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Review Article

Medication Understanding and Taking Self-Efficacy Theory-Based Interventions: A Systematic Review

Jamuna Rani Appalasamy[1,2,*], Siva Seeta Ramaiah[3], Kia Fatt Quek[1], Anuar Zaini Md Zain[1], Kyi Kyi Tha[1]
[1]Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Bandar Sunway, Selangor, MALAYSIA.
[2]School of Pharmacy, Monash University Malaysia, Bandar Sunway, Selangor, MALAYSIA.
[3]Department of Medical, Subang Jaya Medical Center, Sunway, MALAYSIA.

ABSTRACT

Self-efficacy is a predetermined behavioral factor of medication adherence, especially among patients with the risk of stroke. Nevertheless, an in-depth understanding of detailed scope in medication understanding and taking self-efficacy is of lack. Hence, through a broad literature search on medication-related self-efficacy trials, we undertook an evaluation of sixteen eligible studies on behavioral-based interventions. Their primary outcomes assessment focused mainly on the change of self-efficacy related behavioural constructs or actions. The majority of studies were conducted in the United States of America followed by Europe and Asia. The follow up trial period spanned from three months to one year, with most of them opted for the 2-arms RCT method. As for the results, heterogeneity was present; however, more than 80% of the studies reported significant differences (p<0.05) in the medication-related self-efficacy outcomes, which portrayed a positive effect. Nevertheless, interventions with multimedia usage displayed a 'promising potential technique' to assist patient education efforts. Altogether, there is limited evidence available on the intervention trials related to medication understanding and use self-efficacy among patients with stroke or its comorbid risk factor. Thus, behavioral researchers are encouraged to escalate more translational trials, particularly in the developing nations whom its aging workforce is at an upsurge in the coming decades.

Key words: Medication understanding, Medication taking, Behavioral research, Systematic review, Self efficacy.

Correspondence

Mdm. Jamuna Rani Appalasamy, BPharm**,** MSc (Pharm)

Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Jalan Lagoon Selatan, Bandar Sunway, Selangor-47500, MALAYSIA.

Phone: +60 123253775

Email: jamuna.appalasamy@monash.edu

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INTRODUCTION

Adherence to medication is well-defined as an extent of a patient to continue his prescribed medication to a certain degree, accepted and agreed by both the prescriber and patient.[1,2] Hence, medication adherence is very much related to medication-taking behavior. The medication-taking behavior is defined as an observation of variable human behavior characteristics to adhere to treatment by prescribers and is influenced by factors such as healthcare provider or societal-policies.[3] Nonadherence is, therefore, best seen as dependable on the personal justification of treatment and disease whereby the patient actively decides to stop taking their medications at the beginning or during various stages of their treatment phase. However, in certain circumstances, all these thoughts and medication-taking actions are influenced by patients' mental, physical, socioeconomic and cognitive capability in continuing the medication regimen.[4,5]

Self-efficacy has also been identified as a critical predictor of medication adherence.[6,7] The patients' belief builds upon common-sense evaluations of prescribed medicines, which involves perceptions of need for treatment and interest of potential adverse events.[8] The health belief model (HBM) suggests that with perceived susceptibility, severity, benefits and barriers to action, the self-efficacy mediates the extensibility of a patient's engagement in health-promoting behavior[9,10] which is also supports the medication beliefs concept as part of the self-regulation of illness.[11]

Whereas, Albert Bandura, described self-efficacy as one's belief in own ability to succeed in specific situations or a function that determines the motivation to accomplish an action.[12,13] Studies have shown that patients with high self-efficacy perform better in terms of skills development and self-care disease management compared to their counterparts.[13] Besides, researchers had observed people with higher self-efficacy make an effort to complete their tasks with regards to choices affecting better health and medication-taking behavior outcomes.[14] Taking medication as coordinated is the patient's obligation; nonetheless, if the patient has inadequate experience of not seeing the importance of taking medications appropriately; thus, non-adherence is not an astounding outcome. Therefore, the antecedent of medication adherence brings us to the act of; the medication understanding and use self-efficacy (MUSE).[15]

