

Secondary Stroke Prevention through Patient Education Intervention on Lifestyle Risk Factors: A Review

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ABSTRACT: Stroke ranks top five causes of mortality in Malaysia with the rate of 8.3/100,000 population. Stroke are characterised by acute neurological deficits and mostly associated with vascular causes. Risk factors which contribute towards 90% of overall stroke are hypertension, unhealthy diet, physical inactivity, excessive alcohol intake, psychosocial stress, atria fibrillation, smoking, high cholesterol and diabetes. Thus, appropriate secondary stroke prevention is required in modifying these risk factors *via* educational intervention. The aim of this article is to provide a review of literature pertaining to the risk factors associated with stroke highlighting the lifestyle risk factors. Furthermore, this review will also discuss upon the importance of systematic patient education process and applying health promotion theories in lifestyle intervention. Various educational techniques nurses and other healthcare professional can adopt to address lifestyle behavioural changes following stroke will be discussed briefly in this paper.

Keywords: stroke, risk factors, secondary prevention, patient education, lifestyle intervention

Introduction

Stroke are characterized by acute neurological deficits and mostly associated with vascular causes. First ever stroke patient is estimated around 30% to 40% chances to encounter further stroke within five years (Kirshner, 2009). In ASEAN countries, stroke rank top four cause of death with the crude death rate varying from 10.9/100,000 (Thailand) to 54.2/100,000

(Singapore) (Venketasubramanian, 1998). Meanwhile, in Malaysia, stroke causes a mortality of 8.43/100,000 population (Table 1) or 4052 deaths in year 2009 which ranks top fifth common causes of death after pneumonia (MOH Clinical Practice Guideline, 2012).

Vascular etiology of stroke is classified into ischemic and hemorrhagic. For ischemic strokes, thrombotic etiology accounts for 40-50% and embolic etiology contributed about 15-30% while cardiogenic embolism is 20% of overall stroke mortality. Meanwhile, hemorrhagic stroke was classified into intracerebral and subarachnoid which accounts for 5-20% mortality (MOH Clinical Practice Guideline, 2006). Ischemic stroke is more common than hemorrhagic stroke in Malaysia population. Study done in Penang Hospital, shows that both ischemic and hemorrhagic stroke had counted for 74.8% and 25.2% (Ong and Raymond 2002). Commonly ischemic stroke involved large vessel atherosclerosis and small vessel occlusion (Tan *et al.*, 2010).

Table 1: Top mortality rate in MOH centre

Mortality (rate per 100 000 population) in percentage	
Heart diseases and diseases of pulmonary circulation	16.09%
Septicaemia	13.82%
Malignant neoplasm	10.85%
Pneumonia	10.38%
Cerebrovascular diseases	8.43%

(Source: MOH, 2009)

Recurrent strokes are more fatal and disabling compared to first ever stroke. However, established prevalence data on recurrent stroke in Malaysia are not available. This was supported by a report published by Asian Acute Stroke Advisory Panel (2000) which mentioned Malaysia, Thailand, Philippines and Indonesia are among countries with moderate epidemiological data on stroke which limits to hospital-based information.

Guidelines for cost-effective secondary prevention in low-income and middle-income countries proposed by World Health Organization (WHO) highlights the importance of lifestyle modification interventions other than the use of affordable, accessible and effective pharmacological treatments. Currently the mainstay of medical preventive treatment in

Malaysia for recurrent stroke is through biomedical approach mainly pharmacology and physical therapy (Jahangir *et al.*, 2007; Abdullah, 2009; Abdullah and Husin, 2011; Hejazi, 2012).

Recently it is now recognised that biomedical approach alone do not results in significant effects to control risk factors which associated with lifestyle such as smoking, unhealthy diet, physical inactivity, obesity and stress. Evidence-based guidelines recommended lifestyle interventions to be comprehensive, personalized and informed by behavioural change theory and multimodal approach combining optimal medical therapies with lifestyle interventions (Tharakan, 2012).

Although few studies evaluated that multimodal interventions have show limited effects highlighting the difficulty of achieving lifestyle changes (Sit *et al.*, 2007; Joubert *et al.*, 2009; McManus, 2009). Nevertheless, there are studies mentioned that support and advice from healthcare professionals are helpful to increase adherence on secondary stroke prevention therapy (Ovbiagele *et al.*, 2004a; Burton and Gibbon, 2005). Nurses and other healthcare professionals (HCP) are responsible to understand the psychological process, cognitive status and use appropriate behaviour change theories to inform and deliver the educational content of lifestyle intervention (Sullivan and Katajamaki, 2009; Lawrence *et al.*, 2010).

