
Stroke Patients' Awareness of Risk and Readiness to Change Behaviors

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Purpose: Behavior change is an important component of secondary stroke prevention. The transtheoretical model, which describes behavior change as occurring through a series of stages, may be a useful way of assessing patients' readiness to change behavior. The model has been successfully applied to other chronic conditions and argues that people progressing "forward" through the stages are more likely to successfully change their behavior. The aim of this study was to describe stroke patients' readiness to change behaviors for stroke-related risk factors using this model, in the absence of a behavior modification intervention. **Method:** Patients (n = 27) from an acute stroke ward of a major metropolitan hospital in Brisbane, Australia, were interviewed prior to and at 3 months following hospital discharge regarding their awareness of stroke risk factors and their readiness to change stroke risk-related behaviors. **Results:** At both points in time, 30% of patients could not spontaneously nominate one or more stroke risk factors. Despite a trend of "forward" progression in stages of change between the 2 interviews for behaviors relating to hypertension, heart disease, and high cholesterol, there were no statistically significant changes over time for any of the behaviors. Patients' readiness to change stroke risk-related behaviors differed for each risk factor. **Conclusion:** Acknowledging that patients' readiness to change may differ for each risk factor may promote more effective facilitation of stroke secondary prevention behaviors. **Key words:** health behavior, secondary prevention, stroke, transtheoretical stages of change model

There is strong evidence that secondary stroke prevention strategies that are aimed at modifying known stroke risk factors can reduce the risk of recurrent stroke.^{1,2} These modifiable risk factors include hypertension, diabetes mellitus, hypercholesterolemia, cigarette smoking, excessive alcohol intake, obesity, physical inactivity, and poor diet.³⁻⁷ They can be addressed by behavior changes that include compliance with therapeutic regimens; cessation of cigarette smoking and decreased excessive alcohol intake; and the achievement or maintenance of a healthy weight range, adequate levels of physical activity, and a healthy diet.^{1,4,8-11} The American Stroke Association recommends that "... every patient participate[s] in a secondary prevention program... [and that]...patient[s] and family [are] educated about pertinent risk factors for stroke."^{12(p121)} Furthermore, "the need for secondary prevention of stroke is lifelong and is a critical component of rehabilitation...."^{12(p113)}

However, stroke patients' awareness of these risk factors¹³ and their uptake of healthy behaviors to address them have been found to be lacking.¹⁴⁻¹⁶ For example, 2 studies have found that, in a sample of

stroke patients admitted to hospital, 43% and 52% of participants, respectively, were unable to name any stroke risk factors.^{17,18} Two studies reporting overall reductions in risky behavior also noted that some patients had commenced, or recommenced, risky behavior at 6¹⁹ and 12 months post stroke.²⁰ Thus, there is room for improvement in patients' awareness of risk factors and their implementation of strategies to modify them. As modification of risk factors is an essential component of secondary prevention, factors that influence patients' uptake and maintenance of healthy behaviors warrant further investigation.

One approach that has been widely used to explore behavior change across a range of chronic health conditions is the transtheoretical model.^{21,22} The transtheoretical model is a model of health behavior that describes behavior change as occurring in a series of stages: precontemplation, contemplation, preparation, action, and maintenance.²¹

A person is considered to be in *precontemplation* when they are not intending on taking any action in the foreseeable future and in *contemplation* when they have the intention to change in the foreseeable future. In *preparation*, the person is intending to take action in the immediate future (usually within 1 month) and has a plan of action; whereas in the *action* stage, the person has made a specific, overt change. In the *maintenance* stage, the person is working to prevent relapse.²²

Authors of this model argue that a person's overall progression through the stages can involve forward or backward movement²¹; in moving forward, people apply different processes of change depending on their stage.²² Thus, a person's progress forward into the next stage may be promoted by providing an intervention matched to their individual stage, thereby increasing the likelihood of successful behavior change.^{21,22} The application of this model requires an accurate assessment of a person's readiness to, or stage of, change.

To date there has been limited application of this model to the area of stroke prevention.^{23,24} Miller and colleagues²³ found that persons at risk of stroke who received a brief intervention based on the transtheoretical model had significantly more newly initiated risk-related behaviors, achieved more of these behaviors, and had better stroke knowledge than participants who were in a "simple advice" intervention group or a control group. Green and colleagues²⁴ also provided an intervention based on the transtheoretical model to patients with transient ischemic attack (TIA) or minor stroke, consisting of nurse-mediated lifestyle counselling and attendance at a lifestyle class. This study reported a significant increase in the stroke knowledge of the intervention group participants between baseline and 3-month follow-up when compared with control group participants, although there were no significant differences between the groups on behaviors related to individual risk factors.

