Predictive Validity of the Identification of Seniors at Risk Screening Tool in a German Emergency Department Setting

Katrin Singler^{a, c} Hans Jürgen Heppner^{c, d} Andreas Skutetzky^c Cornel Sieber^c
Michael Christ^b Ulrich Thiem^{e, f}

Departments of ^aGeriatrics and ^bEmergency and Intensive Care Medicine, Klinikum Nürnberg, and
^cInstitute for Biomedicine of Aging, Friedrich-Alexander University of Erlangen-Nürnberg, Nürnberg,
^dClinic for Geriatric Medicine, HELIOS Klinikum Schwelm, University Witten/Herdecke, Schwelm,
^eDepartment of Geriatrics, Marienhospital Herne, University of Bochum, Herne, and ^fDepartment of Medical Informatics, Biometry and Epidemiology, University of Bochum, Bochum, Germany

Key Words

Elderly emergency patient · Emergency department · Identification of Seniors at Risk (ISAR) screening tool · Risk stratification

Abstract

Background: The identification of patients at high risk for adverse outcomes [death, unplanned readmission to emergency department (ED)/hospital, functional decline] plays an important role in emergency medicine. The Identification of Seniors at Risk (ISAR) instrument is one of the most commonly used and best-validated screening tools. As to the authors' knowledge so far there are no data on any screening tool for the identification of older patients at risk for a negative outcome in Germany. **Objectives:** To evaluate the validity of the ISAR screening tool in a German ED. **Design:** This was a prospective single-center observational cohort study in an ED of an urban university-affiliated hospital. Participants were 520 patients aged ≥ 75 years consecutively admitted to the ED. **Measurements:** The German version of the ISAR screening tool was administered directly after triage of the patients. Follow-up telephone interviews to assess outcome variables were conducted 28 and 180 days after the

index visit in the ED. The primary end point was death from any cause or hospitalization or recurrent ED visit or change of residency into a long-term care facility on day 28 after the index ED visit. **Results:** The mean age $\pm$ SD was 82.8 ± 5.0 years. According to ISAR, 425 patients (81.7%) scored ≥ 2 points, and 315 patients (60.5%) scored ≥ 3 points. The combined primary end point was observed in 250 of 520 patients (48.1%) on day 28 and in 260 patients (50.0%) on day 180. Using a continuous ISAR score the area under the curve on day 28 was 0.621 (95% confidence interval, CI 0.573–0.669) and 0.661 (95% CI 0.615–0.708) on day 180, respectively. **Conclusion:** The German version of the ISAR screening tool acceptably identified elderly patients in the ED with an increased risk of a negative outcome. Using the cutoff ≥ 3 points instead of ≥ 2 points yielded better overall results.

© 2014 S. Karger AG, Basel

Introduction

Older patients undergoing a geriatric intervention such as comprehensive geriatric assessment are more likely to survive their hospital admission and return to their previous living environment [1]. Emergency depart-

ments (ED) as a point of entry into the health care system play an important role in the management of older patients [2, 3]. However, the ED role in the streaming of elderly patients is currently not well characterized.

Older patients in the ED are known to have an increased risk for adverse outcomes [4]. Unplanned hospital readmissions 1 month after an ED visit are described in 11–25% of elderly patients [4, 5]. Dramé et al. [6] showed an institutionalization rate, defined as admission to a nursing home or long-term care facility, of 18% 6 months after an ED visit. Mortality 6 months after an ED visit is described in 20–24% of patients [4, 7].

Therefore, the identification of patients at high risk for such adverse outcomes plays an important role in emergency medicine. The Identification of Seniors at Risk (ISAR) instrument is one of the most commonly used and best validated screening tools [8, 9]. Outside Canada, there is evidence for its validity from Italy and Switzerland [5, 7].

As to the authors' knowledge so far there are no data on any screening tool for the identification of older patients at risk for a negative outcome in Germany [10]. The study was conducted to evaluate the ISAR screening tool in a German ED. The primary outcome variable of the study was the combined end point of revisit to an ED, transfer to a long-term care facility, hospital admission and death within 28 days after the index ED visit.