Nurses have important roles to educate the public on healthy lifestyle (Holzemer *et al.*, 2011; Lawrence *et al.*, 2011). However, provision of educational intervention from nurses and other HCP regarding lifestyle modification of risk factors for recurrent stroke prevention were lacking in routine practice (Greenlund *et al.*, 2002; Ovbiagele *et al.*, 2004a; Ovbiagele *et al.*, 2004b; Joubert *et al.*, 2009; Lawrence *et al.*, 2009). Lacking of emphasize on routine lifestyle modification information might be due to lack of knowledge, skills and interest among the nurses.

Secondary prevention of stroke through education among stroke patients and family caregivers had been given priority by MOH. Stroke education is included among nine key performance indicators (KPI) that requires improvement in stroke management (MOH Clinical Practice Guideline, 2012). Therefore, this article aims to provide a review of literature pertaining to risk factors associated with stroke highlighting the lifestyle risk

factors. Furthermore, educational techniques nurses and other HCP can adopt to address lifestyle risk factor modification after stroke will also be discussed further.

Modifiable risk factors for stroke

Hypertension (HTN)

The most common risk factor of stroke in Malaysia is hypertension which rates at 75.5 % according to National Stroke Registry database (Nazifah *et al.*, 2012). Meanwhile, a study done in Hospital Universiti Sains Malaysia (HUSM) shows that HTN present in both cerebral infarct (65.2%) and intracerebral haemorrhage (69.2%) patients and most patients (34%) died in the first month after stroke (Jaya *et al.*, 2002).

Control of high blood pressure (BP) contributes towards the reduction of stroke. A dose-response relationship with a 10 mmHg reduction in systolic BP is associated with a 31% reduction in stroke risk (Lager and Mistri, 2010). Variety of sources support the importance of treatment of hypertension for primary cardiovascular disease prevention in general and stroke in particular but only limited data directly address the role of BP treatment in secondary prevention among individual with stroke or TIA (Sacco *et al.*, 2006; Lager and Mistri, 2010; Nazifah *et al.*, 2012).

Antihypertensive drugs are current mainstay of preventing recurrent strokes (Sacco, 2006). An absolute target BP level and reduction are uncertain but benefit has been associated with an average reduction of $\approx 10/5$ mmHg, and normal BP levels have been defined as $<120/80$ mmHg (Sacco *et al.*, 2006). The same practice had been observed conducted in Malaysia on BP monitoring after stroke (MOH Clinical Practice Guideline, 2012).

Nevertheless, lifestyle modifications are also associated with blood pressure reductions and should be included as part of a comprehensive antihypertensive therapy (Sacco *et al.*, 2006; Ederle and Brown, 2008). Systolic BP reductions have been associated with exercise level and optimum nutritional status (Wan Nudri *et al.*, 2003). Thus, it is highly recommended for stroke patients to maintain normal BP level to prevent recurrent stroke.

Obesity

WHO estimates globally there are more than one billion overweight adults with body mass index (BMI) more than 25 kg/m². While in Malaysia, adiposity affects about one third of the elderly population, especially those of the younger age group, women, and higher socioeconomic status (Suzana *et al.*, 2010). Being Malay and Indian ethnicity and living in urban area also had increase the risk of becoming obesity (Suzana *et al.*, 2010).

Obesity is defined as BMI of more than 30 kg/m². Clinically, abdominal obesity is defined by a waist circumference more than 102 cm (40 in) in men and 88 cm (35 in) in women. Obesity is an independent risk factor for coronary heart disease (CHD) and premature mortality. For individuals with disabling conditions with associated physical disabilities, obesity is even more prevalent. However, the relationship of obesity and weight gain in adult years to stroke is complex. But, it has been established that obesity also is strongly related to several major risk factors, including HTN, diabetes and hyperlipidemia (HPL) (Cheah *et al.*, 2011).

Significant and independent association between abdominal obesity and ischemic stroke was found in Atherosclerosis Risk in Communities (ARIC) Study (Hiroshi *et al.*, 2010). The incidences of lacunar, non-lacunar, and cardioembolic stroke are all significantly positively associated with the degree of obesity, regardless of the measure used. The hazard ratios (HRs) for the highest versus lowest quintile of the three obesity measures ranged from 1.43–2.21 for lacunar stroke, 1.90–2.16 for nonlacunar stroke, and 2.37–2.91 for cardioembolic stroke (Hiroshi *et al.*, 2010).

