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ORIGINAL ARTICLE

Reliability and Construct Validity on Undergraduate Geriatric Questionnaire

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Abstract

The number of elderly people in Malaysia is increasing in trend due to better healthcare services provided by the government and increased awareness of the community towards disease prevention. Therefore, the knowledge of future medical doctors towards geriatric care should be upgraded at par to fulfill the needs of the older population. As a result, their level of knowledge should be assessed, particularly in terms of the fundamental concept of geriatrics. A new, invented, reliable and valid questionnaire is needed. This study aimed to develop and validate a newly developed questionnaire to assess the knowledge of medical students in geriatrics. The 23 items consist of true-false questions and one-based answer responses based on five domains of Giant I's geriatric, namely immobility, instability, incontinence, cognition, and iatrogenic. The sample size is calculated using a five-to-one item ratio. The questionnaires were distributed to 143 medical students. Reliability was determined using Cronbach's alpha for internal consistency, while construct validity was assessed using factor analysis. An acceptable internal consistency was observed (Cronbach's alpha = 0.62). Factor analysis showed two meaningful finalized components, which represent the geriatric general knowledge and the Giant I's. According to the findings of this study, this questionnaire is a reliable and valid tool for assessing medical students' knowledge of geriatric.

Keywords: Geriatric, Reliability, Construct Validity, Undergraduate Geriatric, Questionnaire

Introduction

Geriatric can be defined as elderly people aged 65 years and above (Guaraldi et al., 2018; Li et al., 2020; Wei et al., 2020). In this 21st century, aging is not a new phenomenon instead it is an important and fastest growing group worldwide (Li et al., 2020; Wei et al., 2020). Geriatric medicine is "the subspecialty of internal medicine concerned with the health and well-being of older adults"

(Al-Aama, 2016; Gholamzadeh et al., 2018). As a consequence of physiological changes of aging that makes them susceptible to multiple diseases, geriatrics require numerous healthcare services (Al-Aama, 2016; Gholamzadeh et al., 2018).

Geriatric patients often have multiple diseases which are interrelated with each other instead of having only one isolated disease. Hence, it is better to group the diseases into syndrome and according to Bernard Isaacs (1965), he coined it as “geriatric giants" or the 5 I’s which refers to immobility, in cognition, incontinence, instability and iatrogenic (Greenstein et al, 2019). Immobility is the incapability of changing position without any assistance (Szlejf et al., 2012). Meanwhile in cognition, it is usually caused by dementia which are characterized by three features; distorted cognitive function, arising from brain disease and affecting daily function (Butterworth, 2014). Involuntary urine leakage is referred to as urinary incontinence (Flanagan et al., 2012). As for postural instability, it is defined as failure to integrate sensory input and determine body oscillations in the upright posture while maintaining balance (Moraes et al., 2019). Lastly, iatrogenic is defined as non-drug medical intervention that creates harmful drug responses or issues (Permpongkosol, 2011).

As the awareness of the importance of geriatric education to be incorporated in the medical curriculum has arisen among geriatricians and academicians due to the increasing number of aging populations, the number of researchers reviewing geriatric curricula in undergraduate studies across the world has also increased. Literature has proven that different countries have developed their own different curriculum of geriatric and gerontology. In a study conducted in German and Austria medical faculties, they stated that geriatric subjects have been established in most of the faculties, however their research found out that there is highly variable quality in terms of incorporating the subjects into undergraduate training (Singler, 2013). They emphasize on attitude and respect towards the patients, basic knowledge of ageing to acquire, special skills pertaining to conduct history taking and perform the assessment in older patients and principles of treatments. Some of the giant I’s they included in their curricula are incontinence, cognitive and behavioral dysfunction for in-cognition, mobility and gait disorders for instability.

