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PSYCHOMETRIC PROPERTIES OF THE FARSI VERSION OF ISAR USED IN IRANIAN EMERGENCY CENTERS

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ABSTRACT

Background and objective
The rising trend of elderly population on the one hand and the relative high costs of relevant medical and care services on the other hand, highlight the importance of screening programs. Such programs demand fit tools to achieve considered objectives. ISAR, Identification of Seniors at Risk, was designed to screen those elders who are hospitalized in emergency centers, but are going to be discharged from hospital to home. This study aims to evaluate the psychometric properties of the Farsi version of ISAR in Iranian elders.
Method
This is an observation-prospective study with a primary population of 190 elders aged>60. They were selected using conventional sampling method among elders who referred to the emergency centers of Sabzavar, Iran in 2016. Data was collected using demographic questionnaire, ISAR, Barthel's index and GHQ-12 questionnaire at six months post-discharge and was analyzed using SPSS 19 in order to evaluate the psychometric properties of ISAR.
Results
Kappa coefficient of consistency and Cronbach's alpha of ISAR scores, which was executed by two executers (inter-rater coefficient), were 0.79 and 0.52, respectively (P<0.001). Pearson's correlation coefficient resulted from the concurrent execution of ISAR using Barthel's index was 0.71. In addition, It was calculated 0.71 at six months post-discharge using GHQ-12 questionnaire which was significant at P<0.001. The best obtained sensitivity and specificity was 85% and 75%, respectively considering the cut-off point of ≥2 for ISAR. The area under curve (AUC) of ROC was 0.85 implying the high discrimination power of ISAR.
Conclusion
The Farsi version of ISAR shows sufficient reliability, validity, sensitivity and specificity in Iranian seniors. It can be used as an auxiliary tool for the identification of seniors at risk (after six months from discharge) in Iranian emergency centers and can be enlisted in Iranian checkup tests for elders.

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Introduction

As a vital and challenging subject, the concept of geriatrics has been discussed in recent years in both scientific-research and decision making centers. It triggers thousands of questions in mind and fuels countless worries about this group, which will constitute the majority of population in near future. Aging process is, indeed, the gradual degradation of the performance of body systems including cardiovascular system, respiratory system, urine and sexual organs, endocrine glands and immune system. During this process, a healthy adult person turns to a weak person with decreased physiological capabilities who is susceptible to diseases, and in turn, to death [1]. As elderly population grows rapidly, relevant problems and the need for emergent health care services increase [2]. Emergency centers are among the most important and the most conventional departments providing healthcare services to elders [3]. According to WHO reports, the emergency department of hospitals

