Translation and validation of the Malay version of the Stroke Knowledge Test

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1. Introduction

Stroke is one of the top five common causes of mortality in Malaysia with a rate at 8.43/100,000 population [1,2]. Stroke impact is not limited to physical disabilities that stroke patients experience but also burdens family caregivers. Therefore, it is important to highlight stroke prevention measures for primary or secondary prevention. In addition to the biomedical approach, stroke prevention must be emphasized via stroke education [3–5].

Stroke can be prevented by modifying unhealthy lifestyles such as poor dietary patterns, obesity, smoking, excessive alcohol intake, uncontrolled diabetes, hypercholesterolemia, and lack of exercise [6]. Previous studies proved that healthy lifestyles are very important mechanisms to prevent stroke occurrence or to reduce recurrent events. Thus, stroke prevention that highlights lifestyle modification at either primary or secondary prevention should begin with delivering knowledge to the community, patients, and family caregivers.

Many public health campaigns internationally included public education programs, stroke education for patients and family members, and group-based information programs to increase stroke knowledge and awareness. In Malaysia, most of the public education strategy has increased public understanding of prevention and control of chronic diseases such as diabetes, hypertension, and heart disease. Furthermore, this approach was also proven effective in the prevention of non-communicable diseases such as...
the spread of H1N1 and typhoid during floods. However, a focus of educational intervention on stroke remains lacking in Malaysia.

There must be a significant emphasis on assessing the effectiveness of stroke educational interventions. Generally, stroke education evaluation studies should include multiple outcome measures across multiple domains, but at least one measure will usually include stroke knowledge assessment. In order to evaluate the nature and extent of change in stroke knowledge, systematically constructed stroke knowledge measurement with good psychometric properties must be included in stroke evaluation studies.

Thus, this study developed and validated the Stroke Knowledge Test (SKT) in a Malay language version. Three investigation stages were completed. The first stage involved backward and forward translations from the original English tool to the Malay language. The second stage was conducting expert and stroke patients’ validation of the test items and investigation of item properties. The last stage determined reliability of the Malay version SKT.

2. Materials and methods

The present study was conducted in a cross-sectional manner. The source population for this study was 9 stroke experts and 41 stroke patients admitted to medical and surgical wards in Hospital Universiti Sains Malaysia. This study began in September 2011 and ended in December 2012. Ethical clearance was obtained from the Universiti Sains Malaysia, Human Ethical Committee [Ref. no. USMKK/PPP/JEPeM 254.4 (1.1)] prior to study.

The SKT instrument was adapted from a study by Sullivan and Dunton [7] consisting of 20 items on stroke risk factors, signs and symptoms, prevention, prevalence, treatment, and rehabilitation. The 20 multiple choice question (MCQ) items were constructed in a five-alternative multiple choice format which consisted of one correct option, three distracters, and an “I don’t know” option to reduce the tendency to guess. MCQ format was chosen since it has the ability to broadly sample content domain within a reasonable time limit. Each correct answer was given one (1) mark and a wrong answer was given no (0) mark. Possible scores ranged from 0 to 20. Higher score indicates good knowledge.

Data obtained from the study were entered in an Excel spreadsheet and Statistical Package for Social Sciences (SPSS) version 20.0 software. Descriptive statistics were employed to summarize the results. Data were interpreted as means and standard deviations for numerical outcomes and frequency and percentages for categorical outcomes.

2.1. Pilot study

This phase was completed before proceeding to the next study phase in order to check the compatibility of the items in the translated assessment tools. There are three procedures involved in this portion: (1) translation, (2) validation, and (3) reliability (Fig. 1).

2.2. Stage 1: Translation procedure

The SKT was forward and backward translated into Malay by two bilingual experts and subsequently back translated into English by two additional bilingual experts from Language Centre of the Health Campus, USM. The language experts compared the original English instrument with the back translated Malay instrument and edited to obtain the matched Malay version. Following minor adjustments, a final English version was used to re-evaluate the Malay versions. After further discussion, the final Malay versions of the instruments were ready to be used in the study.

Overall, there were 20 MCQ items of the Malay version SKT reviewed and finalized before the questionnaire was compiled. The knowledge items were purposely translated to address the educational needs of stroke patients as well as to evaluate the knowledge outcome. An item was reconstructed to suit the study population in a Malaysian setting. The reconstructed item was about epidemiology occurrence; the researchers changed the answer choice based on the prevalence of stroke in Malaysia found in the Ministry of Health Ischemic Stroke Clinical Practice Guideline.