There is increasing evidence that patients who have experienced stroke but highly self-efficacious are better in coping with the challenges of daily activities compared to their counterparts.[16] Severe stroke causes loss of mobility, which causes patients to experience the isolation of work and societal activities, which in the long run may increase the risk of post-stroke depression and worsen the quality of life.[17,18] Hence, self-efficacy helps patients with stroke to gain confidence and independence to manage and make an important decision about their illness.[19] Nevertheless, there is a lack of understanding among researchers with regards to personalizing methods. Despite the mounting evidence that health belief theory-enhancing interventions have a positive influence on chronic illness,[19-21] to date, there remains a lack of review on the appropriateness and outcome of such interventions on MUSE especially among patients with the risk of stroke. There is a crucial need for such evidence to guide healthcare providers in the development of patient-centered tools for stroke. PROSPERO registration: CRD42017069606.

MATERIALS AND METHODS

We applied an online search strategy involving the use of various health-related databases such as Pubmed, Ovid Medline, Proquest and Embase. We defined the search strategy with three categories used in combinations: (1) 'medication' OR 'drug' AND (2) 'self-efficacy' AND (3) 'adherence' OR 'compliance.' These search strategies and terms as per specific inclusion and exclusion criteria were adopted per database style. Cited references in selected articles were also cross-checked to determine trials that were not present in the databases. The research articles were then checked for duplicates.

Inclusion criteria

Only adults, both genders, patients diagnosed with a stroke or underlying risk factor involved in randomized controlled trials, pragmatic or quasi-trials, which applied the pre-test and post-test method, were included in the review. English language references were selected from January 2007 to December 2017, a period as we felt that preferences and styles of interventions follow a trend and evolve periodically. Therefore, references selected during this period would reflect the current situation. The references include interventions embedded with any health-belief theory, or behavioral technique associated with self-efficacy, that assessed primary outcomes related to MUSE.

Exclusion criteria

Patient samples with a cognitive disability, depression, or anxiety were excluded as these patients' perceptions toward the focus of outcome measures are not in concordance with this review. Besides, such studies involving none other than the patient were considered insignificant for this review. We also excluded reviews, protocols, design and development study, small sample-sized pilot study, or short trials; lesser than three months as it did not reflect a sustainable effort for behavioral intervention.

Quality assessment

Three reviewers used the Cochrane Collaboration's tool to assess the methodological quality of articles, whereby the studies were rated as having 'high', 'low' or 'unclear' risk of bias for selection, performance, detection, attrition and reporting.[22]

Analysis

We evaluated the effect of the interventions on self-efficacy and medication adherence or stroke risk factor effective control via significant differences between two or more groups (positive differences between control and intervention at two or more points of times). Qualitative analysis of subgroup characteristics compared studies of specific behavioral intervention method variance e.g., presentation style. Meta-analysis was inappropriate due to the heterogeneous nature of samples, settings, outcomes measures and follow-up period gaps.

RESULTS

In total, 1858, distinctive articles were identified electronically. On screening, we scanned the titles and abstracts for relevance and duplicates; thus, 1351 articles were removed. From those search results, we refined 507 articles for in-depth evaluation against inclusion and exclusion criteria and of these, only 16 out of 53 articles emerged to be appropriate for analysis. Figure 1 outlines the selection and screening process of the articles. All studies met an adequate Consolidated Standards of Reporting Trials (CONSORT) score, which portrayed good trial design, analysis and interpretation.