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are likely the first place of the hospitalization of elders so that they occupy 20% of the emergency centers of hospitals and this trend increases rapidly [4]. Generally, there are stressful situations in emergency centers where the physical or mental status of patients get worse instantly but follow-up actions are taken only until the elimination of immediate risks. The lack of awareness and knowledge on elderly population on the one hand and no access to services for communicating with them, aimed at identifying other associated problems and taking consequent necessary actions, on the other hand, result in providing no sufficient and suitable care services. This, in turn, results in the frequent clinical visits occurring in emergency centers [5]. Other needs of elders are generally neglected in emergency centers because the focus is there on the specific problem for which the elder refers to the center [6]. Generally, this group of population are susceptible to the risk of unpredictable readmission following being checked up and discharging from the centers. According to researches, at one month, 3 months and 6 months post-discharge, 10%, 24% and 44% of elders are readmitted, respectively [7]. In Iran, there is no sufficient awareness and knowledge on the necessity of screening and identification of seniors at risk. Comprehensive Geriatric Assessment (CGA) is the well-known tool, which is currently used to identify the treatment plan of elders and to make decisions on them. However, the completion of CGA is a time-consuming process taking at least 30 minutes [8]. Therefore, it is impossible to apply it on all elders who are admitted in emergency centers and they should be assessed by a brief, but beneficial, tool. As one of the widely used and the most reputable screening tools, ISAR is used to perform two-stage interventions with immediately execution possibility. The reliability and validity of ISAR in predicting considered outcomes in elders have been approved by various studies conducted in different countries of the world [8, 9, 10, 11, 12]. In addition, it is widely used in emergency centers [13]. Initially, ISAR was designed with 27 items predicting different negative effects and outcomes including death, admission in care or medical centers, and apparent clinical decrease of performance at six months post-discharge. Following statistical analyses, conducted to turn ISAR to a short and rapid tool, the number of items decreased to six and ISAR was published in English and French languages. According to test-retest methodology, the reliability of ISAR is 0.78 [14]. The review of literature reveals that ISAR is used as an applied tool to identify seniors at the risk of unwanted outcomes [15]. For example, in Canada, Italy, Belgium and Netherlands, it is identified as a powerful tool for identifying and predicting the decrease of physical power so that some studies believe that it is an ideal and rapid tool [16, 17]. Furthermore, some researchers believe that it is a beneficial approach, in terms of care and therapy costs, to do necessary interventions with respect to the results of ISAR screening [3-18, 19]. The majority of studies have recommended that prior to implementing ISAR, it is necessary to customize it considering the conditions of each country. Therefore, making change in the total cut-off point of ISAR or in the total cut-off point of polypharmacy is permissible [16, 19]. The notable matter is that, however, the reliability and validity of ISAR is different in different countries such as Canada, England, Netherland and Italy. This difference implies the gap in ISAR between the countries and necessitates the investigation of the psychometric properties of ISAR in Iran, because such differences may root in different medical and health services of countries as well as in study samples [20, 21]. This indicates that ISAR should be evaluated in Iranian elderly population in order to make it a beneficial tool for Iran.

Methodology

The population of this study consists of elders who were going to be discharged from the emergency centers of Sabzvar, Iran after receiving health care services, of which 190 cases were selected using conventional random sampling method. They filled ISAR, GHQ-12 and Barthel's questionnaires as well as demographic information questionnaire. The inclusion criteria were as follows:

- Age>60
- Interest to participating in the study
- Voluntary participation in the study
- Discharging from emergency centers to home after receiving necessary health care services

The exclusion criteria were as follows:

- No interest of case to answering the items of questionnaires
- No cooperation during study
- Hospitalization in specialist departments
- End stages of life

The questionnaires were filled by samplers, who were well trained by the researchers, using observation as well as organizing interview sessions with qualified elders or accompanied person (family members of care provider in the event of cognition deficiency or temporary unconsciousness of case). They were filled in the emergency centers of Emdad and Vasei hospitals of Sabzvar, Iran in all days of a week and at different hours of days and nights. Demographic information included: age, sex, marital status, education, residency place with two contact numbers, the way of transferring patients to emergency center (whether with the ambulance of the center, or by personal car or by strangers or by family members), the reason of referring to the emergency center declared by the patients or his/her accompaniments, diagnosis at emergency center, arriving time (night or day), the major care provider and the number of caring hours in a day. ISAR questionnaire has 6 items about the existence of prevalent problems including decreased physical performance, decreased cognitive performance, polypharmacy, visual deficiency and multiple hospitalizations in medical centers. Each question is answered by yes or no and the assessed elder is scored by points 0 to 6. In the original version of the questionnaire, elders with a score of >2 are identified as seniors at risk. The reliability of questionnaire was obtained 0.78 using test-retest [15].

Barthel's physical performance index was another tool used in this study. It has been designed by Mahoney and Barthel to measure pre and post-therapy performance abilities, to define the extent of medical services and to evaluate clinical outputs [22]. The reliability and validity of the Farsi version of Bathel's index are 0.96-0.99 and 0.999, respectively [23]. Barthel's tool is a standard and well-known tool across the world. It has been used in many similar studies [11, 21, 23, 24]. It is used to measure Activity of Daily Living (ADL). It is constituted by 10 items: feeding, bathing, self-care, dressing, bowel control, bladder control, toilet use, transfer, mobility and stairs. Dependence level is categorized as follows: 95-100 means no dependence; 91-94 means slight dependence, 75-90 means moderate dependence, 50-74 means middle dependence, 25-49 means severe dependence and 0-24 means complete dependence [23]. General Health Questionnaire, GHQ, was another tool used in this study. It was designed by Goldberg in 1972 to identify the mental disorders in different centers and environments