2.3. Stage 2: Validation procedure

2.3.1. Development construct of interest for the knowledge domain

The SKT construct was chosen from relevant literature to suit the study design and population setting [8–10]. There is an established literature measuring the stroke knowledge domain. However, most studies were open-ended questionnaires requiring extensive time to answer the questions. This indirectly contributes to low response rates. Furthermore, the analysis procedure takes longer since extensive coding is required when study participants answer in various forms [11–13]. Therefore, the researchers chose an instrument from an Australian study developed by Sullivan and Dunton [7] with good psychometric properties based on its published paper. The researchers chose this instrument because the original study was also conducted among stroke patients who were undergoing rehabilitation in Australia. The original author granted permission to use the instrument prior to instrument translation. The constructs pertained to general information on stroke (pathophysiology, epidemiology, signs and symptoms, prevention, complications), risk factors, treatments, rehabilitation, and emergency actions.

2.3.2. Validation procedure

2.3.2.1. Content validity. Content validity confirmed that the translated instruments measured what they were intended to measure and their appropriateness and relevance to the study purpose [13]. Content validity is usually undertaken by seven or more experts [14]. This validation process was completed by nine evaluators from various backgrounds in stroke care familiar with validation procedures. Each reviewer received an evaluation kit comprising cover letter, demographic information sheet, and translated instruments prior to review [7].
3. Results

The purpose of this study was to follow a systematic validation procedure for a stroke knowledge instrument to evaluate potential applications in any stroke education program [24]. A series of steps comprising content and face validation, item analysis, and reliability checking of the SKT were completed. The validation process resulted in 20 items that had acceptable content coverage, improved clarity, and relevant difficulty levels, and were appropriate to be included in the final SKT version.

3.1. Stage 1: Translation procedure

The SKT were forward and backward translated into Malay by two bilingual experts and subsequently back translated in English by two bilingual additional experts. The Language Centre of the Health Campus, USM supervised the translation process. The language experts compared the original English version instrument with the back translated Malay version instrument and edited to obtain the matched Malay version. After minor adjustments, a final English version was used to re-evaluate the Malay versions. After further discussion, the final Malay version of the instrument was accepted.

3.2. Stage 2: Validation procedure

3.2.1. Content validity

Validity is defined as the ability of the instrument to measure the attributes of the construct under study [14]. There are two types of validity: (1) translational validity and (2) criterion validity. Content and face validity comprise translational validity. On the other hand, concurrent, predictive, convergent, and discriminant are categorized under criterion validity. This study employed content validity and face validity only.

Initially, there were 33 evaluators involved in the content validation process from various backgrounds (physicians, counselor, nurses, physiotherapist, radiologist, dietitian, pharmacist, and teacher) who were also experts in stroke care and familiar with validation procedures. However, the researchers decided to analyze the data obtained from only nine (9) evaluators as they provided comprehensive recommendations.

The experts reviewed the 20 MCQ draft items on the SKT and evaluated each item on four dimensions using a dichotomous response scale: “clear = 1” vs. “not clear = 0.” The four dimensions were (a) item consistency to content area, (b) item wording clarity, (c) perceived item difficulty, and (d) whether (and why) they thought the item should be included in a revised version of the test [7,15].

Expert reviewers also rated the perceived usefulness of an item using a five-point Likert scale ranging from “not useful” to “very useful.” Finally, expert reviewers stated how likely they were to use the instruments in their workplace using a five-point Likert scale ranging from “unlikely to use” to “likely to use.” Extra space was provided at the end of the evaluation kit for further comments from the experts.

2.4. Stage 3: Reliability testing

For reliability testing, the internal consistency was examined by Kuder–Richardson 20 (KR20) or Cronbach’s alpha for the knowledge domain. Cronbach’s alpha value of 0.50–0.70 was acceptable [22] while 0.70 or higher shows good homogeneity among the items [14,23].
3.2.2.2. Item analysis. The descriptive statistics for the knowledge domain showed no floor or ceiling effects. The score at the 25th percentile was 6, at the 50th was 9, and at the 75th was 11. The mean score was 8.44 (SD = 2.98) out of 20 items. No participants gained the possible minimum (0) or maximum (20) scores for the knowledge domain. The minimum score obtained by the stroke patients was 1 while the maximum score was 14. This showed that the overall SKT Malay version feasibility was good.

The difficulty and discrimination indices indicated that the knowledge domain showed no floor or ceiling effects. The score at the 25th percentile was 6, at the 50th was 9, and at the 75th was 11. The mean score was 8.44 (SD = 2.98) out of 20 items. No participants gained the possible minimum (0) or maximum (20) scores for the knowledge domain. The minimum score obtained by the stroke patients was 1 while the maximum score was 14. This showed that the overall SKT Malay version feasibility was good.

