ADAPTATION AND VALIDATION OF MALAY SIX-ITEM COGNITIVE IMPAIRMENT TEST IN SCREENING FOR COGNITIVE IMPAIRMENT AMONG ELDERLY OUTPATIENTS IN HOSPITAL TENGKU AMPUAN AFZAN

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DECLARATION

I declare that the work contained herein is my own except where explicitly stated otherwise. Where I have quoted from the work of others, the source is duly acknowledged.

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CERTIFICATION

I hereby certify that to the best of my knowledge, this research project is the original work of the candidate, Dr. Umi Kalsom Mohd Idris (PUM 0075/13).

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LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

AVE	Average Variance Extracted
ACTIVE	Advanced Cognitive Training for Independent and Vital Elderly
AMTS	Abbreviated Mental Test Score
APA	American Psychiatric Association
CDT	Clock Drawing Test
CFA	Confirmatory Factor Analysis
CFI	Comparative fit index
CI	Confidence interval
CR	Composite reliability
DSM–IV–TR	Diagnostic and Statistical Manual of Mental Disorders. 4th Edition
DSM–5	Diagnostic and Statistical Manual of Mental Disorders. 5th Edition
ECAQ	Elderly Cognitive Assessment Questionnaire
GPCOG	General Practitioner Assessment of Cognition
HTAA	Hospital Tengku Ampuan Afzan
IQCODE	Informant Questionnaire on Cognitive Decline in the Elderly
MAS	Memory Assessment Scales
MoCA	Montreal Cognitive Assessment
MoH	Ministry of Health
MMSE	Mini-Mental State Examination
NPV	Negative predictive values
RMSEA	Root mean Square error of approximation
RUDAS	Rowland Universal Dementia Assessment Scale
SE	Standard error
SRMR	Standardise root mean square residual
TLI	Tucker-Lewis index
USM	Universiti Sains Malaysia
WAIS	Wechsler Adult Intelligence Scale
WRMR	Weighted root mean square residual
p-value	Probability value
PPV	Predictive positive values
n	Sample size
%	Per centage
>	More than
<	Less than
=	Equal to
6-CIT	Six-item cognitive impairment test

ABSTRAK

ADAPTASI DAN VALIDASI UJIAN ENAM-ITEM KEMEROSOTAN KOGNITIF VERSI BAHASA MELAYU SEBAGAI UJIAN SARINGAN KEMEROSOTAN KOGNITIF PESAKIT WARGA EMAS HOSPITAL TENGKU AMPUAN AFZAN

Penggunaan sebuah alat saringan yang sahih dan dipercayai untuk mengesan kemerosotan kognitif di kalangan pesakit warga emas di hospital adalah sangat penting. Salah satu alat yang menepati ciri-ciri ini adalah Ujian Enam-Item Kemerosotan Kognitif (6-CIT). Ianya ringkas, mudah difahami dan dilaksanakan secara lisan. 6-CIT juga mempunyai sensitiviti, spesifisiti, dan korelasi yang baik dengan "Mini-Mental State Examination" (MMSE). Namun sehingga kini, kesesuaian dan prestasinya sebagai alat untuk menyaring kemerosotan kognitif di kalangan warga emas tempatan belum pernah disahkan. Kajian ini bertujuan untuk menvalidasi versi Bahasa Melayu 6-CIT disamping mengenalpasti prestasi psikometri dan korelasi alat ini dibandingkan dengan alat penanda aras iaitu "Mini Mental State Examination" versi Bahasa Melayu (MMSE-M) dan "Elderly Cognitive Assessment Questionnaire" versi Bahasa Melayu (ECAQ Malay) sebagai alat saringan kemerosotan kognitif di kalangan warga emas di klinik pesakit luar hospital tempatan. Kajian ini merupakan kajian keratan rentas dengan menggunakan kaedah persampelan mudah yang dilaksanakan di antara bulan Ogos 2016 sehingga November 2016 di Klinik Pakar Perubatan dan Pakar Ortopedik Hospital Tengku Ampuan Afzan, Kuantan. Ia terbahagi kepada dua fasa. Fasa 1, terdiri daripada proses alih bahasa dan kajian awal yang melibatkan 24 orang warga emas yang berbahasa Melayu. Manakala Fasa 2 melibatkan 234 orang warga emas yang berusia 60 tahun keatas, boleh berbahasa Melayu, yang tidak menyertai Fasa 1, tidak pekak, dan

