edition of the SSP stroke guidelines did not utilize the results of the INTERACT2 trial but the recent 6<sup>th</sup> edition released in late 2014 have already recommended the lower SBP threshold of 140 mmg Hg for acute ICH.

Based on the results of recent trials on drugs with putative neuroprotective and neurorestorative actions, the SSP has not made any specific recommendation regarding the use of these NP drugs, hence it becomes a matter of preference of the attending physician. Even without a definitive recommendation for its use, still majority of neurologists (75%) were in favor that acute ischemic stroke patients should receive this type of drugs. This is higher than level of agreement noted in the 2009 survey (65.7%). The most common reasons for giving NP drugs were unchanged from the previous survey, which include the clinician's good experience with its use, the lack of a better drug to give to their stroke patients, and the available evidence of efficacy. What was not probed in this survey is the specific NP drug most commonly used or preferred by the respondents.

As compared with the previous survey, more neurologists have been utilizing carotid studies (e.g., duplex scan, Doppler) as part of the diagnostic work-up of their patients with ischemic stroke. However, the number of respondents who have requested carotid studies in more than 80% of their patients have decreased from 25.1% in 2009 to 21% in the latest survey. Although the relative number of requests for CEA or carotid stenting for patients with significant carotid stenosis during the past 5 years have slightly increased from 60.8% to 64%, the current rate at which CEA or CAS have been performed is only 38%. The probable reasons for the underutilization include the preponderance of intracranial stenosis among Asians as well as the substantial improvements in the primary prevention of atherosclerosis by medical means than in the reduction of perioperative risks in carotid revascularization procedures.<sup>12-14</sup> The high cost of doing carotid studies is a practical issue considering the low incidence of finding of significant carotid stenosis.

In the past 5 years, 54% of neurologists have experienced giving thrombolytic therapy in ischemic stroke patients, which is higher from the response in the previous survey (36.4%). Although there is improvement with regard to experience in administering rt-PA among neurologists,

the rate of thrombolysis remains low. Possible reasons for the underutilization include limited access to stroke units and the prohibitive cost of the drug. The SSP has been collaborating with the Department of Health to make the thrombolytic drug more available in government hospitals and at a lower cost.

Another issue unanswered by the guidelines is the indication or timing of starting antithrombotics among patients who are at high risk for ischemic stroke but who had intracerebral bleed. It has been a common local practice to start antiplatelets at a time when the hematoma is considered to be stable or resolving, but it is still not established as whether (or not) to initiate or resume antiplatelet therapy in these patients. Majority of neurologists (77%) would give antiplatelet therapy in patients with stable hemorrhagic stroke, although this proportion has decreased from the result of the previous survey (81.4%). The responses on the time of resumption of therapy, however, was unchanged from the previous survey.

One of the new issues addressed in this study is on the utilization of decompressive hemicraniectomy in patients with malignant MCA infarcts who are otherwise eligible for surgery. Based on the data provided above, it appears that the rate of decompressive hemicraniectomy is low given the high availability of neurosurgeons in their area or hospital of practice. Possible reasons for the non-surgical management of patients with malignant MCA infarcts include the surgical risks inherent in the patient as well as the cost of the surgery. Another topic in the management of post-stroke patients is the use of vitamin supplementation. The lack of strong evidence supporting the use of vitamins after stroke is reflected in the low routine usage by the neurologists.

In patients with a history or incidental finding of diabetes mellitus (DM) during acute stroke, the current SSP guidelines recommend targeting glucose levels at 140 mg/dL to 180 mg/dL if the fasting blood glucose (FBG) is greater than 140 mg/dL or the random blood glucose (RBG) is consistently higher than 180 mg/dL. The present study shows that majority of the surveyed neurologists personally manage and adjust the blood sugar medications in only about 20% of their patients or less. This is in contrast with the result of previous survey, where most (34.9%) of the respondents claimed that they manage blood sugar medications of their patients 75% of the time. The reason for this change can be due to the availability of endocrinologists and diabetologists in tertiary hospitals but can also reflect the limited confidence in DM management among neurologists. In many settings, patients cannot afford the cost of having several co-managing specialists, hence the competency in the management of diabetes will be helpful and more practical. Familiarity with DM management, particularly with the use of insulin, should be emphasized in neurology training programs.

## Conclusion

Based on the results of the survey, the common management patterns on adult stroke among Filipino neurologists are noted: underestimation of the benefits of oral anticoagulation for stroke prevention among patients with NVAf, use of pharmacologic control of blood pressure below the recommended threshold for acute ischemic stroke, widespread use of neuroprotectant drugs despite lack of definite evidence for its use, low utilization of carotid studies in the work-up of patients with ischemic stroke and the low rate of revascularization procedures in confirmed cases of significant carotid stenosis and a relative increase in experience with thrombolysis.

## Limitations and Recommendations

The respondents for the survey comprised 49% of the eligible adult neurology fellows of the PNA. A higher respondent rate would have been ideal. As in all surveys, recall bias is expected. It is important to state that the results of the survey do not reflect the knowledge on stroke management by the PNA Fellows but their clinical preferences in providing individualized care, fully aware of the current practice guidelines. The local setting in the country, the health delivery system, social and personal factors all would play an important role on how neurologists manage their patients.

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## Statement of Authorship

All authors have approved the final version submitted.

## Author Disclosure

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