To date, no study had demonstrated that weight reduction will reduce stroke recurrence globally and specifically in Malaysia. Losing weight significantly improves BP, fasting glucose values, serum lipids, and physical endurance (Gao *et al.*, 2008). Since obesity is a contributing factor to other risk factors associated with recurrent stroke, promoting weight loss and the maintenance of a healthy weight should be given high priority.

Dietary habits

Unhealthy dietary pattern leads to malnutrition should be treated early after stroke. Common complaints are having dysphagia and poor sensory that limits stroke patient dietary intake (Foley *et al.*, 2008). A study in Taiwan has established malnutrition at acute stroke is significant independent risk factors for poorer functional outcomes (Shen *et al.*, 2011). Findings from Malaysian has established age, diabetes and large infarcts are associated with dysphagia (Hamidon *et al.*, 2006). But, study on dietary habits specifically after stroke is yet lacking (Zaherah Mohamed Shah *et al.*, 2012).

Since stroke patients are exposed to malnourishment especially among older patients, more attention should be paid towards dietary monitoring to promote recovery process. A study in New York had proven that intensive nutritional supplementation has improves motor recovery among undernourished patients receiving intensive inpatient rehabilitation after stroke (Rabadi *et al.*, 2008).

Other than that, practicing healthy balanced diet such as increase intake of fruits and vegetables, limit saturated fats and reduce sodium intake is important to prevent stroke and its recurrence (Fang *et al.*, 2000; Bazzano *et al.*, 2001; Resnicow *et al.*, 2002; Fung *et al.*, 2008). Adoption of Mediterranean diet enriched with fish oil and fish meat improves recovery process after stroke (He *et al.*, 2002; Aquilani *et al.*, 2008). Thus, further exploration on the association of dietary habits and stroke is required to be further explored in Malaysia setting.

Physical Activity / Exercise

Physical activity or exercise exerts a beneficial effect on multiple cardiovascular disease risk factors, including stroke (Gordon *et al.*, 2004; Chow *et al.*, 2010). However, activity intolerance is common among stroke patients, especially the elderly. For this population, implementation of aerobic exercise and strength training can improve cardiovascular fitness after stroke (Kruger *et al.*, 2009).

Besides that, structured programs of therapeutic exercise also improve mobility, balance, and endurance (King *et al.*, 2002; Kapasi *et al.*, 2003). Moreover, exercise also enhances glucose

regulation and promotes decrease in body weight and fat stores, control BP (particularly in hypertensive patients), optimize C-reactive protein, levels of total blood cholesterol, serum triglycerides, and low-density lipoprotein cholesterol (Gordon *et al.*, 2004).

The above findings has highlights that exercise reduces the risk of recurrent stroke, enhances recovery of motor skills and maintaining optimum blood chemistry of stroke patients. The most common recommendations advice for all ages is to include a minimum of 30 minutes of physical activity of moderate intensity, such as brisk walking, on most, if not all, days of the week (Singh, 2002). Therefore, it is important for stroke patients to be physically active via exercising as mechanism to prevent recurrent stroke.

Diabetes

Diabetes was a significant independent predictor of mortality with (OR 4.88; 95% CI 1.25-19.1) among acute ischemic stroke (Hamidon and Raymond, 2003). In complimentary to BP reduction, it is found that by controlling the blood glucose level is also important in reducing stroke recurrence. Stroke survivor who is diagnose with diabetes usually at higher risk to develop physiological deterioration (Noor Hasimah *et al.*, 2010). This highlights the need to recognize lifestyle changes in dietary habits and exercise among first ever stroke patient.

However, data supporting diabetes as a risk factor for recurrent stroke are not available in Malaysia. Most of the available data on stroke prevention in patients with diabetes are on the primary rather than secondary prevention. To date, it is unknown whether reduction of blood glucose levels by either pharmacological or non-pharmacological methods will reduce the risk of stroke.