Before the potential influence of an intervention is considered, there is a need to explore patients' readiness to change risk-related behaviors during the time of transition from hospital to returning to living in the community. No studies have done this in the absence of an intervention that targets these behaviors. Additionally, previous research has only explored individuals at risk of stroke or those with TIA or mild stroke. Because patients who

participate in stroke rehabilitation have varying levels of stroke severity, this study sought to include patients across this range. This information will allow the development of tailored interventions that are aimed at improving stroke secondary prevention behaviors in a wide range of stroke patients.

Methods

Participants

Participants were patients admitted to a major metropolitan hospital acute stroke unit in Brisbane, Australia. Inclusion criteria were (1) acute stroke unit admission; (2) age 18 years or older; (3) adequate English, cognition, communication, vision, and hearing to complete consent and instrument; and (4) living within 50 km of the admitting hospital (for ease of face-to-face follow-up). Patients who were admitted from, or were being discharged to, residential care were not eligible for inclusion.

Procedure

Identification of eligible patients was done in consultation with members of the treating team. For example, decisions about a patient's cognitive ability were made in conjunction with the stroke unit's doctor or occupational therapist, and decisions about the eligibility of patients with aphasia were made in consultation with the stroke unit's speech pathologists. The lead author (S.E.) approached patients, provided information about the study, and obtained written consent from patients prior to the initial interview.

Aphasia-friendly principles (use of pictures, white space, prompt sheets, gestures, repeating of information)²⁵ were used throughout the consent process and interviews. Ethical clearance was obtained through the relevant hospital and university human research ethical committees.

Data collection and analysis

Data were collected on the following demographic and clinical variables: gender, age, living situation, years of education, type and side of stroke, and modifiable stroke risk factors. The presence of stroke risk factors was confirmed by reviewing the patient's medical chart. Face-to-face initial interviews were conducted by

the lead author (S.E.) prior to discharge (mean days post stroke = 9.0; *SD* 4.7), and follow-up interviews were conducted (also by S.E.) in patients' homes 3 months later (mean days post stroke = 101; *SD* 6.0).

Patients' unprompted awareness of risk factors was assessed by asking "Do you know of any medical or health reasons that may have caused or contributed to your stroke?" Patients' recognition of modifiable risk factors was assessed by asking "What risk factors do you have?" This was followed by prompts of high blood pressure, diabetes mellitus, smoking, high cholesterol, excessive alcohol use, heart disease, obesity, and lack of physical activity, as defined by Australia's National Stroke Foundation's Risk Factor Tick Test.²⁶

For each of the risk factors that they identified as having, patients were asked to select one statement that best described how they felt about behaviors that addressed that particular risk factor. Statements were sourced from the Family Focused Health Risk Assessment.²⁷ This assessment is based on the transtheoretical model and used statements representing each of the 5 previously described stages of change to assess multiple health risks.²⁷ For example, "I intend to try and start doing this behavior in the next 6 months" represented the contemplation stage. If patients required further clarification of behaviors, examples were provided.^{8,26} Participants were also asked about their format and delivery style preferences for receiving information, and these results are reported elsewhere.²⁸ (A copy of the instrument is available from the lead author [S.E.] on request.)

Because of the small sample size, these 5 stages were collapsed into 2 categories: nonaction and action. Nonaction included patients who reported to be in a precontemplation, contemplation, or preparation stage; action included patients who reported to be in an action or maintenance stage. Results were analyzed using narrative reporting, descriptive statistics, and McNemar test performed for each risk factor to explore differences in readiness to change between the 2 time points.

Results

Hospital interviews were conducted with 34 patients, and follow-up interviews were conducted for 27 patients. Only data from the 27

participants who underwent both interviews were included. **Figure 1** shows the flow of participants through the study, and **Table 1** shows participants' demographic and clinical characteristics.