tidak sakit tenat. Analisis deskriptif, analisis eksplorasi dan pengesahan faktor, analisis prestasi psikometrik 6-CIT pada dua aras (iaitu pada 7/8 dan 10/11) dan analisis korelasi dilaksanakan terhadap data-data yang dikumpulkan dalam Fasa 2. Analisis faktor menyimpulkan dua faktor, iaitu orientasi dan perhatian-daya ingatan adalah bermakna dengan Cronbach's alpha 0.819 dan 0.708. Secara keseluruhannya, prestasi versi Bahasa Melayu 6-CIT adalah sangat baik. Sensitiviti alat ini pada dua aras iaitu 7/8 dan 10/11 adalah 95%, manakala spesifisiti alat adalah dari 85% sehingga 97% apabila dibandingkan dengan MMSE-M . Apabila dibandingkan dengan ECAQ Malay, sensitiviti alat adalah 100%, manakala spesifisiti alat dari 71.4% sehingga 84%. Korelasi negatif didapati diantara markah keseluruhan dan markah setiap faktor di dalam versi Bahasa Melayu 6-CIT dengan MMSE-M dan ECAQ Malay. Kajian ini menyimpulkan bahwa proses pengalihan bahasa 6-CIT ke Bahasa Melayu adalah mudah. Waktu digunakan untuk ujian saringan dengan menggunakan alat ini adalah cepat. Model dua faktor iaitu orientasi dan perhatian-memori terbukti sahih dan dipercayai untuk mengenalpasti kemerostoan kognitif, selaras dengan kajian-kajian sebelum ini. Penemuan hasil kajian ini memberikan bukti bahawa versi Bahasa Melayu 6-CIT boleh digunapakai sebagai alternatif untuk ujian kemerosotan kognitif pada masa akan datang.

Kata kunci: 6-CIT Melayu, Kemerosotan Kognitif, Validasi, Prestasi Psikometrik, Korelasi

ABSTRACT

ADAPTATION AND VALIDATION OF MALAY SIX-ITEM COGNITIVE IMPAIRMENT TEST IN SCREENING FOR COGNITIVE IMPAIRMENT AMONG ELDERLY OUTPATIENTS IN HOSPITAL TENGKU AMPUAN AFZAN

The usage of a valid and reliable tool is crucial in order to improve the detection of cognitive impairments among elderly patients in hospital settings. Six-Item Cognitive Impairment Test (6-CIT) a potential screening tool because it is concise, fast, and easy to administer verbally. It has excellent sensitivity, specificity, and correlates well with the Mini-Mental State Examination (MMSE). To date, the instrument's adaptability and performance have yet established upon the local population. This study aimed to validate the Malay version of 6-CIT as well as determining its psychometric properties, and correlation with the gold standard as a screening tool for cognitive impairment in Malay speaking elderly outpatients in local hospital settings. This cross-sectional study conducted between August to November 2016 at the Orthopaedics and Medical Outpatient Clinics Hospital Tengku Ampuan Afzan. The study divided into two phases and the sampling method done by a convenient sampling. Phase 1 involved translation process of instrument and pilot study upon 24 Malay speaking elderly. Two hundred and thirty four Malay speaking aged 60 and above elderly, who was not involved in Phase 1 study, not deaf, and not too ill approached for Phase 2. The data then analysed for descriptive, exploratory and confirmatory factor analyses, the standard measures of diagnostic test at two cut-offs (7/8 and 10/11) and analysis of correlations compared to gold standard. From the factor analyses, orientation and attention-memory with good

internal consistency (Cronbach's alpha = 0.819 and 0.708) extracted. The overall performance of the Malay 6-CIT was excellent. At two cut-offs (7/8 and 10/11) the sensitivity were 95%, while the specificity ranged from 85% to 97% compared to MMSE-M. When compared to Elderly Cognitive Assessment Questionnaire (ECAQ Malay), the sensitivity = 100% and specificity = 84%. Significant negative correlation between total and each factor of the Malay 6-CIT with gold standard obtained. In conclusion, the translation process of this tool was easy. The administration was quick and favorable in busy settings. Orientation and attention-memory model concluded from the factor analyses proved to be valid and reliable in detecting cognitive impairment, consistent with previous studies. The results of the present research provide evidence for the Malay 6-CIT used as an alternative screening instrument for cognitive impairment in future.

Key words; Malay 6-CIT, Cognitive Impairment, Validation, Psychometric Values, Correlation

CHAPTER 1
INTRODUCTION

1.1. Background

1.1.1. Cognitive Impairment in Older Adults

Nowadays, health care issues concerning elderly have become more important together with the growth of the population. One of the subjects that came alight is cognitive impairment (CI). CI itself is not a specific disease, but it is a broad syndrome (Rosli *et al.*, 2016). It can be triggered by various causes, among others are psychiatric disorders, neurological disorders, medical illness, substance abuse, and medication side effects (Mackin and Areán, 2009). The onset could be gradual or acute (Mukadam and Sampson, 2011). However, regardless of the characteristic of the CI, it has potential to cause loss of cognitive function that severe enough to affect with almost all the key aspects of life. They are including physical, emotional, social relationship, educational, marriage and work functioning which significantly limits the individual's potential to lead a meaningful life (Zuccalà *et al.*, 2003; Oliver *et al.*, 2007; Rosli *et al.*, 2016).