In another research paper entitled European Undergraduate Curriculum in Geriatric Medicine, there was also early consensus on inclusions of the geriatric giants; impaired intellect and memory (dementia and delirium), immobility, instability and incontinence. However, the extent of which other general medical conditions were still more contentious (Masud et al., 2014). Teaching of geriatrics takes place during clinical years (fourth to sixth year) of the undergraduate medical curriculum (Michel et al., 2018). Furthermore, research conducted in Australia regarding geriatric medicine in undergraduate students shows that their curricula is not that much different compared to the Europeans (Tam et al., 2014). However, their curriculum of geriatric medicine is spread out through the years in medical school. In their preclinical years, they have a theoretical part of geriatric medicine through lectures and problem-based learning. Lectures on the physiology of aging and prescribing for older people. Problem-based learning topics include falls, fractures, osteoporosis, dementia, depression nutrition, movement disorders, stroke and disability (Matsuse, 1996). This shows that they also incorporated the giant I’s in their geriatric curricular ever since in pre-clinical years. In their 4th year, they’ll have a 9-week medical home unit (geriatric medicine) attachment and a 6-week block in the 5th year consisting of geriatric medicine and rehabilitation medicine attachment in the hospital.

Geriatric medicine is an elective in most universities in the US and the contents are integrated into existing courses throughout the four years of medical school (Anderson and American Medical Colleges, 2004). They have outlined common learning outcomes of geriatric medicine in US medical schools, mainly to familiarize students with care for elders as part of a multidisciplinary team and to foster understanding of ethical issues in geriatric care, such as palliative care. However, there are not many discussions that emphasize on giant I’s of geriatrics in their curriculum. They use a wide variety of teaching strategies including formal lectures, small group discussions, case studies, self-directed learning and interdisciplinary team interactions. In

their 3rd and 4th-year medical school, they will experience primarily the clinical experience of geriatric medicine in internal medicine and family medicine rotation.

Common questionnaires used to assess the knowledge of the elderly amongst students are validated University of California at Los Angeles (UCLA) geriatrics knowledge test (GKT) / UCLA- GKT (Koh et al., 2012; Koh et al., 2015; Visvanathan, 2011). UCLA-GKT is an 18-item questionnaire divided into two sections. It measures the level of knowledge of important geriatric topics and medical issues (Koh et al., 2015). The respondents are required to select "true," "false" or "don't know" in response to eight statements in the first section with scoring 1 for a correct answer, 0 for "don't know," and -1 for an incorrect answer. There are ten scenario-based multiple-choice questions with one best answer in the second section that sum up 10 marks. A total score of 18 points equals a perfect score of 100%. The Cronbach's alphas of UCLA-GKT range from 0.71 to 0.80 for medical students based on the previous study (Koh et al., 2015). UCLA's knowledge test can be used sequentially to demonstrate knowledge gains, making it suitable for use as a diagnostic, formative, or summative assessment tool (Visvanathan, 2011). Another test that is like the University of California at Los Angeles Geriatrics Knowledge Test (UCLA-GKT) is the University of Michigan Geriatrics Knowledge Test (UM-GKT). It has been developed for house officers to evaluate the level of knowledge and comprehension of the important geriatric topics and medical conditions (Krain et al., 2007; Tuqan et al., 2017).

However, it has been used in the study among 5th-year medical students at the National University of Singapore even though it has only been validated in the house officers previously (Wiese et al., 2014). It has 20 scenario-based multiple-choice questions with the single best answers that sum up 20 marks. Moreover, The Facts in Aging Quiz (FAQ) is also widely used in the geriatric study and it consists of 50 items (right/wrong) to assess general and specific knowledge about aging and older people (Wiese et al., 2014). It is a short assessment tool that covers the fundamental physical, cognitive, and social aspects of aging, as well as common misunderstandings about aging (Sutin et al., 2011). FAQ has also been used to assess aging-related knowledge and attitudes among students and professionals from a variety of healthcare disciplines despite the FAQ being created and used primarily in the field of gerontology (Sutin et al., 2011).