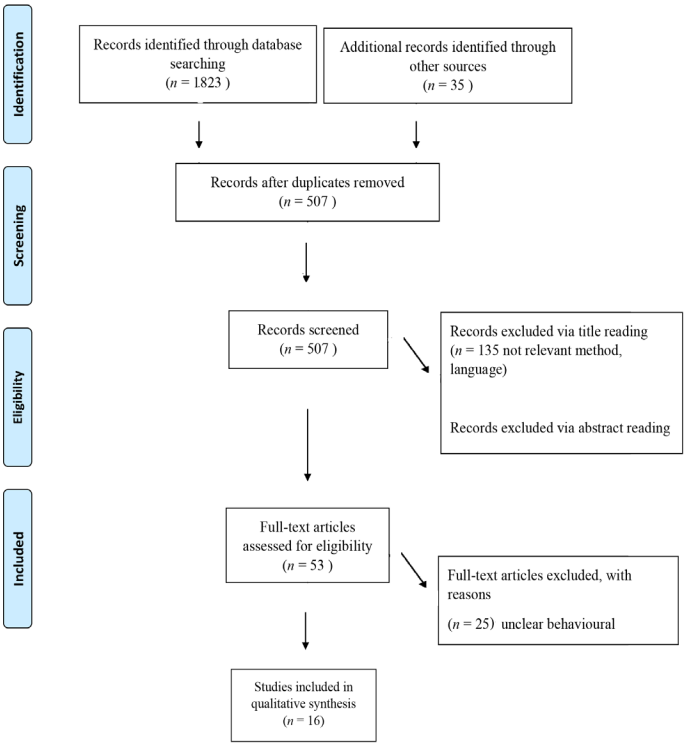

Figure 1: Selection and screening process of the articles.

General characteristics

Table 1 depicts the summarized information for the 16 selected studies. Seven of them were conducted in the North America region,[23-29] four in the Europe region,[30-33] three in the Asia region,[34-36] and one each in Oceania[37] and Africa region.[38] Six studies of patients' illnesses focused on diabetes,[23,24,26,30] six studies were on heart disease,[25,35,32,37,33] whereby one of them was a combination with hypertension,[27] three studies focused on stroke,[29,36,38] and one study targeted hypertension.[28] The majority of studies adapted the 2-arms RCT design compared to the 3-arms[32,28] and 4-arms design.[31] Nevertheless, the behavioral interventions used various methods that were unique in their ways, contributing to heterogeneity in terms of content, length of study and repetitiveness.

Interventions characteristics

The majority of studies applied several strategies to improve self-efficacy related to medication adherence,[24,25,31,26,28,37,29,33,38] but all interventions were best described as to improve self-care of the targeted illness with its self-efficacy in medication management. They were developed based on health behavior theoretical concepts related to self-efficacy in terms of medication taking. Thence, similar outcome measures of interest; MUSE. We distinguished the interventions into didactic or patient-centered techniques, nevertheless they differed in terms of presentation format and content personalization. Only five studies involved with the usage of multimedia formats, but vary in presentation type, length and constructs. They were video narratives design,[35,32] didactic phone-based text messages,[26,38] and interactive patient-centered text messages.[37] However, the face to face intervention delivery was the most commonly used, by which two of them were in the form of a didactic presentation by healthcare personnel.[28,29] But, the rest focused as a patient-centered effort,[23,24,30,31,27,36,33] with two studies being a combination of both didactic and patient-centered.[34,25] Nonetheless, the contents of each study spanned extensively at either honing patients' medication self-management,

Table 1: Summarized information of the 16 selected studies.

Author, year, country	Health issue	Study type and intervention design	Study duration (no. of follow-ups)	Health Belief construct/ behavioural technique	Sample		Primary outcome/assessment; significant differences (p<0.05), Odds ratio, OR, confidence interval, CI)
					Control	Intervention	
William P.S. *et al.* (2009) USA[23]	Type 2 diabetes	2-arm RCT, Usual care vs Telephone (coach) intervention	6 months, 2 follow up	Paraprofessional coaching (self-efficacy, social reinforcement)	27	21	a)The Diabetes Knowledge Test; p>0.05[c] b) Summary of Diabetes Self-Care Activities; $p<0.05^{a,c}$ c) The Multidimensional Diabetes Questionnaire Self-Efficacy subscale; $p<0.05^{a,c}$ d) Awareness of self-care goals; $p<0.05^{a,c}$
Tan M.Y. *et al.* (2010) Malaysia[34]	Diabetes	2-arm RCT, Usual care vs Structured education programme (face to face and telephone calls)	3 months, Pre-post	Self-efficacy and self-care	82	82	a)Revised Diabetes Self-care Activities (RDSA) Questionnaires i)Medication adherence; $p<0.05^{a,b,c}$ ii)Dietary intake; $p<0.05^{a,b}$ iii)Total physical activity; $p<0.05^{a,c}$ iv)Glucose self-monitoring; $p<0.05^{a,c}$; mean differences 0.56, 95% CI: 0.32–0.80 b) HbA1c; $p<0.05^{a,c}$; mean differences 1.75, 95% CI: 8.45–9.02
Wolever R.Q. *et al.* (2010) USA[24]	Type 2 diabetes	2-arm RCT, Usual care vs Integrative health coaching	6 months, Pre- post	Integrative health coaching (Self-awareness)	26	30	a) Patient activation measure (PAM-13); $p<0.05^{a,b,c}$ b) Morisky adherence scale; $p<0.05^{a,b}$ c) The benefit-finding scale; $p>0.05^{b}$, $p<0.05^{a,c}$ d) A1C; $p>0.05^{b,c}$
Barnason S. *et al.* (2010) USA[25]	Heart failure	2-arm RCT, Usual care vs Transition intervention	3 months, pre-post	Transition intervention mechanism (social cognitive Theory)	20	20	a) Medication adherence; $p<0.05^{a,c}$ b) Medication use barriers management (BMQ)l; $p<0.05^{a,c}$ c) Medication use skills (DRUGS); $p>0.05^{b,c}$ d) Self-efficacy for HF self-care; $p<0.05^{b,c}$
David T. *et al.* (2012) France[30]	Type 2 diabetes	2-arm RCT, Usual care vs 3-day Therapeutic patient education programme	3 months, pre-post	Self-efficacy and perceived competence	60	60	a) Summary of Diabetes Self-Care Activities Questionnaire; $p<0.05^{a,c}$ b) HbA1c i)Physical activity; $p<0.05^{a,c}$ ii)Dietary behaviours; $p<0.05^{a,c}$ iii)Medication adherence; $p=0.61$ c) The Perceived Competence for Diabetes Scale i)Physical activity; $p<0.05^{a,c}$ ii)Dietary behaviours; $p<0.05^{a,c}$ iii)Medication adherence; $p=0.07$