Worldwide, the prevalence of CI is increasing (Kaur *et al.*, 2014; Rosli *et al.*, 2016) and one of the raising concerns is the poor detection of CI older adults (Douzenis *et al.*, 2010; Torisson *et al.*, 2012). Early recognition and management of cognitive impairment are crucial because it is not only associated with the administration of the patient and dissatisfaction of caregivers with their general practitioners, but early detection also allows them to plan

ahead of their future while they are still capable (Brodaty *et al.*, 2006). In more critical settings like a hospital, the presence of cognitive impairment is associated with high adverse outcome and mortality in older patients (Douzenis *et al.*, 2010; Mukadam and Sampson, 2011; Torisson *et al.*, 2012). Moreover, cognitive impairment has been linked to decreased effectiveness of medical interventions and poor utilization of outpatient mental health services (Mackin and Areán, 2009).

1.1.2. Issues in Early Detection of Cognitive Impairment

According to literatures, there are various factors that directly and indirectly lead to the poor detection of cognitive impairment among elderly in both primary and hospital settings, causing under-diagnoses of the condition (Torisson *et al.*, 2012). Among others, the poor performances on formal cognitive tests are due to; the patient's condition, such as delirium, physical impairments, pain, lethargy, sleep deprivation, medication (e.g. opioids, benzodiazepines), depression, anxiety, not cooperative, language barriers, cultural issues and learning disability (Zuccalà *et al.*, 2003; Larson, 2008; Mackin and Areán, 2009; Torisson *et al.*, 2012). At the other hand, busy setting, short time of consultation, limited experts to administer, complicated to administer with usage of instrument, an extended period of time consumed to administer the cognitive test, are among the external factors that identifies as the reason for poor recognition of CI in both primary and secondary health care (Zhu *et al.*, 1998; Goring *et al.*, 2004; Torisson *et al.*, 2012).

Early identification of the impairment will make a significant contribution to health care delivery. As the patient's factor is difficult to control, therefore, modifying the external factor by using a simpler and shorter cognitive test that are reliable and valid enough for the screening of cognitive impairment is crucial.

1.1.3. Limitations of Validated Cognitive Assessment Tool in Local Setting

While there are numbers of cognitive assessments available with some more complex than others, however, most of them have being developed and validated in the developer's population (Rosli *et al.,* 2016). Validating and adapting a tool that previously developed from other country or cultural is paramount to ensure that the tool measures what it supposed to measure, according to the local cultural that it intended to implied. Differences in language, proverbs, history, and others could compromise the validity and reliability of a tool. As the consequences, the usability and adaptability of the tool might be restricted to the residents.

According to a systematic review by Rosli et. al., (2015), the Mini-Mental State Examination (MMSE) is the most validated tool in both primary and hospital settings in Asia. The tool has been widely studied, and used to detect CI since its development in 1975 by Folstein *et al.* (Ismail *et al.*, 2010; Mitchell and Malladi, 2010; Mansbach *et al.*, 2012). It has being recommended to be used in Malaysia by Clinical Guideline for Dementia (2009) for screening in the community and secondary settings. Zarina *et al.,* (2007) has translated and

validated the Malay version with excellent sensitivity (97.5 %) and specificity (60.6 %) (Zarina *et al.*, 2007). However, the overall performance of the instrument is highly influenced by the person's educational background, language, cultural (Ng *et al.*, 2007; Ibrahim *et al.*, 2009; Ismail *et al.*, 2010). Therefore, the prevalence of CI may be overestimated in lower literacy population (Tuijl *et al.*, 2012; Rosli *et al.*, 2016). The complexity, length, and the compulsory of the respondents to have the ability to read and write (Brodaty *et al.*, 2006; Tuijl *et al.*, 2012), hinder its usage as a reliable and quick screening tool. The latest issues of MMSE with copyright issues further obstruct its practice.

The Montreal Cognitive Assessment (MoCA) is another tool that started to regain reputation in a local setting. It has been the second most validated tool Asian language with acceptable validity (Rosli *et al.*, 2016). It was developed by Ziad Nasreddine (1996) in Montreal, Quebec (Nasreddine *et al.*, 2005). The MoCA has several items such as picture naming, articulation, and a word list that sensitive to the cultural background (Rosli *et al.*, 2016). Early validation studies indicated that the MoCA was more sensitive to mild cognitive impairment than the MMSE for mild cognitive impairment (Costa *et al.*, 2013). In a large sample study (n = 2237) conducted by Din et. al., (2016) in community settings, the optimal cut-off point for MoCA-BM was 17/18, with a sensitivity of 68.2% and specificity of 61.3% (DIN *et al.*, 2016). The instrument also noticed to be influenced by educational level, and adjustment of cut-offs points is necessary to increase the validity and reliability (Rosli *et al.*, 2016). Therefore its practicality as a screening tool in a busy setting also questionable.