[25]. This questionnaire is available as 12, 28, 30 and 60-item questionnaires of which the 28-item (GHQ-28) and 12-item (GHQ-12) forms are widely used both in Iran and other countries [25, 26, 27]. Likert scale is the most typical scoring method of GHQ questionnaire where points 0, 1, 2 and 3 are allocated to each item in the meaning that answer A is scored by point 0, answer B is scored by point 1, answer C is scored by point 2 and answer D is scored by point 3. In this way, the maximum score of the trial would be 36 [25]. According to Iranian studies, the Cronbach's alpha of this questionnaire was calculated to be 0.87 implying that the Iranian version of GHQ-12 questionnaire has an acceptable validity and reliability in measuring Iranian hygienic and mental health status [26, 27].

Prior to translating the questionnaire and setting psychometrics properties for Iranian population, the subject was communicated with the main designer of the questionnaire and his consent was obtained in order to observe ethical principles. The relevant authorities were made sure that they can benefit from the results of this study and that the data of cases will be treated as confidential data.

Cronbach's alpha and inter-rater reliability were used to assess ISAR reliability. In addition, its validity was confirmed using concurrent criterion-related validity and predictive criterion-related validity. Data analyzed using SPSS 21 and descriptive and inferential methods (Kappa coefficient of consistence, Cronbach's alpha, Pearson correlation coefficient, Area under ROC curve).

Results

In sampling stage, the mean age of case group was 72. The case group consisted of 190 members of which 101 and 89 cases were male and female, respectively. Moreover, 96% of discharged elders have at least one chronic disease and 46% of cases introduced their spouse as the main care provider. In 74% of male cases, the main care provider was their wives while only 13% and 12% of married daughters and sons were providing care services, respectively and about 16% of cases had no main care provider. In 52% of cases, care services were being provided at home round the clock while in 11% of cases it was performed at home only in days. The majority of elders had been transferred to emergency centers at the early hours of mornings and nights with dyspnea (21%), heart pain (17%), hypertension (8%), stomach pain (6%), hands and feet numbness (5%), fall (6%), weakness and fatigue (5%) and dizziness (6%) as the most prevalent cause. ISAR reliability was assessed by calculating Cohen's Kappa coefficient and Cronbach's alpha. Table 1 and 2 show the results.

Table 1: Kappa coefficient of ISAR

test	executer	Number of cases	Test item	Kappa coefficient
Kappa coefficient	General doctors-nurses	30	Item 1	0.86
			Item 2	0.78
			Item 3	0.92
			Item 4	0.88
			Item 5	0.91
			Item 6	1
			All items (depending on positive or negative questionnaire)	0.79

Table 2: Cronbach's alpha of ISAR

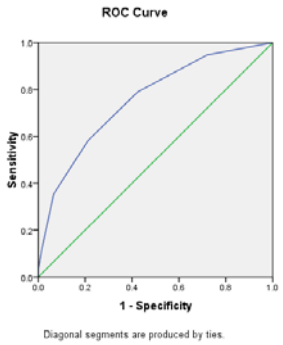
test	Number of cases	Number of items	Cronbach's alpha
Cronbach's alpha	190	6	0.52

The results of table 1 and table 2 confirm the reliability of the Farsi version of ISAR. It should be noted that reliability is a condition of validity. Therefore, the validity of questionnaire was assessed too. Table 3 shows the results.