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Table 1: Cont'd.

Author, year, country	Health issue	Study type and intervention design	Study duration (no. of follow-ups)	Health Belief construct/ behavioural technique	Sample		Primary outcome/assessment; significant differences (p<0.05), Odds ratio, OR, confidence interval, CI)
					Control	Intervention	
Sanjay A. *et al.* (2014) USA[26]	Type 2 diabetes	2-arm RCT, Usual care vs Text-message intervention	6 months	Motivation, self-efficacy and self-care behaviours concept	64	64	All patients[c] a) Diabetes Empowerment Scale Short Form; Δ0.1 (95%CI -0.2 - 0.4) b) Hb A1C; *p*= 0.230 c) Morisky Medication Adherence Scale–8; Δ1.1 (95%CI 0.1- 2.1) d) Summary of Diabetes Self Care Activities Scale (monitoring); Δ0.6 (95%CI -0.4 - 1.5) Spanish speaking patients[c] a) Diabetes Empowerment Scale Short Form; Δ0.2 (95%CI -0.2 - 0.6) b) Hb A1C; *p*= 0.025 c) Morisky Medication Adherence Scale–8; Δ1.4 (95%CI 0.2 - 2.7) d) Summary of Diabetes Self Care Activities Scale (monitoring); Δ0.9 (95%CI -0.2 - 1.9)
Seon Y.H and Jin S.K. (2014) Korea[35]	Acute coronary syndrome	2-arm pre-post quasi experiment, Usual care vs Risk factor-tailored small group education (multimedia)	12 months, 3 follow-up	Motivational support programme (self-efficacy-in self-care awareness)	40	34	a) Self efficacy scale; $p<0.05$ [a,b,c] b) Self-care compliance; $p<0.05$ [a,b,c]
Mary E.C *et al.* (2014) USA[27]	Coronary artery disease and Hypertension	2- arm RCT, Patient education vs Patient education with the support with positive effect and self-affirmation	12months, Pre-post (2 months once follow up for the intervention group)	Positive effect and self-affirmation (self-efficacy)	Angioplasty (*n*=115) Hypertension (*n*=125)	Angioplasty (*n*=122) Hypertension (*n*= 131)	a) Self efficacy for behaviour change; $p<0.05$[a,c] b) Positive and negative psychosocial changes; $p<0.05$[a,c]
N.E. Stanczyk. *et al.* (2015) Netherlands[32]	Cardiovascular	3-arm RCT, Usual care vs Computer tailored video or text based intervention with 6 feedback session	12 mths, pre-post	I-Change model (Motivation to change and self-efficacy)	721 (generic advice,G)	670 (video,V) 708 (text,T)	a) Readiness to quit smoking Video; $p<0.05$ [a, c] G (OR =1.90,*p*= .005) and T(OR = 1.71,p= .01) b) Self-efficacy; *p*= 0.22
Leila P.D. *et al.* (2015) New Zealand[37]	Coronary heart disease	2-arm RCT, Usual care vs personalized 24-week mHealth program	6 months, 2 follow up at 3 and 6 months	mHealth program, (social cognitive theory)	62	61	a) Self-efficacy for Managing Chronic Disease 6-item scale; $p>0.05$[c] b) Brief Illness Perception Questionnaire; $p>0.05$[c] c) Morisky 8-item Medication Adherence Questionnaire (mean differences: 0.58, 95% CI 0.19-0.97; $P=.004$[a,c])