Tight glycemic control (Hb A1c < 6%) is important and supported by epidemiology and a meta-analysis review to reduce microvascular and possibly macrovascular complications (Eid *et al.*, 2003; Sacco *et al.*, 2006; Hazizi *et al.*, 2009). Furthermore, patients with DM should aim for less than 140 mg/dL for blood sugar level, BP less than 130/90 mmHg, LDL < 2.6 mmol/L and being physically active in order to reduce recurrent stroke (Hazizi *et al.*, 2009). Multifactorial approaches with intensive treatments to control hyperglycemia, HTN, HPL, and microalbuminuria have demonstrated reductions in the risk of cardiovascular events.

Alcohol Intake

The effect of alcohol on stroke risk is controversial. For ischemic stroke, studies abroad have demonstrated an association between alcohol and stroke, ranging from a definite independent effect to no effect (Beulens *et al.*, 2010). There is a J-shaped association between alcohol and ischemic stroke, with a protective effect in light or moderate drinkers and an elevated stroke risk with heavy alcohol consumption (Beulens *et al.*, 2010).

There is no study had been done in Malaysia to explore an association of alcohol use and stroke disease. Previous studies done are conducted among psychiatric disorder patients and school children which limits the findings towards looking the association between mental health, sexual behaviour and ethnicity (Rathakrishnan *et al.*, 2012; Indran, 1994; Jernigan and Indran, 1999). This limits the prediction of alcohol effect in recovery process of stroke patients.

Current recommendation for secondary stroke prevention is to aim for elimination or reduction of alcohol by consumption to two drinks / day in order to prevent further deterioration of health risks (Lucas *et al.*, 2005). Further exploration needs to be established to determine the role of alcohol intake pattern among Malaysian.

Atrial Fibrillation (AF)

Atrial fibrillation is one of common cardiac arrhythmia which is an irregular condition of the heartbeat. Prevalence of AF in Malaysia is 2.8% with majority caused by ischemic heart disease followed by hypertension, heart failure and stroke (Freestone *et al.*, 2003). However, this study was done in a single centre which limits the generalizability of the findings to the whole Malaysian population.

Another recent review had reported that rate of stroke related to AF is 13.0%-14.5% based on community studies in Malaysia, Singapore and China while 3.1% - 24.2% of stroke rate in hospital-based cohorts (Yutao *et al.*, 2012). However, the use of anticoagulant therapy is still low being 0.5% - 28% in Malaysia, Singapore, and China (Yutao *et al.*, 2012). Strokes can be

reduced by controlling the incidence of AF commonly occurs in patient more than 65 years old and after previous ischemic attack through anti-coagulant therapy.

Primary and secondary prevention of AF requires prescription of anticoagulant such as aspirin and warfarin to be administered according to the patient's age and risk profile (Sacco *et al.*, 2006; Yutao *et al.*, 2012). Stroke recurrence can be reduced by monitoring AF among stroke patient. Therefore, emphasize on stroke knowledge must be strongly exert on the stroke patients to increase their compliance towards treatment.

Smoking

From observational studies, it is known that risk of stroke decreases after quitting even after three months and that the elevated risk disappears after five years (Ovbiagele, 2010). A prospective cohort study in Asia among 36 hospitals including Malaysia found that ex-smoker status (OR 2.18; 95% CI 1.18 to 4.05) were risk factors for early death among ischemic and hemorrhagic stroke patients (Wong, 1999). Thus, it can be concluded that cigarette smoking is a major independent risk factor for stroke.

A combination of nicotine replacement therapy, social support, and skills training has been proved to be the most effective approach for quitting from smoking (Stead *et al.*, 2008). It is important to ensure counselling session must be done thoroughly if cigarette smoking cessation failed. Since smoking cessation has been associated with a reduction in stroke related hospitalizations and supports secondary prevention efforts done abroad, it is highly recommended the same mechanism to be adopted in Malaysia among stroke patients.

Hyperlipidaemia (HPL)

A study done in Malaysia found that hyperlipidaemia (37%) is the third common risk factor after HTN (71.5%) and diabetes mellitus (40.2%) (Ong and Raymond, 2002). An epidemiological study has shown a weak association between raised serum lipids and risk of stroke (Boshuizen *et al.*, 2007). This finding is controversial since the control of cholesterol level to reduce mortality rate is found to be effective among those with coronary heart disease (CHD) rather than in stroke.

Both study mention above have contradict findings thus a final conclusion unable to derive whether HPL is an independent factor contributing towards incidence of stroke and whether the reduction of total cholesterol level will prevent from recurrent stroke. However, the prescription of statin therapy is important among individuals in the high risk group (cardiovascular disease, occlusive arterial disease or diabetes) even with normal cholesterol concentrations as a prevention of recurrent of stroke (Castilla-Guerra *et al.*, 2009).