In addition, there are not many validated questionnaires used in the assessment of geriatric's knowledge among students. Most of the studies used their self-developed questionnaire (Arakawa et al., 2020; Fisher et al, 2014). At the University of Adelaide, Australia, a self-developed questionnaire regarding the perceptions of importance and competence in frailty diagnosis, assessment, and management was used to assess the medical student's knowledge on frailty (Arakawa et al., 2020). Frailty is the most troublesome manifestation of population aging and is defined as a state of vulnerability to a stressor due to the declination of physiological systems (Arakawa et al., 2020). The survey consists of a 26-items Likert scale questionnaire with scores ranging from 1 to 6. Most of the self-developed questionnaires for students in other geriatric knowledge studies will include falls and delirium in their items which are the components of instability and incognition (Duque et al., 2013; Fisher et al., 2014).

Other items that were added to the questionnaire were pharmacology, dementia, cognitive-behavioral disorders, osteoporosis, urinary incontinence, frailty, and a home visit (Duque et al., 2013; Fisher et al., 2014). Up to our knowledge, there is no literature review regarding the specific questionnaire that includes all the five components of Geriatric Giants to assess the student's knowledge. Only a few of the Giants Geriatric was included which are instability, in cognition and incontinence (Duque et al., 2013; Fisher et al., 2014).

In conclusion, there are numbers of research that has been done across the world assessing and evaluating geriatric medicine in undergraduate curricula using various methods including questionnaires, surveys and consensus. However, we found out that there is very little research or article discussing this subject in Malaysia, especially the tools available to evaluate the effectiveness of geriatric medicine curricula in Malaysia. Thus, our aim is to construct the

validity and reliability of geriatric questionnaires to assess undergraduate students in geriatric medicine.

Materials and Methods

The objectives of this study are to measure the reliability of newly developed undergraduate geriatric questionnaires and to measure the construct validity of newly developed undergraduate geriatric questionnaires. A newly developed questionnaire is used and distributed to all year four medical students (143 students) who are enrolling in a family medicine program, specifically during geriatric health tutorials. The questionnaire was developed based on general items on geriatric and five fundamental components of geriatric namely immobility, in cognition, incontinence, instability and iatrogenic. Sample size calculated based on 23 items are 5 x 23 = 115 according to Pallant in 2013 (Pallant, 2013). The students were given three days to answer the questions as part of pre-testing assessment before the tutorial. Verbal and written consent are given by their willingness to sign in the online pre-test and submit the answers. Analysis is done through reliability (value of Cronbach's alpha) and construct validity assessment by performing exploratory factor analysis. Sufficient assessment is considered when: correlation matrix (pairs with moderate correlations of >0.3), Bartlett's test (assumption: correlations between variables are all 0) and significant Kaiser-Meyer-Olkin (KMO) Measure. Good reliability of the questionnaire is assumed when Cronbach's alpha reaches value $\geq$ 0.7.

Ethical Approval

The study has been approved by IIUM Research Ethics Committee (IREC 2021-263)

Results and Discussion

Demographic Data of the Respondents

A total of 143 medical students responded. All of them were Muslims and 99% were Malaysian. 69.2% were female. The age of respondents ranges from 22 to 27 years of age (Table 1).

Table 1. Demographic Data of the Respondents

Variables	Categories	Number of person (N)	Percentage (%)
Gender	Male	44	30.8
	Female	99	69.2
Citizen / Ethnicity	Malay (Malaysian)	141	98.6
	Non - Malaysian	2	1.4
Age	< 25	124	86.7
	$\geq$ 25	19	13.3

Reliability analysis

The Cronbach's alpha value of the 23 items was 0.652 which is fair. Table 2 shows the corrected item-total correction for each item.