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Table 1: Cont'd.

Author, year, country	Health issue	Study type and intervention design	Study duration (no. of follow-ups)	Health Belief construct/ behavioural technique	Sample		Primary outcome/assessment; significant differences (p<0.05), Odds ratio, OR, confidence interval, CI)
					Control	Intervention	
Janet W.H.S *et al.* (2016) Hong Kong[36]	Stroke	2-arm RCT, Usual care vs Patient empowerment intervention	6 months, Follow up at T1:1 week, T2:3 months and T3:6 months	Self-efficacy and self-management behavior	105	105	Chinese Self-Management Behavior Questionnaire a) Self efficacy in illness management T1 (OR= 2.11 (95 % CI =(−1.77- 6.00); (p>0.05)[c] T2 (OR= 5.44 (95 % CI =1.24- 9.64); (p<0.05)[a,c] T3 (OR= 5.59 (95 % CI =1.22- 9.95); (p<0.05)[a,c] b) Self BP -monitoring T1(OR= 2.49 (95 % CI =(1.32-4.68); (p<0.05)[a,c] T2 (OR= 2.56 (95 % CI =(1.32-4.96); (p<0.05)[a,c] T3 (OR= 2.31 (95 % CI =(1.11-4.81); (p<0.05)[a,c]
Karin M. *et al.* (2016) Germany[33]	Chronic heart failure	2-arm RCT, Usual care vs Patient-centred self-management educational program	12months, 2 follow up at 6 and 12 months	Integrated self-management behaviour and self-efficacy	227	248	At 6 months a) Self-efficacy sub-scale of the Kansas City Cardiomyopathy Questionnaire; p>0.05[c] b) Symptom control-monitoring; p<0.05[a,c] c) Medication Adherence Report Scale; p>0.05[c] d) Quality of life; p>0.05[c] At 12 months a)Self-efficacy sub-scale of the Kansas City Cardiomyopathy Questionnaire; p>0.05[c] b)Symptom control-monitoring; p<0.05[a,c] c) Medication Adherence Report Scale; p>0.05[c] d)Quality of life; p>0.05[c]
Fred S. *et al.* (2017) Ghana[38]	Stroke	2-arm cluster-RCT, No medication text sms and BP self-measure vs With medication text and BP self-measure	3 months, Pre- post	Motivation (Social cognitive theory)	27	29	a)15-item treatment self-regulation questionnaire; p<0.05[b] b)Systolic blood pressure; p>0.05[c] c)Medication possession ratio (MPR); p>0.05[c] d)18-item perceived confidence scale Intervention group; p<0.05[a,b]

[a]Differences favour intervention group, [b]within group, [c]between group

perception, lifestyle and diet balance or awareness. Therefore, the heterogeneity of the studies caused many limitations to determine which method best addressed behavioral constructs related to MUSE.

Effect of self-efficacy outcome based intervention

Thirteen of the 16 studies (81%) reported a significant ($p< 0.05$) effect of their intervention on MUSE, which is inclusive of positive differences in medication usage or adherence[23-24,30-27,37,36,38] except for study[25] that reported a lower impact on medication use. Nevertheless, we became aware that two studies (13%) had a significant effect on illness management self-efficacy, which encompasses self-monitoring and illness prevention control.[28,33] However, one study reported improvement with only the Spanish speaking group.[26] Furthermore, one study reported coping and preparatory planning improvement in the readiness to quit smoking.[32] Nevertheless, few studies had non-significant effect on illness management self-efficacy.[24,30,31,37,36,38] Besides, a subgroup analysis of five studies, which also explored belief or psychosocial outcome,[24,30,31,27,38] reported significant enhancement of variables related to self-efficacy behavioral constructs (e.g., confidence, perceived benefit) except for study[37] which stated non-significance on those constructs ($p>0.05$). Nonetheless, considering all variables more subjectively, none of these studies exceeded a better intervention impact for risk factor prevention compared with others because of outcome-weighted differences (e.g., subjects, sample size, follow-up frequency).