Statin therapy is proven to reduce the incidence of coronary and strokes events with a control of total cholesterol level at least 100 mg/dL for most patients and LDL-C < 70 mg/dL for those with multiple risk factors (Castilla-Guerra *et al.*, 2009; Sacco *et al.*, 2006). Monitoring diet, exercise regularly and compliance towards statin agents prescribed by the physician will further control HPL (Sacco *et al.*, 2006). Therefore it is worth to educate the stroke patients and their family on lifestyle issues especially on dietary management since it has association in reduction of blood pressure, managing obesity and reduction of blood cholesterol (Sacco *et al.*, 2006; Rafidah *et al.*, 2008).

Educational intervention on lifestyle modification

Educating stroke patients to understand the significance of healthy lifestyle is important to achieve the benefits of management. Lacking of knowledge among stroke patients may affect lifestyle modification following stroke. Previous studies highlighted there is still inadequate informational provision on lifestyle modification after stroke assisting the standard care during acute phase among healthcare professionals (HCP) including nurses (Hoffmann and Cochrane, 2009; Holzemer *et al.*, 2011).

Patient education on prevention of recurrent stroke through lifestyle modification is a core business of rehabilitation nursing and other HCP. Stroke patients experience recurring stroke are at higher risk for death and disability compared to those who experience first stroke. It is recommended that rehabilitation intervention should be started sooner to facilitate neuro-cognitive regeneration. Rehabilitation process usually begins as early as second days of ward admission once patient hemodynamic status and general condition are stable.

Findings from study done abroad found the most common question being asked by stroke patients and their families is they wanted to know what they can do to decrease the risk for second stroke (Choi-Kwon *et al.*, 2005). When patients understand stroke risk factors and can identify their own risks, they are better able to apply the information to their lives (Denby and Harvey, 2003). Thus, educational intervention is a fundamental area of the rehabilitation process as it has been highlighted among nine key performance indicators (KPI) that requires improvement in stroke management (MOH Clinical Practice Guideline, 2012)..

Educational process

Educational process will not be effective if it is not supported by adequate policy and proper coordination of teaching session among HCP (Hoffmann and Cochrane, 2009). Current guideline reinforced by MOH has highlights the importance of stroke education in preparing the patient and their caregivers before discharge. However, this mainstay of practice had only been carried in most MOH hospitals but no finding on the effectiveness of the stroke education has been established. Furthermore, National Stroke Association (NASAM), a non-government organization has delivered some information pertaining secondary stroke prevention via website but how far it has reached the public has not been documented systematically.

Stroke education had been listed among the nine KPI in MOH stroke management thus it highlights the obligation of nurses and HCP to educate the family and the stroke patients while hospitalization. An educational program should be simultaneously comprehensive and concise within a patient's busy rehabilitation schedule (Denby and Harvey, 2003). It is important to actively involve the stroke patients, family members and to obtain the co-operation from multidisciplinary HCP to improve health and prevention of recurrent stroke (Ovbiagele, 2010).

Patient education process is similar to nursing process which involves the assessment, planning, implementation and evaluation phase (Table 2). Prior to educational intervention, informational needs assessment of patient and their family members is important (Hoffmann and McKenna, 2006). Findings from assessment can be used to develop effective educational strategy and tools according to patho-physiological defects, disabilities and social support

systems (Kirshner, 2009). Hence, systematically plan of educational intervention program will results in behavioural changes towards healthy lifestyle.

Table 2: Comparison between nursing process and education process

DOMAIN	NURSING PROCESS	EDUCATION PROCESS
ASSESSMENT	Appraise physical and psychosocial needs	Determine learning needs, readiness to learn and learning styles
PLANNING	Develop care plan based on mutual goal setting to meet individuals needs	Develop teaching plan based on mutually pre-determined behavioral outcomes to meet individuals needs
IMPLEMENTATION	Perform nursing care interventions using standard procedures	Perform teaching using specific instructional methods and tools
EVALUATION	Determine physical and psychosocial outcomes	Determine outcome changes (knowledge, attitudes and skills)

(Adopted from Bastable, (2006). Patient Education)

Is it possible to change behaviour?