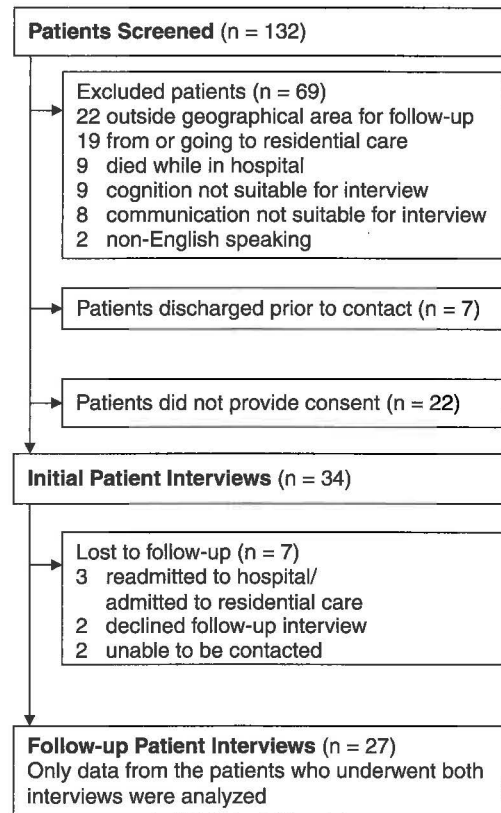


Figure 1. Flow of participants through the study.

Table 1. Demographic and clinical characteristics of participants (n = 27)

Characteristics	n (%) ^a
Female	11 (41)
Mean age, years (<i>SD</i> ; range)	63 (14.9; 28–82)
Living situation	
Alone	5 (19)
With spouse (with or without other family)	17 (63)
With family or friend	5 (19)
Mean years of education (<i>SD</i> ; range)	12 (3.6; 7–22)
Type of stroke	
Ischemic	18 (67)
Hemorrhagic	9 (33)
Side of stroke	
Left	13 (48)
Right	13 (48)
Bilateral	1 (4)

^aValues given as n (%) unless otherwise indicated.

Risk factors: Unprompted awareness and prompted recognition

Prior to discharge and at follow-up, 8 (30%) participants could not spontaneously nominate 1 or more stroke risk. Of the 19 (70%) participants who could name 1 or more risk factors prior to discharge, 15 (79%) could also name 1 or more at follow-up. **Table 2** reports the proportion of patients with the risk factor prior to discharge and at the follow-up interview and the proportion of patients with the risk factor present (as confirmed by their medical notes) but who did not acknowledge its presence when shown the prompt list of risk factors. Of all the risk factors, hypertension was both the most frequently present and denied by 24% of participants at both time points.

Readiness to change

Table 3 presents the proportion of patients, of those who acknowledged each risk factor, who reported being in the collapsed categories of stage of change prior to and at 3 months following discharge.

Statistical analysis showed no significant differences between the 2 time points for any of the behaviors. However, for behaviors relating to

hypertension, heart disease, and high cholesterol, there were trends for more patients to report being in action or maintenance at follow-up than prior to discharge, which gives an overall pattern of "forward" progression through the stages between the 2 time points (**Figures 2A-C**).

Discussion

Our study found higher general risk factor awareness than previous studies,^{17,18} but the reason for this is unclear. It is possible that the discrepancy is a result of geographical differences that may have influenced the quality and availability of stroke information that patients receive while in the hospital following the stroke. The impact of information about risk factors and secondary prevention that was received while in the hospital is a possible reason for the discrepancy with the results of other studies. Neither of the aforementioned studies reported on the information that patients received while in the hospital.^{17,18}

In the current study, hypertension was not acknowledged by nearly one quarter of participants with that risk factor. Although some studies of stroke survivors have found hypertension to be

Table 2. Proportion of participants with each stroke-related risk factor present and those not acknowledging the presence of that risk factor (n = 27)

Stroke risk factors	Prior to discharge interview		3 months post discharge interview	
	Participants with risk factor present n (%)	Participants not acknowledging the risk factor n (%)	Participants with risk factor present ^a n (%)	Participants not acknowledging the risk factor n (%)
Hypertension	21 (78)	5 (24)	21 (78)	5 (24)
Ischemic heart disease	8 (30)	2 (25)	8 (30)	3 (38)
High cholesterol	10 (37)	2 (20)	12 (44)	2 (17)
Excessive alcohol use	3 (11)	1 (33)	4 (15)	0
Lack of physical activity	11 (41)	0	11 (41)	2 (18)
Current cigarette smoking	6 (44)	0	2 (7)	0
Diabetes mellitus	5 (19)	0	5 (19)	0
Obesity	10 (37)	1 (10)	11 (41)	4 (36)

^a Number of people with risk factor may be higher following discharge than prior to discharge due to self-report of newly diagnosed condition.