Other than these two, the readily validated cognitive instrument in the Malay language is Rowland Universal Dementia Assessment Scale (Rudas). In a study of 49 elderly in primary care clinic in the state of Kelantan, the Malay version of RUDAS has a satisfactory validity and reliability (Shaaban *et al.*, 2013). It is comparable with MMSE and ECAQ in diagnosing dementia. It is a short six-item screening test, which assesses orientation, praxis, drawing, judgment, memory, and language, with the advantage of being capable of assessing impairment in executive function (Iype *et al.*, 2006). This concise tool, however, still significantly correlated with years of formal educations (Iype *et al.*, 2006).

The presence of institutional bias in most of the validated cognitive assessment tool is one of the biggest concerns as educational level among elderly in Asian country still low (Kua and Ko, 1992; Rosli *et al.*, 2016). As an answer to this, Kua et. al., (1992), developed Elderly Cognitive Assessment Questionnaire (ECAQ), a ten-item screening test for dementia (Kua and Ko, 1992). It is developed and validated in English, Malay and Chinese by Kua *et al.,* in Singapore with a sensitivity of 85.3%, specificity 91.5% in a local setting (Kua and Ko, 1992). The cut-off score of 5 and below out of a ten suggest cognitive impairment. It is a simple, easy to administer in busy settings, and most importantly insensitive of educational level (Kua and Ko, 1992). However, clinicians found that it is less sensitive in detecting the early phase of cognitive impairment (Jer Lim *et al.,* 2003). Thus it might delay the early management and intervention that aimed in secondary settings. Another caveat will be, though ECAQ is widely used in Malaysia, to date, there's no published validation study of this instrument in our local population.

Other than mentioned above instrument, an informant-based report on cognitive decline, The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) seemed to be beneficial especially to those is unable to be evaluated because of stroke, or delirium (Othman *et al.,* 2015). The Malay version of short IQCODE (MS-IQCODE) has been validated and shown to be reliable for the assessment of cognitive impairment in Malaysian population (Othman *et al.,* 2015).

1.1.4. Six-Item Cognitive Impairment Test as a Potential Screening Tool

Looking into the current problem, finding an alternative tool that is reliable and valid enough in a local setting is crucial for early detection of cognitive impairment among elderly. A potential screening tool to be used is Six-Item Cognitive Impairment Test (6-CIT). It is concise, fast, and easy to administer (Katzman *et al.,* 1983; Tuijl *et al.,* 2012; Hessler *et al.,* 2016). 6-CIT correlates well with MMSE in Europeans and the United States population in screening for cognitive impairments among elderly in both community and hospital settings (Brooke and Bullock, 1999; Tuijl *et al.,* 2012; Hessler *et al.,* 2016). Furthermore, 6-CIT was more superior then MMSE as a screening questionnaire due to its higher sensitivity, brevity, and its insensitivity of educational background (Brooke and Bullock, 1999; Tuijl *et al.,* 2012). It applies to visually impaired person, the person who has difficulties or inability to write, and lack of interpretative errors (Brooke and Bullock, 1999; Tuijl *et al.,* 2012; O'Sullivan *et al.,* 2016). At a cut-off point of 10/11, 6-CIT showed excellent sensitivity and specificity in detecting cognitive impairment in older hospital patients (K Upadhyaya *et al.,* 2010; Tuijl *et al.,* 2012; Abdel-Aziz and Larner, 2015;

O'Sullivan *et al.*, 2016). These features suits for an ideal tool for hospital usage. However, to date, the instrument's adaptability and performance have yet to be established upon the local population.

1.2. Rationale of the study

Though there are some locally available and translated cognitive screening instrument, to date, the validated one is, unfortunately, hard to find. Therefore, this research in validating the Malay version of 6-CIT (denote as Malay 6-CIT) for further potential usage in local population seemed to be at the point. Furthermore, by the psychometric and diagnostic properties of Malay 6-CIT against the gold standard (MMSE) and widely used tool (ECAQ), will provide the diagnostic accuracy of this relatively new tool in local settings, hence offering an alternative that can be used with confident by the practitioners in future.

CHAPTER 2
LITERATURE REVIEW

2.1. Overview

Nowadays, the concept of memory loss and cognitive dysfunction as a part of normal aging is already obsolete. Evidence from Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study concluded that, in healthy older adults, with proper cognitive training, ones should be able to maintain their good cognition until the end of their lives (Rodgers, 2002). Hartshorne and Germine (2015) on their study upon the temporal relationship of cognitive performance with age, found some of the cognitive abilities are much better when the person to grow older. These results confirmed that crystallized intelligence peaks later in life, as the data from the Weschler IQ tests (in their study) showed that the vocabulary peaks in the late 40s, then had another peak, in the late 60s or early 70s.

While most of the older adults could age gracefully, some are not too fortunate. Those who do not could sufferers of a condition known as cognitive impairment (CI). CI itself is not a definite diagnosis, but a group of signs and symptoms that affected the person's cognitive functions (Petersen, 2004), which therefore has potential to influence the individual quality of life.

This literature review will cover several topics related to this study. The first topic is about the CI in general; the prevalence, the causes, as well as the risk factors. The later part of this topic will be covering the issues pertaining detection of CI and the importance of early detection.