It is possible to improve risk perception in the stroke population by delivering information and awareness campaign (Sullivan *et al.*, 2008). Subjective risk factor perception is important component to the motivation to change unhealthy lifestyle. The health belief model suggests ‘risk perception’ is a key element to understanding how a person becomes motivated to change their behaviour. The health belief model holds that individual perceptions and modifying factors are predictors of the likelihood of action (Figure 1). Patients’ choice to make a healthy change is motivated by their knowledge about the risks of susceptibility towards the disease and knowledge about the seriousness of the disease. Patients’ willingness to change usually influences by their understanding of the benefits of change and of their perceived of the barriers to change. After a person has had a stroke, they need to be aware of the threat or seriousness of their risk for a second stroke.

Thus, patient-centred strategies may lead to the identification of better tools to improve knowledge and lifestyle changes after stroke. Specifically targeted programme may be beneficial to the stroke population if they are individually designed (Roden, 2004). Even though improved patient knowledge do not guaranteed behavioural changes. However, poor knowledge does not necessarily lead to nothing of behavioural changes at all.

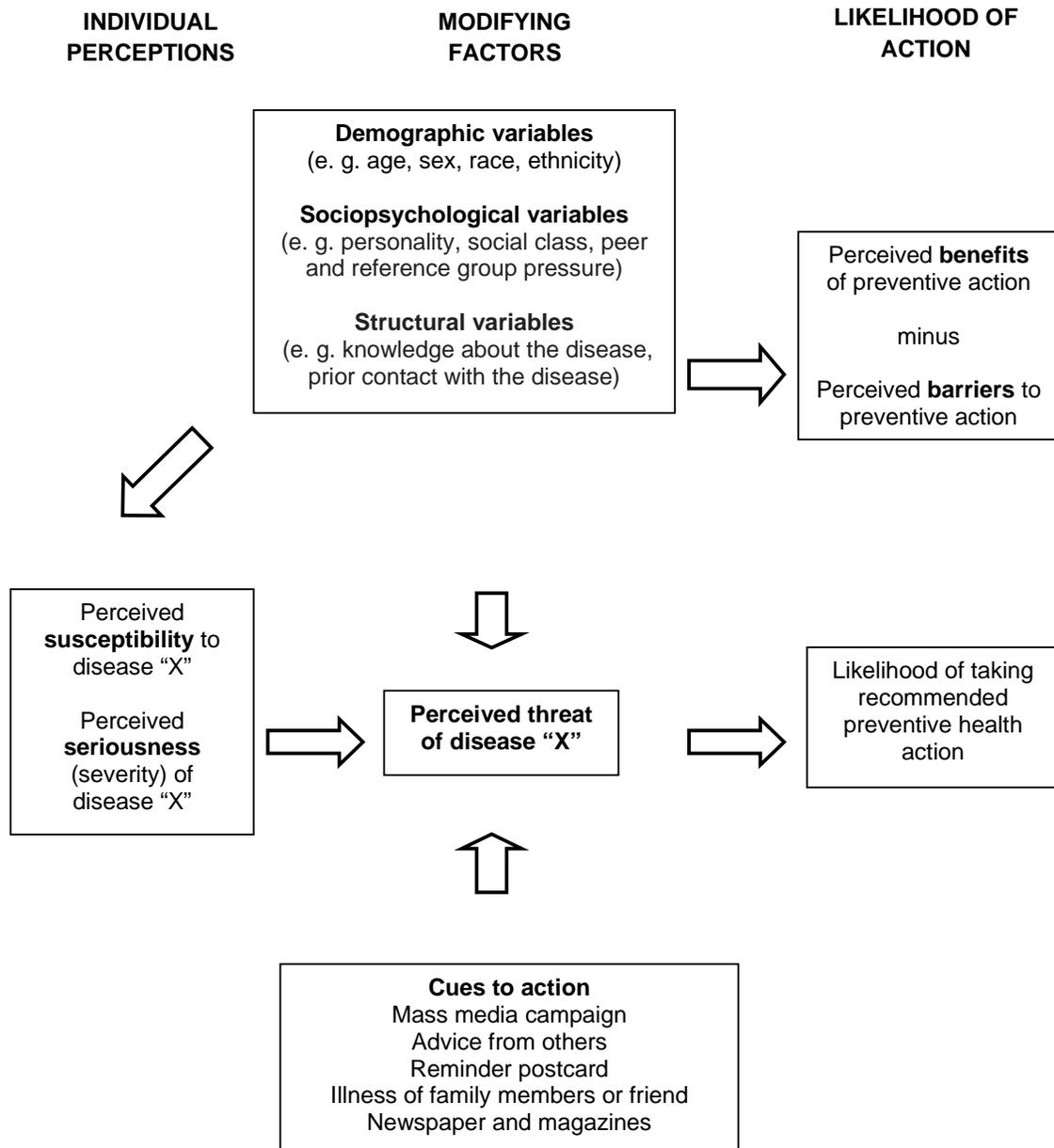


Figure 1: Health Belief Model (Adopted from Rosentock, 1974)