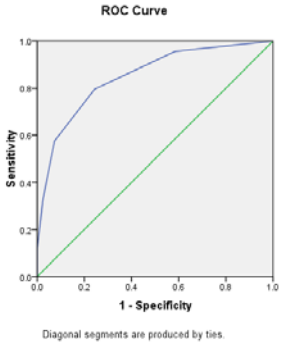
Table 3: Calculation of Pearson correlation coefficient of ISAR using Barthel's scale and GHQ questionnaire

Main variable	Dependent variable		number	mean	Standard deviation	Max.	Min.	Pearson correlation (r)	p-value
ISAR	Concurrent criterion	Barthel's score	190	74.50	1.52	100	2	-0.66	0.001
	Predictive criterion	GHQ-12 score	110	20	9.74	36	0	0.71	0.000

To calculate the sensitivity and specificity of ISAR, ROC curve was first drawn. Curve 1 shows the area under curve (AUC) of ROC implying the ability of ISAR in the discrimination of normal and patient cases.



AUC=0/75



AUC=0/84

Curve 1: ROC curve for calculating the discrimination power of ISAR (AUC)
Left side: re-admission and death in emergency centers were included as the negative outcomes of the study
Right side: in addition to the mentioned outcomes, any admission in other centers, referring to clinic, need for more care services and fall were considered as negative occurrences.

To determine the best cut-off point of the questionnaire, the sensitivity and specificity of points 1 to 6 were assessed. Since the best cut-off point of screening test is a point at which a relative equilibrium is established between sensitivity and specificity [28], point 2 was considered as the best possible state of both sensitivity and specificity (sensitivity=80% and specificity=75%). Considering point 2 as the best cut-off point of the study tool, sensitivity and specificity will be 80% and 75%, respectively. In addition, positive and negative predictive values of ISAR were 90% and 53%, respectively.

Discussion

According to ISAR reliability and validity assessments, the kappa coefficient of consistency obtained by two executers who conducted the test on 30 cases was 0.79 for all items which is significant at sig. level 0.001. This implies the excellent inter-rater reliability of the questionnaire (table 1). In addition, the inter-correlation coefficient of the questionnaire or alpha shows that the reliability of ISAR is at a moderate level (0.52%) (Table 2) Few studies have reported the reliability of the questionnaire and majority of them have been concentrated on the validity. The results of this study showed that the Farsi version of ISAR applied on patients after discharging from hospital has an acceptable reliability.

To determine the validity of ISAR, Pearson correlation coefficient was calculated for ISAR using standard Barthel's index and was obtained -0.66 implying the concurrent validity of ISAR after patients' discharge from hospitals. Data distribution was normal. Therefore, Pearson statistics was calculated and the correlation between ISAR and GHQ-12 questionnaire was computed at six months post-discharge. The obtained results show the acceptable correlation between them. The results agree with the results of many studies including the studies of the designers of our study tool [8, 9, 11, 15] but disagree with some others [10, 14]. However, the majority of such studies have assessed ISAR validity using different methods. For example, Salvi et al assessed and calculate hospitalization, mortality and disability in order to define the validity of ISAR in the accurate prediction of negative outcomes, such as readmission in emergency centers, and confirmed the excellent discrimination power of ISAR [8]. They reported the AUC of the mentioned outcomes as 0.90 (in a sig. level of 0.001 and confidence level of 0.95). In the process of designing screening tools, available literatures name AUC the accuracy or the discrimination power [20. 21]. Considering its discrimination power, Monz et al in Belgium believe that the validity of ISAR is weak to moderate. However, it should be mentioned that this study considered *readmission in emergency center* as the sole negative outcome and this may be the cause of the weak discrimination power of ISAR in our study. It seems that if decreased physical performance, fall, need for more care services at home, referring to care centers or direct hospitalization in the specialist departments of clinical centers, and finally mortality, were considered as the negative outcomes of this study, our results would be more different and valuable [9]. Hogerdoein et al study showed the weak discrimination power of ISAR. Therefore, they did not approve the validity of ISAR [11]. However, the acceptable power of ISAR in the accurate prediction of seniors at risk was approved in both Monz and Hogerdoein's studies [11] whereas Edmanz et al in England conducted a study on ISAR adopted on cases discharged from England emergency centers and believed that ISAR lacks acceptable validity in England [14]. It should be noted, however, that the difference between caring systems and study population may affect the validity and discrimination power of ISAR. In addition, the researcher believes that one should not neglect the important matter that in the study of English researchers the negative outcomes were considered only at 3 months post-discharge and this period cannot serve as a criterion for ISAR validity. In addition, this agrees with Boorman's study [2011] where the study was followed-up 4 months after discharge and its results showed non-acceptable validity of ISAR. Considering the results of the mentioned studies and our study, it can be argued that the validity and discrimination power of ISAR should be assessed and judged at 6 months post-discharge, so that the designers of ISAR have emphasized this six-month period.