Methods

Study Design

This is a prospectively conducted single-center observational cohort study examining the validity of the ISAR in 520 patients ≥ 75 years consecutively admitted to a German ED. During an 8-month period (April to November 2010), a trained study nurse applied the ISAR to consecutive patients aged ≥ 75 years presenting to the ED. The data were collected in the context of a multinational project examining the prognostic stratification of old patients in the ED conducted by the ED working group of the 'inter-RAI Network of Excellence in Acute Care'. The study was approved by the institutional review board of the hospital and the ethical committee of the affiliated university.

Setting and Selection of Participants

The ED is part of an urban university-affiliated hospital. Nearly one quarter of the 80,000 attendees per year are ≥ 75 years old. Exclusion criteria were lack of informed consent, lack of reliable information given by the patient or a caregiver. Due to ethical reasons, patients expected to die within the following 24 h were excluded. Major trauma and cardiorespiratory instability were no exclusion criteria. In accordance with an Italian validation study, we did not exclude patients from long-term care facilities in order to identify patients at risk for negative health events regardless of their current living status [7].

Interventions

Screening took place 5 days a week (Monday to Friday) during the daytime in an interdisciplinary ED, and all patients of the observation period were screened for eligibility. In case of repeated visits to the ED, only the initial visit (index visit) was considered. ISAR was translated into German and backtranslated by a professional translator. Backtranslation into English showed no substantial differences compared to the original version. The ISAR screening tool was administered directly after triage of the patient. If information could not be obtained directly from the patient, an accompanying family member or caregiver was involved. Patients with incomplete ISAR data due to missing values were excluded from the analysis. Demographic data and patients' deficits in the activities of daily living were obtained by assessment of the patient, proxy or caregiver and review of all medical records available.

Outcomes and Statistical Analysis

Follow-up telephone interviews were conducted 28 days and 180 days after the index visit with the person originally interviewed. The current living address or dates of death were confirmed by the responsible registration office.

As a primary outcome variable, we used the combined end point of death from any cause or hospitalization or recurrent ED visit or change of residency into a long-term care facility on day 28 after the index ED visit. We assumed an incidence of the primary outcome of at least 25%. The ISAR screening tool in its original version dichotomized into a low-risk (< 2 points) and a high-risk group (≥ 2 points) should be able to detect a relative risk (RR) for the primary outcome of 1.5 or greater. Under these assumptions, using Fisher's exact test with 80% power and a significance level of $\alpha = 5\%$, a sample size of 462 participants (2×231) was calculated. In addition, the study should be adequately powered to detect a difference in all-cause mortality at 180 days as well. For this purpose, we assumed death at 180 days after the index ED visit to occur in at least 16%, and an RR of 1.66 or greater indicated by the ISAR tool. Under otherwise equal assumptions, we calculated a sample size of 508 participants (2×254) overall. As the latter sample size was the greater one, we aimed to enroll at least 508 participants.

Continuous variables are reported by mean and standard deviation, categorical variables with absolute and relative frequencies. Tests for group differences were performed using Student's *t* test for continuous and symmetrically distributed variables, and the χ^2 test for categorical variables. As a measure of association, we used the RR with 95% confidence interval (CI). For adjustment, multivariate logistic regression analysis was performed, resulting in an adjusted odds ratio with corresponding 95% CI. We also calculated sensitivity and specificity for different ISAR cutoff values.

For the sample size calculation and the calculation of 95% CI for sensitivity and specificity, we used the software StatsDirect, version 2.7.8., 2010 (StatsDirect Ltd., Altrincham, UK). For all other analyses, SPSS 21, 2012, was used (IBM, Ehningen, Germany).

Results

Overall, 520 participants [313/520 women (60.2%)] were included. The mean age $\pm$ SD was 82.8 ± 5.0 years, the median age 82.0 years. 60.2% of the participants lived

independently at home, 17.7% were residents of a nursing home. Ambulatory support by a caregiver was found in a large percentage of patients for a variety of activities of daily living (for example, in 38.3% of the patients for personal hygiene and 42.9% for supporting mobility). Table 1 depicts characteristics of the study sample in total and for the ISAR-defined subgroups.