Table 2. Item-total correction for each item

Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Geriatric refers to medical care for older adults age more than	.063	.662
Life expectancy of male is expected to be up to 78-year-old	.287	.634
Following are among the Giant I's in geriatric except	.527	.605
Following are among the causes of immobility in geriatric except	.218	.643
Incontinence is the complication of immobility	.131	.650
Following examinations are needed for immobility assessment except	.320	.631
Following are true regarding Barthel Index except	.412	.623
Following drugs can cause fall in older person except	.214	.642
Time Up and Go Test require the patient to walk straight and turn back at point of	.324	.630
No specific lab investigation is required in instability	.341	.628
Initial treatment for most patients with venous insufficiency includes following except	.064	.659
Women have higher risk for incontinence compared to men	.258	.639
Following are the acute reversible causes of urinary incontinence, except	.300	.632
Measuring the post-void residual is required for initial therapy for stress or urgency urinary incontinence	.151	.648
Antimuscarinics are proven for stress incontinence	.162	.648
Following lifestyle modifications play role in initial therapy of urinary incontinence except	-.016	.668
Following are the potential causes of faecal incontinence except	.272	.635
Mild cognitive impairment affects the patient's daily activities	.162	.648
Following are among the initial assessment for those with cognitive complaints, except	-.153	.666
Following medications targeted at improving cognition except	.350	.626
Lewy bodies present in which subtypes of dementia	.324	.629
Iatrogenesis is defined as any injury or illness that occurs because of environmental care	.272	.636
Multiple physicians is one of the risk factor for geriatric iatrogenic	.012	.655

Construct Validity

After discussion with experts and team members, we decided to keep all the items in view of each item is important to represent the domains. Factor analysis of the 23 items showed the acceptable value of Kaiser-Meyer-Olkin measure of sampling adequacy (0.602) and significant Bartlett's Test of Sphericity (< 0.001), which give rise to two domains.

The first domain consists of geriatric introduction, immobility, incontinence, in cognition and iatrogenesis of Giant I's. Meanwhile, the second domain consists of geriatric definition, instability and long-term immobility as shown on Table 3 below.

Table 3. Construct validity with two meaningful domains extracted

	Component	
ITEMS	1	2
Q1		.505
Q2	.437	
Q3	.706	
Q4	.332	
Q5		.483
Q6	.440	
Q7	.463	
Q8		.320
Q9	.525	
Q10	.	.414
Q11		.555
Q12	.351	
Q13	.389	
Q14		.374
Q15	.254	
Q16	.021	
Q17	.557	
Q18		.196
Q19	-.264	
Q20	.608	
Q21	.495	
Q22	.382	
Q23	.253	

The purpose of this study is to determine the reliability and construct validity of the newly developed questionnaire on knowledge of geriatrics among medical students. Reliability refers to the reproducibility of assessment data or scores, over time of occasions (Downing, 2004). Meanwhile, validity means the extent to which a concept is accurately measured in a quantitative study (Heale and Twycross, 2015). Among major types of validity is construct validity which is defined as the extent to which a research instrument measures the intended construct. Thus, in this research, we intend to investigate whether the domains which are included in the newly developed questionnaire can assess geriatric knowledge among medical students.

The approach typically used to estimate the reproducibility of test scores in written assessments employs the concept of internal consistency usually estimated by the Cronbach alpha (α) coefficient. The result of Cronbach's $\alpha$is a number between 0 and 1. An acceptable reliability score is one that is 0.7 and higher (Heale and Twycross, 2015). The higher the Cronbach alpha, the more reliable the questionnaire is. The higher the values also imply the items are measuring the same dimensions (Bujang et al., 2018). However, we found out that our questionnaire Cronbach alpha is lower than general guidelines which is 0.65. Nevertheless, a general accepted rule is that α of 0.6-0.7 indicates an acceptable level of reliability, in which this questionnaire is still reliable. Among the limitations that may contribute to the lower Cronbach alpha value include the small sample size in our study. This is because in a research article mentioned that a sufficient sample size is needed so that research conducted can provide reliable and reproducible evidence that can detect the desired Cronbach alpha of an instrument (Bujang et al., 2018). Second limitation may be due to various components compiled together rather than similar themes which contribute to the lower reliability. This is further justified in an article that

mentioned that a low value of alpha could be due to a low number of questions, poor inter-relatedness between items or heterogeneous constructs (Tavakol and Dennick, 2011). Therefore, the questions in our questionnaire are then divided into two main domains which consist of different components respectively.