The second part of this literature view provided information and comparison of some of the available measures or the instruments for diagnosing and screening for CI. The issues regarding the significance of a locally validated instrument are raised by the end if the topic.

The last part would be the process of adapting and validating a foreign language tool into local population and issues connect to it. Overview of statistical analyses usually used for validation is discussed in concise manners at the end of this chapter.

2.1.1. Cognitive Impairment as Not a Part of Healthy Aging

Inevitable changes occur in all parts of the body including the brain as an individual gets older (Glisky, 2007). Certain areas of the brain like the prefrontal cortex and the hippocampus which important for executive function, memory, and learning shrink. At the same time, the degradation of white matter causing interruption between interneurons communications occurs. Changes in blood vessels are causing the narrowing of the arteries and reducing the oxygen supply to the brain. Furthermore, in some people, pathological deposits like plaque and tangles accumulated inside and surrounding the neurons causing the death of the cells (Rodgers, 2002; Glisky, 2007).

These changes contribute to the decline of several cognitive functions like the abilities to learn new things and retrieve information, to perform on complex tasks of attention, learning, and memory compared to a younger person (Rodgers, 2002; Glisky, 2007). However, some of the cognitive abilities like

verbal knowledge, and vocabulary intelligence (Rodgers, 2002; Hartshorne and Germine, 2015) markedly increase with age. Moreover, Rogers (2002), found from his study that, if a healthy older adult in his 70‘s or 80’s were given enough time to perform a complicated task, he'd be able to complete it comparable to the younger counterparts.

While some of the forgetfulness like misplacing the keys, and forgetting names could be a part of normal aging, but some like forgetting the way home, unable to name observed objects and impaired judgment are not (Mackin and Areán, 2009). The primary difference between age-related memory loss and CI is that the former isn’t disabling (Glisky, 2007; Mackin and Areán, 2009).

CI or cognitive disorders (as stated in most of the literature), marked by a disabling disruption in the intellectual abilities such as memory, language, judgment, and abstract thinking (Petersen *et al.*, 2001). To date, there are many attempts to classify the CI. Some take the severity approach; while some take into consideration of the impairment like aphasia, apraxia, etc., and others try to organize them according to the aetiology.

2.1.2. Classification of Cognitive Disorders and Rationale supporting it

The American Psychiatric Association (APA) had recently revised the classification of a group of disorders that previously known as ‘Delirium, Dementia, Amnestic and Other Cognitive Disorders’ in Diagnostic and Statistical Manual of Mental Disorders 4th Edition (DSM –IV-TR) to

Neurocognitive Disorders in the Diagnostic and Statistical Manual of Mental Disorders. 5th Edition (DSM-5) (Ganguli *et al.*, 2011). The word ‘dementia’ and ‘mild cognitive impairment’ replaced with neurocognitive disorders, while delirium was maintained (Ganguli *et al.*, 2011). According to APA, these changes allow the clinicians to diagnose the patients according to their severity and the possible aetiologies if the disorders. Also, this classification would direct the clinician to focuses more on the abilities of the patients instead of disabilities. The removal of term ‘dementia’ also intended to reduce the stigma that came with the word (Ganguli *et al.*, 2011).

The classification by the APA reflective of the multi-facets causal and clinical manifestations of CI (Ganguli *et al.*, 2011). While some would cause acute, severe disruption of cognitive functions and life threatening condition like ‘delirium due to another medical condition,' but others like 'mild neurocognitive disorder probably due to Alzheimer’s disease without behavioural disturbance' are more modest.

Despite the fact that the onset of CI could differ, nonetheless, the condition had potential to progress until they significantly impede the affected individual’s quality of life. Therefore early management of the cause is very crucial. Attempts had made to simplify the classification of CI's. Some identify them into biological factors, and the environmental factors, while others like to divide them into modifiable or non-modifiable causes (Cicconetti *et al.*, 2004). Among the common causes of CI are nutritional, metabolic, infection, tumours,

substance, toxins, injuries, Alzheimer's disease, Lewy body dementia, and other illnesses (Petersen *et al.,* 2001; Albert *et al.,* 2011). These diverse manifestations, later on, determines the distinct and individualistic approach of managements.

According to literature, the earlier of identification of the cause of the disorder would promote a better outcome. However, the new trend of the health management is health promotion, meaning to identify a person at risk and to promote a better quality of care to prevent disorders from occurring. (Cicconetti *et al.,* 2004). Biologically, it is undisputed facts that age is the biggest risk factor to get CI (Glisky, 2007), however aside from that, other risk factors also identified. The various researches concluded that low educational level, the presence of family history of CI, female sex, and the presence of cerebrovascular diseases are among the designated risk factors for cognitive impairment (Cicconetti *et al.,* 2004; Larson, 2008; Baumgart *et al.,* 2015). As an addition, modifiable factors like cigarette smoking, obesity, lack of physical activities, and vitamin D deficiencies could contribute to the occurrence of CI (Larson, 2008). On the other hand, alcohol consumption, caffeine intake, cognitive training, and active physical activity could be a protective factor for CI (Cicconetti *et al.,* 2004; Baumgart *et al.,* 2015; Hartshorne and Germine, 2015).