According to the ISAR screening tool, 95 patients (18.3%) scored <2 points, while 425 patients (81.7%) scored ≥ 2 points. 315 patients (60.5%) scored ≥ 3 points. Irrespective of the cutoff in use (ISAR ≥ 2 points or ≥ 3 points), patients of the ISAR-defined high-risk group were significantly more often female than male and had much more needs to support activities of daily living function than patients of the low-risk group.

The combined primary end point at 28 days was observed in 250 of 520 patients (48.1%). Death of any cause until day 28 occurred in 46 persons (8.8%), an unplanned hospital stay in 94 patients (18.1%), an unplanned readmission to the ED in 83 patients (16.0%) and a nursing home admission in 19 (3.7%) as depicted in table 2. The risk for the primary end point after 28 days was significantly higher for patients scoring ≥ 2 or ≥ 3 points, as compared to the low-risk group. The RR were 1.77 (95% CI 1.28–2.45) for ISAR ≥ 2 points and RR 1.61 (95% CI 1.30–1.98) for ISAR ≥ 3 points. The same could be observed for the combined end point on day 180 with RR 2.20 (95% CI 1.54–3.14) for ISAR ≥ 2 points and RR 1.84 (95% CI 1.48–2.28) for ISAR ≥ 3 points. The combined end point at 180 days occurred in 260 patients (50.0%). Mortality until 180 days after the index ED visit was 26.0%

(135 patients), an unplanned hospital stay occurred in 177 patients (34.0%), unplanned readmission to the ED in 170 patients (32.7%) and a nursing home admission in 16 patients (3.1%) (table 2).

Sensitivity and specificity for ISAR and the combined end point at 28 days (t1) and 180 days (t2) are shown in table 3. The area under the curve for continuous ISAR score values on day 28 was 0.621 (95% CI 0.573–0.669). For the combined end point on day 180, the following area under the curve was found for continuous ISAR score values: 0.661 (95% CI 0.615–0.708). Figure 1 depicts the corresponding receiver-operating characteristic curves.

Table 1. Characteristics of the study sample in total and for ISAR-defined subgroups

Characteristic	Total (n = 520; 100%)	ISAR 0–1 (n = 95; 18.3%)	ISAR ≥ 2 (n = 425; 81.7%)
Female sex*	313 (60.2)	47 (49.5)	266 (62.6)
Age > median (82.0 years)	260 (50.0)	40 (42.1)	220 (51.8)
Support necessary for domain			
Bathing**	279 (53.7)	11 (11.6)	268 (63.1)
Personal hygiene**	199 (38.3)	2 (2.1)	197 (46.4)
Dressing**	220 (42.3)	4 (4.2)	216 (50.8)
Mobility**	223 (42.9)	8 (8.4)	215 (50.6)
Climbing stairs**	306 (58.8)	17 (17.9)	289 (68.0)

Values are n (%). * $p < 0.05$; ** $p < 0.001$.

Table 2. Combined end point, secondary end points and RR at t1 (28 days) and t2 (180 days)

	Total		RR (ISAR ≥ 2)		RR (ISAR ≥ 3)	
	n	%	RR	95% CI	RR	95% CI
<i>t1</i>						
Combined end point	250	48.1	1.77	1.28–2.45	1.61	1.30–1.98
Death	46	8.8	3.20	1.02–10.11	2.68	1.32–5.43
Hospital stay	94	18.1	1.69	0.94–3.04	1.32	0.89–1.96
Readmission	83	16.0	1.32	0.75–2.34	1.51	0.98–2.33
Nursing home admission	19	3.7	1.90	0.45–8.09	1.41	0.55–3.65
<i>t2</i>						
Combined end point	260	50.0	2.20	1.54–3.14	3.14	1.48–2.28
Death	135	26.0	5.81	2.45–13.80	13.80	1.93–4.26
Hospital stay	177	34.0	1.76	1.17–2.64	2.64	1.22–2.11
Readmission	170	32.7	1.68	1.11–2.53	2.53	1.25–2.20
Nursing home admission	16	3.1	3.35	0.45–25.08	25.08	0.40–2.94

Fig. 1. Receiver-operating curve analysis for the ISAR score (continuous) and combined end point at **(a)** t1 (28 days) and **(b)** t2 (180 days).