This questionnaire is developed based on the Geriatric Giants which consist of instability, immobility, incontinence, in cognition and iatrogenesis. Based on the SPSS results, it suggests dividing the questionnaire into two domains. The first domains consist of immobility, incontinence, in cognition and iatrogenesis. Meanwhile, the second domain only includes instability. This could be due to terms of immobility and instability being interchangeably used as they are overlapping each other. Postural instability is defined as failure to integrate sensory input and determine body oscillations in the upright posture while maintaining balance (Moraes, 2019). Immobility means an inability to change positions in bed without assistance (Szlejf et al., 2012). Mild immobility is defined as the inability to run quickly or perform heavy activities. Moderate immobility is defined as being unable to go shopping or use public transportation. Severe immobility is defined as being unable to bathe or clothe (Hami et al., 2021).

Falls is the principal component of immobility and instability in which instability can lead to falls and eventually result in immobility (Softic et al, 2013). A fall is defined as an accidental shift in position that results in a lower level of rest on the ground (Batsis et al., 2021). Falls is the most common cause of death and injury among the elderly, resulting in disability and immobility. The risk factors for immobility and instability are almost the same which include joint pathology such as osteoarthritis of the knees, foot pathology, cognitive impairment, gait abnormalities, vestibular disorders, muscle weakness, visual impairment, an unsafe environment and fear of falling (Greenstein et al, 2019). Hence, it is better to separate the instability and immobility in a different domain to make the respondents understand the questionnaire better and easy to answer as observed in this questionnaire.

Following are the final distribution of the questionnaire items and their domains and subdomains:

Domain 1: Consist of general introduction regarding geriatric and four subdomains of Giant I's (immobility, incontinence, incognition and iatrogenesis):

Q2) Life expectancy of male is expected to be up to 78 year old. (General / introduction)
Q3) Following are among the Giant I's in geriatric except (General / introduction)
Q4) Following are among the causes of immobility in geriatric except: (General / introduction)
Q6) Following examinations are needed for immobility assessment except (Four Giant I's)
Q7) Following are true regarding Barthel Index except (Four Giant I's)
Q9) Time Up and Go Test require the patient to walk straight and turn back at point of (Four Giant I's)
Q12) Women have higher risk for incontinence compared to men (Four Giant I's)
Q13) Following is the acute reversible causes of urinary incontinence, except (Four Giant I's)
Q15) Antimuscarinics are proven for stress incontinence (Four Giant I's)
Q16) Following lifestyle modifications play role in initial therapy of urinary incontinence except (Four Giant I's)
Q17) Following are the potential causes of fecal incontinence except (Four Giant I's)
Q19) Following are among the initial assessment for those with cognitive complaints (Four Giant I's)
Q20) Following medications targeted at improving cognition (Four Giant I's)
Q21) Lewy bodies present in which subtypes of dementia (Four Giant I's)
Q22) Iatrogenesis is defined as any injury or illness that occurs as a result of environmental care (Four Giant I's)
Q23) Multiple physicians is one of the risk factor for geriatric iatrogenic (Four Giant I's)

Domain2: Consist of geriatric definition, instability and long term immobility
Q1) Geriatric refers to medical care for older adults age more than
Q5) Incontinence is the complication of immobility
Q8) Following drugs can cause fall in older person except
Q10) No specific lab investigation is required in instability
Q11) Initial treatment for most patients with venous insufficiency includes following except
Q18) Mild cognitive impairment affect the patient's daily activities

Conclusion

This study showed that this newly developed 23 items questionnaire is a valid and reliable tool to assess knowledge of medical students on geriatric in general and Giant I's of geriatric domain specifically. It can be used in future studies for medical officers in the primary or tertiary center as well. It can also be used to assess other support medical staff such as paramedics and pharmacists who have been trained in geriatric.

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