Teaching methods

There is no one perfect teaching methods for all stroke patients. Whatever the method chosen, it will usually be most effective if it is used in combination with other instructional approaches to enhance learning process (Bastable, 2006). Decisions about which methods to use will be based on factors such as audience, size, diversity (age, educational background, culture), preferred learning style, and the setting for teaching (Denby and Harvey, 2003).

Common methods used in delivering educational interventions are lecture, group discussion, one-to-one teaching, demonstrations and return demonstration, gaming, and simulation. However, active teaching methods which involve the stroke patients, family members and multidisciplinary HCP interactively are more benefits rather than passive education (Denby and Harvey, 2003; Smith *et al.*, 2009). Further exploration is required to determine which method is the best since many trials done has low quality methodology which prevents conclusion to be drawn although it has significant results and advantages (Brereton *et al.*, 2007).

Lecture and audiovisual aid

Lecture is highly structured method by which the nurse or HCP verbally transmits information directly to groups of stroke patients for the purpose of instruction. Lecture format allows for only minimal exchange between the nurse, other HCP and stroke patients. However, it can be an effective method of teaching in the lower level cognitive domain to impart content knowledge. Handout materials and audiovisual aids (AVA) can compliment this method to inform stroke patients and family members about stroke information (Eames *et al.*, 2003).

Audiovisual aids can be in the form of written material such as booklet or pamphlet or in an audio form such as video compact disc (VCD) or audio CD. With respect to the limitation, lecture method is ineffective in teaching affective and psychomotor behaviours since it does not provide for much stimulation for stroke patients and limited opportunity for learner involvement (Bastable, 2006).

A study done in USA shows that video viewing has its disadvantage due to its passive educational experience (Denby and Harvey, 2003). The stroke patients are remained sitting while watching the video and even fall asleep during the viewing (Denby and Harvey, 2003). Meanwhile, findings from Malaysia proved that video-based therapy home for post-acute stroke patients is safe, promotes independence, and reduce stress among caregivers but no significance difference in functional outcome between intervention and control group (Redzuan *et al.*, 2012). Thus, video-based therapy must be compliment with other method which requires face to face contact between the learner and educator.

In Malaysia the development of modules and teaching materials specifically for stroke patient has not been discussed seriously at the level of policy maker as to compare with diabetes (Lee *et al.*, 2012). Development and dissemination patient education materials on diabetes had been highlighted recently to be shouldered by both public and private sector. Therefore, more research should be carried out for further exploration on the development of educational modules and role of stroke educator.

Group discussion

Group discussion is a method of teaching in which stroke patients get together to exchange information, feelings, and opinions with one another and with nurse or HCP as an educator. Group size can vary, but the group discussion technique can be used with as few as three peoples and with as many as 15 to 20 peoples. It is important to ensure the group members are from homogenous background in terms of age, sex, education level, occupational background and diagnoses to facilitate discussion. Group discussion method is beneficial for teaching in both affective and cognitive domains (Bastable, 2006). Group members can use this platform to exchange their experience and sharing knowledge on handling their problems in daily living (Weltermann *et al.*, 2000).

However, there is still a limitation for this method. Nurse or other HCP who facilitates the discussion must be an expert to stimulate the discussion and ensuring it is not out of topic. Misconception must also be tackles as soon as possible to ensure each stroke patient will receive the right information. Another problem commonly arise is dominant participant whom dominates the discussion or passive participant whom never contributes any

information. Therefore, ensuring homogeneity of background as mentioned before is important before begins a discussion.

Nowadays, an e-intervention of group discussion via internet has been recommended since the limitation of time in face to face interaction. A review done by Ramadas *et al.* (2011) an online peer support groups are one of the successful approaches which were applied in e-interventions to manage type 2 diabetes mellitus. There is an opportunity for future research to adopt online group discussion as an interactive medium to exchange information among stroke survivors in Malaysia.