Discussion

Although different screening tools for the identification of elderly patients at risk for negative health events exist, to our knowledge no German data on the risk stratification of elderly patients in the ED are available. Due to differences in health care systems across countries, the generalizability of international data is limited. We used the ISAR as one

Table 3. Sensitivity and specificity for ISAR and the combined end point at t1 (28 days) and t2 (180 days)

	Sensitivity	95% CI	Specificity	95% CI
<i>t1 ISAR</i>				
≥0	100		0	
≥1	98.4	95.6–99.6	7.0	4.3–10.8
≥2	88.8	84.2–92.4	24.8	19.8–30.4
≥3	71.2	65.2–76.7	49.3	43.2–55.4
≥4	40.4	34.3–46.8	73.7	68.0–78.9
≥5	10.0	6.6–14.4	93.3	89.7–96.0
6	2.0	0.7–4.6	98.9	96.8–99.8
<i>t2 ISAR</i>				
≥0	100		0	
≥1	99.2	97.3–99.9	8.1	5.1–12.1
≥2	90.1	86.6–94.0	27.3	22.0–33.2
≥3	73.8	68.1–79.1	52.7	46.4–59.0
≥4	42.7	36.6–49.0	76.5	70.9–81.6
≥5	10.8	7.3–15.2	94.2	90.7–96.7
6	1.9	0.6–4.4	98.9	96.7–99.8

of the most validated screening tools to evaluate its predictive validity in a German ED and to assess data on different cutoff values in use. The main results are as follows: (1) the German version of the ISAR appears to be a useful screening tool for the identification of older patients with an increased risk of an adverse outcome after a visit in a German ED; (2) the ISAR is predictive for a combined end point of death of any cause, recurrent ED visit, hospitalization and change of residency into a long-term care facility after 28 days and 180 days, and (3) using ≥ 3 points as a cutoff seems to perform better than ≥ 2 points in our setting.

Identification of older patients at risk for a negative outcome is important as those patients may benefit from a geriatric assessment and individualized treatment approach [1]. For elderly patients a visit to the ED often implies a subsequent decline in health and function [4, 7, 11–13].

As shown in different health care settings, the ISAR is an effective screening tool to identify older patients with an increased risk of hospitalization or readmission to the ED [5–8, 14]. In a recent study the ISAR identified frail patients in the emergency departments with an increased vulnerability to internal and external stressors [15].

Accordingly, our results of a German ED show that the ISAR is able to identify elderly patients with an increased risk for adverse outcomes.

The data demonstrate a significantly increased risk for the combined end point (death, hospitalization, readmis-

sion to an ED and transfer to a long-term care facility) after 28 and 180 days. Transfer to a long-term care facility is very often associated with the functional decline of a person. Although the transfer to long-term care facilities is also dependent on variables such as availability of facilities and wishes of the patient and the patient's family, we are convinced that our data confirm the validity of the ISAR for the German health care system [14, 16–18].

In our study sensitivity and specificity for ISAR (cutoff ≥ 2) and the combined end point at 28 days was 88.8 and 24.8%, respectively, and 90.1% sensitivity and 27.3% specificity at 180 days. Sensitivity for ISAR (cutoff ≥ 3) was 71.2%, specificity 49.3% at 28 days; at 180 days sensitivity was 73.8% and specificity 52.7%. The study confirms and extends the results of former Canadian and single European studies [5–8, 16, 19] for its use in older patients in a German ED setting.

In the original paper, McCusker et al. [8] included patients aged 65 years and older seen in the ED of 4 acute-care Canadian hospitals.