Table 3. Proportion of participants in a nonaction or action stage of change, prior to and at 3 months post discharge, for behaviors relating to each risk factor

Risk factor	Stage of change	Prior to discharge	3 months post-discharge
Hypertension		(n = 14)	(n = 16)
	Nonaction	29%	6%
	Action	71%	94%
		(n = 6)	(n = 5)
Ischemic heart disease	Nonaction	33%	0%
	Action	67%	100%
High cholesterol		(n = 9)	(n = 10)
	Nonaction	33%	10%
	Action	67%	90%
		(n = 2)	(n = 3)
Excessive alcohol use	Nonaction	100%	0%
	Action	0%	100%
Lack of physical activity		(n = 3)	(n = 3)
	Nonaction	67%	67%
	Action	33%	33%
		(n = 5)	(n = 6)
Current cigarette smoking ^a	Nonaction	40%	33%
	Action	60%	50%
Diabetes mellitus		(n = 5)	(n = 5)
	Nonaction	20%	20%
	Action	80%	80%
		(n = 5)	(n = 6)
Obesity	Nonaction	60%	50%
	Action	40%	50%

^a One of the 6 participants who reported to be a current smoker had missing data at initial interview; therefore, this participant was excluded from analysis

the most commonly identified risk factor,^{18,29,30} other studies have found limited awareness of its personal relevance in populations including people with recent stroke,¹⁸ women at risk of stroke,³¹ and members of the general public.³² Limited awareness of the personal relevance of a risk factor may not be restricted to hypertension. For example, a study of women at risk of stroke found that only 5% of women with atrial fibrillation and 16% of women with heart disease could identify their health condition as a risk factor for stroke.³¹ This is contrasted by studies in which individuals with a certain risk factor could identify its presence as a risk factor for stroke.^{30,33} There does not appear to be a direct influence of a pa-

tient having a risk factor on his or her recognition of its personal relevance.

There also appears to be variation according to which risk factor is present. This, in part, may be explained by some risk factors being more obvious to patients, such as obesity or excess alcohol consumption, compared to, for example, hypertension. The level of patients' understanding of the diagnosis and treatment for their medical condition (eg, hypertension and high cholesterol) may also differ depending on the particular risk factor, as might the ease at which they feel they can complete recommended behaviors. Because a patients' awareness of their risk factors is an important influence on subsequent risk-related