One-to-one teaching

This method gives an opportunity to communicate ideas and feelings as well as receive non-verbal messages. One-to-one teaching should not be a lecture delivered to audience of one to satisfy the nurse's goals for teaching. Instead, the experience should actively involve the stroke patients and be based on his or her unique objectives of learning. The nurse will deliver individual instruction designed specifically to meet a particular stroke patients need in one-to-one teaching.

A study done in New Jersey among attendance at Emergency Department in waiting area has proven that participants from intervention group who received counselling therapy were appeared to be more motivated to reduce their smoking habits, compared to control participants (Yvonne Chan *et al.*, 2010). However, knowledge retention in the intervention group gradually declined during the follow-up at 3-month. The number of cigarettes they smoked per day did not dramatically decrease in comparison with their own baseline.

In contrary to a study in USA which focus on risk factor modifications among stroke survivor, individualized educational intervention significantly improves adherence to risk-factor modification (Holzemer *et al.*, 2011). Thus, these finding indicates that appropriate individual approach for population who has stroke with many lifestyle risk factors will stimulate changes towards healthy lifestyle as to compare with population without having problems than stroke.

Meanwhile in Malaysia, one to one approach has been found to be an effective approach in psycho-educational program (PeP) for parents of children with cancer (PoCwC) in Malaysia (Othman *et al.*, 2009). Repeated measures of ANOVAs revealed increased knowledge about cancer ($p=0.01$) in the intervention parents compared with standard care after receiving 4 x 50 min sessions of information on childhood cancer and coping strategies in addition to standard care (Othman *et al.*, 2009).

Furthermore, a quasi-experimental study done among hemodialysis patients to examine the effectiveness of patient education on fluid compliance had proven successful (Barnett *et al.*, 2008). Results shows mean interdialytic weight gain decreased following the educational intervention by nephrology nurse from 2.64 kg to 2.21 kg ($P < 0.05$) and adherence to fluid restrictions increased from 47% to 71% following the intervention. Thus, further exploration is required to conclude the effectiveness of this approach in enhancing the knowledge on lifestyle risk factors among general population especially on the family members of stroke patients.

Demonstration and return demonstration

Demonstration is a method by which the stroke patients are shown by the nurse or HCP how to perform a particular skill. *Return demonstration* is a method by which the stroke patients attempt to perform the skill with cues from the nurse or HCP and the stroke patients (Banford *et al.*, 2001). This method is effective in teaching psychomotor domain skills. Both may also enhance cognitive and affective learning (Bastable, 2006).

Gaming and Simulation

Gaming is a teaching method in which the learner participates in a competitive activity with preset rules. Even though these activities do not reflect reality, they are designed to accomplish educational objectives. The goal is for the learners to win a game by applying knowledge and skills just learned or previously rehearsed. Gaming promotes retention of information by stimulating stroke patients' enthusiasm and increasing participation. More complex games require the learner to use problem solving and critical thinking. This method adds variety to the learning experience and is excellent for dull or repetitious content.

Gaming have a place in stroke rehabilitation centres which helps some patients regain upper body strength and coordination after suffering a stroke. Rehabilitation Gaming System (RGS) combines specific rehabilitative principles with a psychometric evaluation to provide a personalized and automated training. Current result has shows that the RGS effectively adjusts to the individual features of the user, allowing for an unsupervised deployment of individualized rehabilitation protocols (Cameirao *et al.*, 2010). However, research is still advancing to determine its significant recovery in larger stroke patient population.

On the other hand *Simulation* is a method that uses an artificial or hypothetical experience to engage learners in an activity reflecting real-life conditions but without the risk-taking consequences of an actual situation. A variety of activities can be presented to help patients learn problem solving skills. Simulations are effective for teaching in the cognitive, affective and psychomotor domains (Bastable, 2006).

Games and simulations are a lot alike because both methods require learners to actively participate in dealing with concrete and realistic situations (Bastable, 2006). Experiential learning process occurs when a learner must choose an action and handle the sequences. Simulations are effective in helping someone find solutions to problems, change attitudes, or prepare for possible events they may encounter (Baker *et al.*, 2008).

Conclusion

Appropriate secondary stroke prevention is required in modifying lifestyle risk factors via educational intervention. Various educational techniques nurses and other HCP can adopt to address lifestyle behavioural change which suited the needs of the stroke patient. However, it is important to take into consideration health belief values and learning style of the stroke patients. It is advisable to choose teaching methods in combination which will actively involved the stroke patients.

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