Performance characteristics for adverse health outcomes such as death, long-term care admission and functional decline were sensitivity 72%, specificity 58% and area under the curve 0.71 (6-month follow-up, ISAR cutoff ≥ 2) [9, 12].

In our cohort using a cutoff ≥ 2 , sensitivity was higher and specificity lower which in our opinion could be explained by the age differences between the two cohorts (≥ 65 vs. ≥ 75 years). This is confirmed by a recent European study from Graf et al. [5], conducted in a Swiss university hospital ($n = 345$). Graf et al. found a sensitivity for readmission of 91.8% after 1 month; specificity was 21.9%. After 6 months ISAR showed the same sensitivity (91.8%) and a specificity of 28.6% (ISAR ≥ 2). These results from a Swiss university hospital are in line with our data; the ISAR was able to predict unplanned readmission with moderate accuracy at 28 and 180 days [5].

In a European prospective study, Salvi et al. [7] evaluated a cohort of 200 patients ≥ 65 years in 2 Italian EDs and found the ISAR to be a reliable and valid tool to predict a composite outcome (death, long-term care placement, functional decline, ED revisit, hospital admission) 6 months after an ED visit (odds ratio 3.81, 95% CI 1.88–7.70).

In a recent Italian study, it was shown that the ISAR also serves as a valid screening tool to identify frail patients with a need for further geriatric interventions [15]. As in many other countries a geriatric approach in the ED occurs very infrequently, and the patient's length of stay in the ED is often short. Therefore, it is important to have

a screening tool that is not time-consuming but reliably identifies patients that need a further individual approach. In a recent study by di Bari et al. [20], the ISAR was compared with a prognostic tool based on administrative data, the so-called Silver Code in ED patients ≥ 75 years. Prognostic performance of both screening instruments was satisfactory, both instruments correlated well. The Silver Code was shown to be as predictive for ED return visits, hospitalization and death within 6 months after the index visit as the ISAR. Although a risk stratification tool based on administrative data is objective and inexpensive, it does not give any information about the patient's clinical condition. Test performance varied for both, ISAR and Silver Code, for the different outcome parameters. As also seen in our data, it was strongest for mortality after 6 months and weak for unplanned return visits to the ED and rehospitalization. Like Di Bari et al., we explain the different findings from the original studies conducted in Canada by differences between the health care systems and community services.

Di Bari et al. used a cutoff ≥ 2 points for the ISAR as recommended in the original study [5]. 75% of the patients were screened positive whereas only 34% were hospitalized and 6% died within the hospital [20]. Also in our setting, the predictive ability of the ISAR screening tool with its original cutoff ≥ 2 points was shown to be less useful. More than 80% of the patients would be screened positive, with a sensitivity of 88.8% and a specificity of only 24.8%, predicting the combined primary end point at 28 days with 90.1% sensitivity and 27.2% specificity at 180 days, respectively. Low specificity of the ISAR was already criticized earlier. Warburton et al. [21] recommended an adaptation of the screening criteria to the specific patient population, including a cutoff of 6 drugs in the polypharmacy item. Salvi et al. [7, 22] also recommended a higher threshold of drugs in the polypharmacy item to improve performance of the screening instrument. As we know from our own data that elderly patients in our local setting on average take 6–8 different drugs on a regular basis, we chose a cutoff of 6 drugs in the polypharmacy item, as recommended by the German Geriatric Society [10].

In order to improve utility, we adapted screening criteria to our local patient population and calculated different cutoffs of the screening instrument [21]. The better cutoff in terms of specificity was a positive scoring ≥ 3 points. With this cutoff, 60.6% of the patients were screened positive, yet more than 80% of the patients using a cutoff ≥ 2 points. With a cutoff of 3 points, sensitivity was 71.2% and specificity 49.3% at 28 days.