For face validation, the SKT Malay version was administered to 10 stroke patients from USM Hospital. All respondents rated the overall items relevant to measure stroke knowledge. However, some items in the SKT were rated as difficult. The researchers realized that when the questions were difficult, patients had a higher tendency to leave it blank. Additionally, the stroke patients also suggested the researchers use an appropriate type, a larger font, simple sentences, and easy language. Based on their comments, several modifications were made to improve the items as listed in Table 3.

3.2.3. Item analysis procedure

3.2.3.1. Socio-demography characteristics (n=41). A cross-sectional study was completed with 41 stroke patients to examine the validity and reliability of the SKT at USM Hospital (Table 4).

3.3. Stage 3: Reliability testing

Following this, the internal consistency coefficient for the knowledge domain was calculated using the Kuder Richardson method.
It is hoped that the Malay version SKT contributes towards stroke education assessment and evaluation meant to measure stroke patients’ knowledge levels. Furthermore, this tool can also be used to identify individual learning needs of stroke patients and their caregivers. Validity is defined as the extent to which an instrument measures what it is supposed to measure\cite[13,14]. Reliability, on the other hand, refers to the consistency and repeatability of an instrument\cite[13,14].

The validation aspects included in this study were content validity, face validity, and item analysis. Meanwhile, the reliability testing involved internal consistency. Construct validity was not completed for the SKT since knowledge items were not indicated for factor analysis; they were abstract concepts that required operational definition and clustering into common factors. Furthermore, the researchers also did not conduct criterion validation for this tool since there was no published tool yet in Malaysia comparable to this MCQ version of the SKT. Furthermore, most of the tools used in many research studies were self-developed by the authors.

The item analysis on SKT knowledge items showed that most items had appropriate values of difficulty and discrimination indices. The difficulty indices showed that 70\% of the items were between acceptable and excellent and 30\% of the items were considered poor items. On the discrimination index, 75\% of the items were considered acceptable, 20\% were difficult, and 5\% were easy. Compared to initial content validation, experts had also rated similar items to number five as unsuitable to be included in the final version due to its difficulty level\cite[7]. However, the researchers decided to retain the questions since the items reflected the overall picture of the knowledge on stroke.

In this study, 20\% of the items were rated difficult which may indicate a lack of related knowledge among the majority of stroke patients. However, these poor items were related to the prevalence of diseases such as diabetes mellitus and atrial fibrillation, epidemiology on stroke disease, alcohol intake, and smoking status. Meanwhile, 40\% of the items that had low difficulty indices had a discrimination index around 33\%. These findings were similar with the original author which found that this area had the most answered as “I don’t know” by the respondents.

This was common because stroke patients usually lacked knowledge in these areas; they probably had not been exposed to such information before the stroke. Therefore, researchers should recognize an area that warrants special attention during patient education interventions. This specific topic should be emphasized during patient educational interventions for the stroke patients and their family members. A good measure would be to provide the fundamental information for the establishment of interventions successfully tailored to the needs of the target population.

Although reliability testing is necessary, it was not a sufficient component of the instrument validity. This is because reliability may change when it is conducted with a different population. Reliability was regarded as the ability of an instrument to estimate the mean score of a test.

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Although reliability testing is necessary, it was not a sufficient component of the instrument validity. This is because reliability may change when it is conducted with a different population. Reliability was regarded as the ability of an instrument to
consistently measure an attribute over time. The researchers had used KR-20 to establish the internal consistency reliability of knowledge test as it is preferable for use with measures with dichotomous variables (e.g., 1 for correct response and 0 for incorrect response [7,25]) while Cronbach’s alpha coefficient is indicated for determining the internal consistency reliability of a measure with variables scored such with Likert scales [27,28].

Validation study findings showed that knowledge (KR20 = 0.58) had moderate internal consistency. Even though this was fairly acceptable, the knowledge domain was considered a good test as KR20 tends to result in more conservative estimates than Cronbach’s alpha [28]. Enhancing the reliability of a questionnaire can be done by increasing the number of items [27] and increasing the sample size might produce a different internal consistency result. KR-20 tends to result in more conservative estimates than Cronbach’s alpha [28].

5. Conclusions

The Malay version SKT had good content coverage, acceptable item properties, and positive expert review ratings. Thus, it was relevant to evaluate stroke knowledge level outcomes. Furthermore, this instrument should be tested among other population groups in the future. The authors highly recommend that test–retest reliability be conducted with an easily reachable study population.
Conflicts of interest

The authors declare no conflict of interest related to this study.

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