Therefore, it is becoming new challenges for the practitioners to be able to identify the person at risk and determine the CI at the earliest stage, in the most beginning accounted to ensure the best outcome. However, this paradigm is not

without challenges. The issue regarding the early detection of CI further discussed in chapters below.

2.1.3. The Increasing Trend of Cognitive Impairment Prevalence and the Challenges

The National Institute on Aging in 2011 projected that by the year 2050, the elderly population would increase to almost 2 billion people (Sperling *et al.*, 2011). The expansion of this particular population will inevitably bring huge health impact to the society. One of the biggest health concern regarding elderly population is the emergence of age-associated conditions, including, CI (Zhu *et al.*, 1998).

The prevalence of CI increases with age. Globally, the prevalence ranges from 14.9% (in the community-based study) (Rodríguez-Sánchez *et al.*, 2011), to 31.53% to 36.1% in hospitalized elderly patients (Kaur *et al.*, 2014). In studies conducted in nursing homes, the prevalence of CI could be high as 58% to 79% (Lithgow *et al.*, 2012).

The prevalence of CI is often various from studies due to several factors. (1) The different clinical and demographic characteristics of participants, (2) the inconsistency in the operational definitions of CI, (3) and the various study protocols or instruments used by different centres (Jicha *et al.*, 2008).

In the local situation, the numbers are not too much differs. In Malaysia, elderly defined as older people aged 60 years and above (Mafauzy, 2000). From the latest national census 2010, the total population of Malaysia was 28.3 million, and out these, 5.1% were elderly. According to Mafauzy (2000), the number people who age 60 and above was 1.4 million (in the year 2000) and by 2020, is expected to increase to 3.3 million (Mafauzy, 2000).

From local researches, the prevalence of cognitive impairment among older people in community ranges from 11% to 22.4% (Mafauzy, 2000; Hamid *et al.*, 2011; Rashid *et al.*, 2012; Shaaban *et al.*, 2013), comparable with global findings. Mei *et al*., (2016), also identified 59.3% among 108 elderly sent to nursery homes in Klang Valley tested positive for the cognitive disease.

As mentioned before, there are a variety of causes of CI, and the impact brings together with the conditions differs according to the severity. Early detection of CI, not only would assist in a proper diagnosis, thus prompting first presided treatment, but it also could avoid complication that could occur from the state. In particular illness, like heart disease, CI is an independent prognostic marker (Zuccalà *et al.*, 2003). Therefore CI assessment, even by a simple CI screening tool is a must in older patients with heart failure (Zuccalà *et al.*, 2003).

However, despite high awareness about the importance of early detection and management of CI, unfortunately, this condition is still poorly identified (Mackin and Areán, 2009). This worrying phenomenon not only occur in the

primary care clinics, but also in secondary care settings (Mitchell and Malladi, 2010).

In one of the studies conducted by Moorhouse (2009) in Canada upon the perceived general practitioner's acceptance in screening for dementia, three factors identified as barriers to cognitive function screening. The first factor was time consumption, the general practitioner there felt that they did not have enough consultation time, and particular time elaborated for cognitive assessment. One of the factors for the arisen of this perception is due to their past knowledge and experience of using a long and complicated tool for assessment. Number two was the failure of the practitioners to recognise the early symptoms, thus missed the opportunity for screening. Lastly, the poor screening rate was due to the physicians sceptical of the benefit of treatment of dementia (Moorhouse, 2009).

The factors that limit the ability to screen for CI in hospital settings, however, a little bit different from as in primary care. From researches, the poor performances on formal cognitive tests are due to; the patient’s condition, such as delirium, physical impairments, pain, lethargy, sleep deprivation, medication (e.g. opioids, benzodiazepines), depression, anxiety, refused to engage with testing, physical disability, language barriers, cultural issues, and learning disability (Zuccalà *et al.*, 2003; Ely *et al.*, 2004; Oliver *et al.*, 2007; Larson, 2008; Mackin and Areán, 2009; Torisson *et al.*, 2012). In addition, the combination of busy setting, short time of consultation, limited expertise,

complexity of the instrument, an extended period consumed to apply the cognitive test, are among the external factors that identify as the reason for poor recognition of CI in secondary health care (Zhu *et al.*, 1998; Ely *et al.*, 2004; Goring *et al.*, 2004; Oliver *et al.*, 2007; Torisson *et al.*, 2012).

Goring *et. al*. (2004), concluded in his study that the complexity and time consumption of the cognitive test that limits the usage of a cognitive screening tool thus hinder the early detection of CI patients. He suggested, choosing a simpler, quick to deliver test that is reliable and valid to be used is important (Goring *et al.*, 2004). It may improve the quality of care of the patients, hence improves the outcome. Other than that, it may also improve the quality of life for patients and their families, aid the intervention strategies, thus delay the nursing facility placement (Mansbach *et al.*, 2012).