If we wish to report the validity of study tool based on the analyses of the majority of studies conducted over the world and compare our results with them, we can argue that our results indicate that the discrimination power of ISAR in Iran depends on the type and number of negative outcomes. It is estimated moderate to good (AUC=0.75-0.84) so that, in predicting some outcomes, such as readmission in emergency centers, the discrimination power is moderate. However, if we add additional negative outcomes to post-discharge negative outcomes, such as fall, need for increased care hours, hospitalization in care centers, referring to doctor office and decreased physical performance, the discrimination power of ISAR will be almost good. In summary, our results imply the ideal validity of ISAR.

ROC curve was used to calculate cut-off point and to determine the sensitivity and specificity of each point. The best cut-off point is a point at which a relative equilibrium is established between sensitivity and specificity. If point 1 and above was

considered as the cut-off point, the sensitivity would be excellent (0.90) but the specificity would not be suitable (0.42). On the other hand, if point 3 and above was considered as cut-off point, the specificity would be ideal (0.92) but the sensitivity would fall to a large extent (0.57) and would be non-valuable. Cut-off point 2 corresponded to the sensitivity of 0.80 and the specificity of 0.75, which seems a relative ideal point. Surprisingly, Canadian designers of ISAR have introduced point 2 and above as the cut-off point which corresponds to the sensitivity of 0.73 and the specificity of 0.51. This agrees with the results of similar studies [9, 11, 12, 15]. In the study of Hogredoein et al, the sensitivity and specificity of ISAR was determined to be 0.93 and 0.39, respectively which has the highest sensitivity in the accurate prediction of seniors at the risk of negative outcomes [11] compared with other tools, which were simultaneously assessed. Although the values of sensitivity and specificity were not declared in the study of Monz et al, the high sensitivity of ISAR was confirmed by the researchers but its specificity was low [9]. Therefore, in the Farsi version of ISAR for post-discharge applications, the best cut-off point for Iranian cases was considered to be 2. In this point, it is predicted that the ability of ISAR in screening seniors at risk at post-discharge condition is 80%. In addition, it can be predicted that the ability of ISAR in screening seniors not at risk of readmission is 75%.

Generally, positive predictive value says us the likelihood of the engagement of a patient with positive test results in a diseases. In this study, the ratio of the number of seniors with a score of ≥2 in ISAR, who were at the risk of expected negative outcomes after study period, to the total number of seniors with a score of ≥2 in ISAR was 0.90. This implies that if the result of ISAR is positive, the likelihood of being at risk at post-discharge condition will be 90%.

On the other side, negative predictive value says us the likelihood of the engagement of a patient with negative test results in a disease [19]. In this study, the ratio of the number of seniors with a score of zero or 1 in ISAR, who were not at the risk of expected negative outcomes after study period, to the total number of seniors with a score of zero or 1 in ISAR was 0.58. It can be argued, therefore, that if ISAR result is negative, the likelihood of not being at risk at post-discharge condition will be 58%. Unfortunately, no study has reported positive or negative predictive value and we could not make a comparison.

Similar to other studies, this study suffers inevitable limitations, which may affect result generalization and relevant applications. The researcher's access to the studied centers went with various difficulties such as receiving no response, need for frequent contacts within a day, long phone conversations or need for personal presence in the studied unit for obtaining accurate data from samples. This was a limitation of this study.

Conclusion

The Farsi version of ISAR has ideal validity, reliability, and sufficient sensitivity and specificity. As a tool for identifying seniors at the risk of readmission in Iranian emergency centers at six months post-discharge, it can be enlisted in checkup tests for Iranian seniors.

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