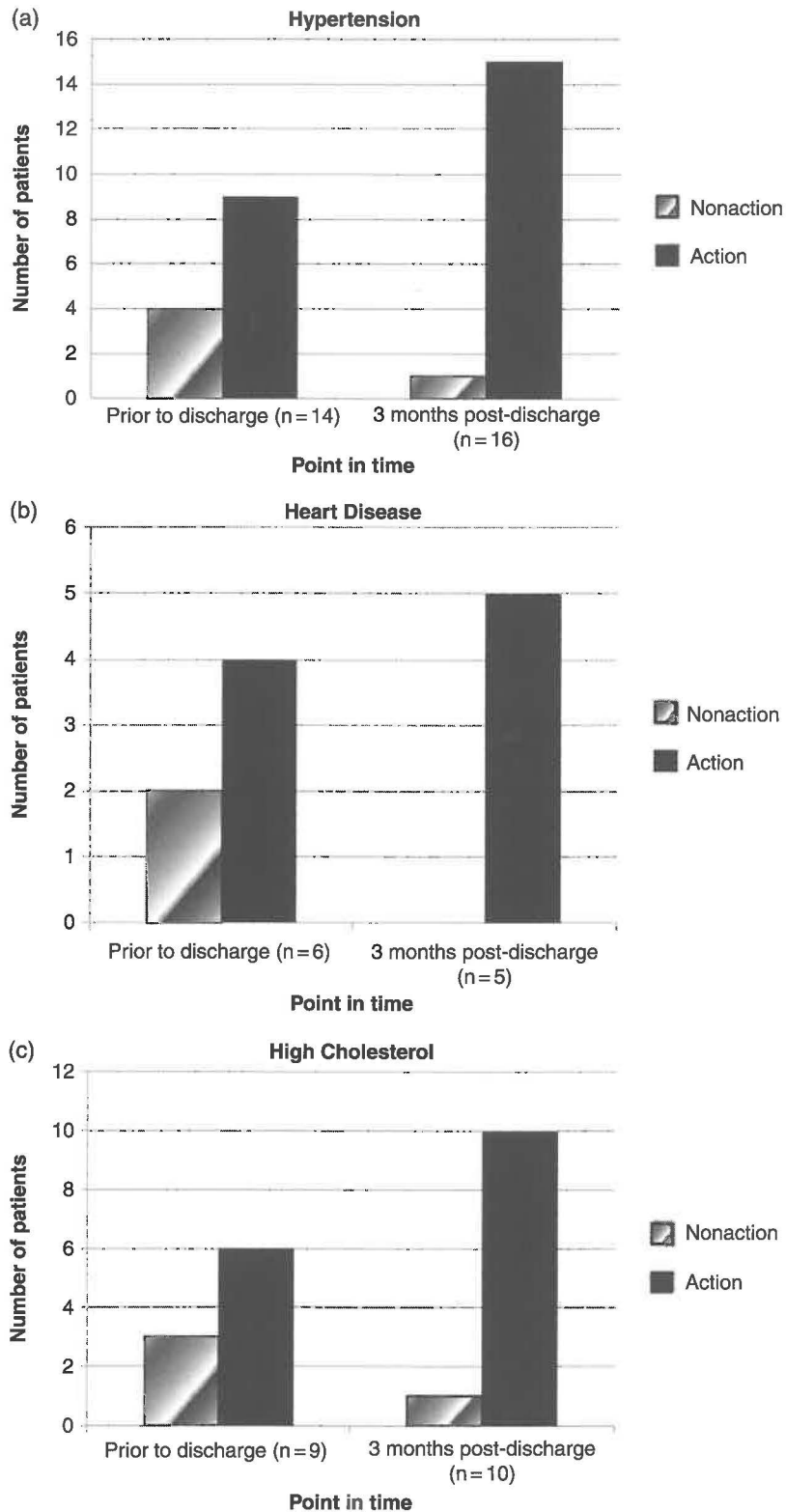


Figure 2. Proportion of participants in a nonaction or action stage of change prior to and at 3 months post discharge for behaviors relating to (A) hypertension, (B) heart disease, and (C) high cholesterol.

behavior, further investigation is needed on factors that influence recognition and understanding of personal risk factors.

The current study found that patients' readiness to change differed across the range of risk factors. This has also been found in studies of people at high risk of cardiovascular disease³⁴ and older people across a range of healthy behaviors.³⁵ It is possible that patients may have perceived some behaviors to be easier to change than others. For example, participants may perceive taking hypertension medication as an easier behavior to implement than a regular exercise program, possibly due to the time and nature of the required commitment.

The variation over time in readiness to change in this study occurred in the absence of a specific education or behavior modification intervention. Patients admitted to the acute stroke unit from which participants were recruited for this study did not have routine access to any formal stroke education programs or a designated stroke educator. However, as this study did not ask participants to identify specific details of any risk factor or secondary prevention information that they had received, some participants may have received brief advice about changing lifestyle behaviors as part of usual follow-up care.

In a study of people at risk of cardiovascular disease, Doherty and colleagues³⁴ originally hypothesized that individuals with multiple risk factors would be more motivated to change their behaviors than those with only one risk factor, but this was not supported by their results.³⁴ The authors speculated that this may have been the result of individuals at greater risk denying or lacking awareness of this risk or being indifferent to it.³⁴ Although this is beyond the scope of the current study, exploration of the possible influence of the number of risk factors on stroke patients' readiness to change may provide information that is valuable for tailoring education to individuals' needs.

This study aimed to recruit patients from a wider range of stroke severities than previous studies. The small sample size, however, limited this study's ability to explore the potential influence of stroke severity on stroke knowledge and readiness to change behavior.

Limitations

This study's small sample size limited further statistical analysis, and results should be interpreted with caution. The limitation of recruitment of patients from one metropolitan city also limits the generalizability of the results. There is overlap of behaviors for some risk factors, and formal evaluation of the psychometric properties of the readiness to change instrument would be useful as this instrument is newly developed.

Future directions

This study has raised many potential areas for future research. Factors that influence patients' recognition and understanding of their risk factors are an area worthy of further exploration. Additionally, studies with longer follow-up periods, including a regular reassessment of readiness to change, would allow more thorough investigation of behavior change following stroke. Finally, larger studies that combine qualitative and quantitative designs should be used to explore the potential for various factors (such as patients' stroke type, presence and extent of stroke-related impairments, and the number of risk factors) to influence stroke knowledge and readiness to change.

Conclusion

Patients need to be aware of their risk factors and be willing to address them to reduce their risk of subsequent stroke. No studies have explored what happens to stroke patients' readiness to change behaviors over time in the absence of an intervention that is aimed at addressing these behaviors. This study found no significant changes in patients' readiness to change risk-related behaviors over the 3-month period following stroke but identified positive trends for some risk factors. Acknowledging that patients' recognition of their risk factors and their readiness to change related behaviors may differ between risk factors would need to be considered in the development and provision of any interventions that are aimed at improving stroke secondary prevention behaviors. Future work is suggested to identify factors that influence these behaviors.

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