However, choosing the best screening tool, which is valid and reliable enough, but at the same time straightforward and fast to apply is not as easy and still one of the great challenges of medicine (Cullen *et al.*, 2007). The caveat to this problem is due to multifactorial causes that will be discussed in the next part of this literature review.

2.2. The Screening Instrument for Cognitive Impairment

The cognitive function is paramount for the continuation of human life and encompasses multiple domains including reasoning, memory, attention, and language (Glisky, 2007). Disruption of these functions would affect individuals' quality of life.

To identify which domains of cognition affected in certain disorders, the neuropsychological assessment is traditionally carried out. It could assess the extent of impairment of a particular skill and attempt to determine the area of the brain which may have been damaged following brain injury or neurological illness (Lezak, 2004). It is usually a very extensive, lengthy, and needed full cooperation from the patients. Among the widely used neuropsychological assessment tools are; Wechsler Adult Intelligence Scale (WAIS), Memory Assessment Scales (MAS), and Boston Naming Test (Lezak, 2004). Due to the time consumption and the complexity of these tests, they are not practical to be used in busy settings. Therefore, shorter and simpler instruments meant for screening being introduced over the past years.

While the cognitive screener not intended as a replacement of the full neuropsychological assessment, it should still be possible to obtain indices of the main cognitive domains in a brief consultation (Cullen *et al.,* 2007). It should try to comply with the specific domains of the cognitions but maintained its validity to identify CI. (Cullen *et al.,* 2007). Though "no single instrument is suitable for global use" but clinician surveys indicate that the Mini-Mental State Examination (MMSE) used most in practice (Brodaty *et al.,* 2006; Cullen *et al.,* 2007). Some details of these cognitive screening tools usually used summarised in Table 1 below.

For local settings, the Malaysia Clinical Practice Guideline for Dementia (CPG), 2009 recommended several brief screening instruments to use in secondary and tertiary settings. Among all, are; Mini-Mental State Examination (MMSE) and Elderly Cognitive Assessment Questionnaire (ECAQ) (Yusoff *et al*., 2009). The CPG also

mentioned the Practitioner Assessment of Cognition (GPCOG) and 6-items Cognitive Assessment Test as alternative (Yusoff *et al*., 2009).

The issue with the screening instruments in Malaysia is, most of the instruments available were developed and validated in the Western population. The validity of a tool might be affected when being applied onto another population (Othman *et al.*, 2015). The final segments of this literature review will explain briefly the problems faced in translating a foreign tool and the validation process itself.

Table 1 Commonly used screening tool for cognitive impairment in primary and secondary settings

Instrument	Developer, year developed	Features	Remarks
Mini-Mental State Examination (MMSE)	Folstein et. al., 1975	• 30-item questioner covering orientation, registration, attention or calculation, recall, naming, repetition, comprehension both verbal and written, writing, and construction • 8 min in average to perform • cut-offs below 24 cognitive impairment • sensitivity (60.6 %) • specificity (97.5 %) (Folstein *et al.*, 1975; Feng *et al.*, 2012)	• sensitive to the person's educational background • copyright issues making the test least available for use • required equipment to administer (Brooke and Bullock, 1999; Tuijl *et al.*, 2012)
Clock Drawing Test (CDT)	Shulman et. al., 1983	• no memory component • assess comprehension, planning, visual memory, reconstruction of graphic images, visuospatial processing, motor programming and execution, numerical knowledge, abstract thinking, concentration, and frustration • quick and easy to administer, not sensitive to language barrier • CDT, in conjunction with the Mini-Mental State Examination, could result in significantly improved early detection of dementia • sensitivity and specificity (85%) (Lee *et al.*, 2008; Hatfield *et al.*, 2009)	• lack of no universally accepted standards of the marking system • poor screening method for very mild dementia • sensitive to educational background • qualitative assessment • influenced by mood • required equipment to administer (Lee *et al.*, 2008; Hatfield *et al.*, 2009)

Table 1 continued

Instrument	Developer, year developed	Features	Remarks
Montreal Cognitive Assessment (MoCA)	Nasreddine et. al., 1996	• Originally designed to detect mild cognitive impairment • more executive function and visuospatial items • available in 34 languages and has been validated in many different cultural settings including Malaysia (Lam *et al.*, 2013; Rosli *et al.*, 2016)	• several items such as picture naming, articulation, and a word list that sensitive to the cultural background • sensitive to educational background • required equipment to register (Rosli *et al.*, 2016)
Rowland Universal Dementia Assessment Scale (RUDAS)	Rowland et. al., 2004	• 6-item tool assessing memory, praxis, orientation, drawing, judgement, recall and language. • similar sensitivity but better specificity than MMSE • useful brief screening test in clinical settings (Iype *et al.*, 2006)	• required equipment to register • educational bias (Iype *et al.*, 2006)
Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)	Form, 2003	• 26 questions based on change in cognitive function over a 10-year period • MMSE has been found to be better than the IQCODE in memory clinic (Hatfield *et al.*, 2009)	• Information by others • Informants' bias • influenced by factors regarding the informant's state of mind and relationship with the patient (Hatfield *et al.*, 2009)