DISCUSSION

This review indicates a lack of evidence on the aptness of interventions on medication taking behavior, especially MUSE among patients with the risk of recurrent stroke. There was variation in the behavioral theories adaptation and how the constructs were integrated into the intervention to observe targeted outcomes related to MUSE (e.g. medication and lifestyle adherence, smoking cessation, blood pressure control, diabetes monitoring). We observed a clear demonstration of specific techniques (preference of the patient-centered method) towards medication-taking self-efficacy enhancement and understood that the communication technique plays the most crucial criterion for the said self-efficacy. Nevertheless, the majority results were in the projected course; towards behavioral improvement despite various outcome differences between the experimental and control subjects.

Behavioral theory and outcome measure

The self-efficacy construct was applied as an integrated basis in the conceptual framework of all studies. This embedded construct within the social cognitive theory,[12,13] is also the mainstay of self-concepts in sync with the self-affirmation notion.[39] Similarly, self-efficacy enhances motivation parallel to the self-determination theory.[40] Furthermore, the Stages of change model[41] and the Health Belief Model[9,10] have integrated the self-efficacy construct as a crucial element in their behavioral modification framework. Thence, a purposeful outcome measure, self-efficacy, was conceptualized and incorporated in the interventions.

Nonetheless, behavior changes outcome measurement is versatile and remains a challenge for researchers. Hence, it was apparent that several studies reported continuous variables such as HbA_{1c} or blood pressure[34,24,30,26,28,38] to brace the relevance of the self-efficacy outcome. In contrast, the rest of the other studies opted for other related behavioral competencies (e.g., self-care, medication adherence, illness perception and self-monitoring). These actions suggest that the improvement of medication-taking or medication use self-efficacy among patients with diverse medical or medication history is not well-founded. Therefore, the medication associated self-efficacy outcome-based interventions for stroke was with limitation and thus could not be generalized with other population.

Health related communication

In the interim of analysis of the 16 studies, providing information about the illness and medication management as well as ensuring patient engagement in self-care health activity were considered important. Patient-centered communication and care concepts[42,43] were widely optimized compared to the didactic approaches as the former method ensures patient participation in deciding the best quality of life improvement. However, several studies in this review[25,32,33] contradicted the efficacy of the patient-centered method, which reflected non-significant differences of specific self-efficacy tasks (e.g., adherence, illness management) between groups but instead favored the didactic approach.[26,29,38] Hence, in those studies, there were possibilities that the communication barriers between patient and provider were unidentified, or personalized communication needs were insufficiently catered. Thus, this brings about the views on the preferences of information presentation format. It is undoubtedly that face to face approach was a popular choice as well as the majority of the studies inclined towards positive intervention efficacy. However, the method is still debatable, whereby bias of self-reporting, the intensity of follow-up and funding constrain remained high.[44,45]

With this said, we were aware that the multimedia-assisted method is considered as a choice of intervention since few studies achieved significant differences in the formerly reported outcomes.[35,37,38] These studies demonstrated the persuasive power of motivational texts or narratives to sustain individuals' health activity, belief or perception.[46,47,48] The truth was that each risk factor which comorbid stroke, was different in terms of its mental and physical severity challenge stages. Consequently, we recommend that care is taken into developing specific cues of action to enhance a focused self-efficacy ability as patients' need.[49] It is crucial and would be useful to understand the applicability of each intervention in an actual healthcare setting, giving the importance to the availability of supporting workforce and cost.

CONCLUSION

As health is defined 'complete well-being rather than the disease absence,'[50] therefore, shared decision-making comes with the task of healthcare providers' preparedness in understanding the belief and attitude of their patients. The complexity of the emotion, motivation and perception component of behavioral changes makes an individual unique to one another. Thus, personalizing health communication to impact self-efficacy, especially among patients with a stroke risk factor, requires a comprehensive approach with specific-skill outcome measures and sensible application of behavioral interventions.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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