Table 1 continued

Instrument	Developer, year developed	Features	Remarks
Abbreviated Mental Test Score (AMTS)	Hodkinson et., al., 1972	• clinician-rated 10 item scale developed as screening test for medical inpatients • age, time of day, recall of an address, year, place, recognition of two people, date of birth, dates of world war I, name of the monarch and counting backwards from 20 to 1 • high correlations with MMSE (0.87) (Hodkinson, 1972)	• some questions sensitive to cultural background • cannot distinguish between delirium and dementia • no equipment needed (Hodkinson, 1972)
Six-item Cognitive Impairment Test (6-CIT)	Katzman et. al., 1983	• extremely simple • three orientation items, count backwards from 20, months of the year in reverse order, and learn an address • culturally unbiased • easy to translate into other language • cut-off of 7/8 having high sensitivity and specificity even in mild dementia (Katzman *et al.*, 1983; Tuijl *et al.*, 2012)	• scoring involves weighting of the items to produce a score out of 28 • no equipment needed (Katzman *et al.*, 1983)

2.3. The Validation Process of an Instrument and Issues in Translation

As mentioned before, the use of a validated tool in a local setting is imperative and will further determine the value of the tool and its usability in future. However, the process to ensure the validity of an instrument is not as simple. It involves a string of complicated and delicate process that started with adapting the international instrument into the local language.

Numerous issues can be identified in translating a text from one language to another. Two of them are non-equivalence; and differences in the construction of sentences. The latter is concerned with the discourse of the two languages. Baker (2011) says that non-equivalence at word level is one of the many difficulties translators face when dealing with texts. Some of the reasons for such non-equivalence are due to the culture-specific concepts: a concept in the source language may not exist in the target language, no word to express in the targeted language, or the source language may have more accurate term, while the target language only has more a general term (Baker, 2011).

A local study by Komalasari (2013), had elaborately identified the issues in the translation from English to Malay. In her study, she found that, the English term could be absence in the Malay language, making conveying the accurate information difficult, needing the translator to substitute the word thus might differ the meaning (Komalasari, 2013). The second problem she accounted was, the terms in the Malay language may not be favourable to the derivation of other linguistically connected terms. Furthermore, translator faces problems in translating derivational forms of languages as few scientific and technical expressions applied are root words, and the resultant forms

were not copied in the Malay language. The third was the Malay language does not have suffixes for marking adjective and translator would constitute to the usage of another word to show the adjectival function or preserving the use of the root term and the sentence convey the adjectival function (Komalasari, 2013). In her study, she gave several examples to clarify it;

As examples;

Political scientist = ahli sains politik (science = sains ; politics = politik)

Cultural phenomena = fenomena budaya (culture = budaya)

However, Baker (2011) had purposed several strategies tackling translation issues. Among the strategies that may be adopted, including; cultural substitution, the use of a superordinate (general term) in place of a hyponym (specific term), the use of words borrowed from the source language, paraphrase using unrelated words, or omission of several words.

2.3.1. The Translation Process

In adopting a different questionnaire the local population, the language of choice determined by respondents' language proficiencies. As many perceptions and terms entail culture-specific connotations, the direct translation is unlikely to transport the intended meaning. Without clearly specifying the expected meaning of the idea in the translated questionnaire, the researcher risks introducing systematic bias.

An exact translation of the novel version of the questionnaire needs a researcher not only to guarantee overall conceptual equivalence but also to consider vocabulary, idiomatic and syntactical equivalence. In this vein, Brislin (1980) has suggested using simple sentence assemblies as well as clear and acquainted wording as much as possible to facilitate translation. Also, by adding redundancy and necessary context for difficult phrases, the researcher can clarify the envisioned meaning (Brislin, 1980; Harzing *et al.*, 2013).

The most frequently used interpretation technique is back-translation (Brislin, 1980). In this procedure, the original version of the questionnaire is translated into the target language and later translated back into the original language by a second bilingual individual. The use of two independent translators increases the chances that the original gist has been retained, ensures scrupulous accuracy and helps to detect mistakes. However, given the earlier notion that similar concepts may not always exist in another language, back-translation does not guarantee overall conceptual equivalence (Harzing *et al.*, 2013).

Harpaz (2003) identifies two additional paraphrase techniques: bilingual method and board procedure (Harpaz, 2004). The former approach comprises sending the original and the interpreted questionnaire to bilingual individuals and then correcting items based on contradictions in their responses. In the latter approach, a committee consisting of bilingual individuals translates the questionnaire jointly and discusses possible mistakes or difficulties (Harpaz, 2004). Finally, to cross-check for possible translation errors and to ensure