These are the first German data on an ED screening by means of the ISAR tool. In Germany geriatric advice is not available in all hospitals on a regular basis, and geriatric resources have to be applied thoroughly. Therefore, we were seeking for an instrument that is feasible in daily practice and shows a good sensitivity, but also at least moderate specificity. The results of our study are in accordance with similar studies conducted in Canada and Belgium [12, 23].

Limitations of the Study

Our study has some limitations to be considered. First, the study was conducted 5 days a week during daytime due to the convenience of the study nurse. However, the cohort is large, and the follow-up was complete supporting the validity of our findings.

The hospital has a geriatric department, and some of the hospitalized patients included in the study received a comprehensive geriatric assessment, which may induce bias in terms of the composite outcome. The number of patients sent to the geriatric ward was small, and we do not think that it causes remarkable changes to our results.

Another limitation is the fact that patients with major trauma or cardiorespiratory instability were included in the study, although many of these patients were directly admitted to an intensive care unit and thus not seen in the ED. This could also induce a bias. However, the main in-

tention of the study was to find a screening instrument for elderly patients at risk who might be otherwise missed and not to screen patients who are obviously at a high risk due to their clinical condition.

Another limitation is that our study misses data about the clinical utility of the instrument [14]. This aspect was outside the main focus of our study. The screening was done by study nurses, and further research is planned to assess utility in daily practice.

Conclusion

So far there is no gold standard for the identification of elderly patients with an increased risk for adverse outcomes after an ED visit [18]. The ISAR instrument, in its German version, is an acceptable screening tool to identify elderly patients in the ED with a risk of an adverse outcome. Using ≥ 3 points as a cutoff appears to be better for the use in our setting than the cutoff originally reported. Further studies have to be conducted to evaluate its utility and compare it with other screening tools.

Disclosure Statement

Ulrich Thiem is board member of the German Geriatrics Society, which already recommended the use of the ISAR screening tool in 2012 [10]. Hans Jürgen Heppner was involved in the development of the mentioned consensus statement as an expert in the field.

References

- 1 Ellis G, Whitehead MA, O'Neill D, et al: Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database Syst Rev* 2011;7:CD006211.
- 2 Wofford JL, Schwartz D, Byrum JE: The role of emergency services in health care for the elderly: a review. *J Emerg Med* 1993;11:317–326.
- 3 Hwang U, Morrison RS: The geriatric emergency department. *J Am Geriatr Soc* 2007;55:1873–1876.
- 4 Aminzadeh F, Dalziel WB: Older adults in the emergency department: a systematic review of patterns of use, adverse outcomes, and effectiveness of interventions. *Ann Emerg Med* 2002;39:238–247.
- 5 Graf CE, Giannelli SV, Herrmann FR, et al: Identification of older patients at risk of unplanned readmission after discharge from the emergency department – comparison of two screening tools. *Swiss Med Wkly* 2012; 141:w13327.
- 6 Dramé M, Lang PO, Novella JL, et al: Six-month outcome of elderly people hospitalized via the emergency department: the SAFES cohort. *Rev Epidemiol Santé Publique* 2012;60: 189–196.
- 7 Salvi F, Morichi V, Grilli A, et al: Predictive validity of the Identification of Seniors at Risk (ISAR) screening tool in elderly patients presenting to two Italian Emergency Departments. *Aging Clin Exp Res* 2009;21:69–75.
- 8 McCusker J, Bellavance F, Cardin S, et al: Screening for geriatric problems in the emergency department: reliability and validity. Identification of Seniors at Risk (ISAR) Steering Committee. *Acad Emerg Med* 1998;5: 883–893.
- 9 McCusker J, Bellavance F, Cardin S, et al: Detection of older people at increased risk of adverse health outcomes after an emergency visit: the ISAR screening tool. *J Am Geriatr Soc* 1999;47:1229–1237.
- 10 Thiem U, Greuel HW, Reingraber A, et al: Consensus for the identification of geriatric patients in the emergency care setting in Germany. *Z Gerontol Geriatr* 2012;45:310–314.
- 11 Friedmann PD, Jin L, Karrison TG, et al: Early revisit, hospitalization, or death among older patients discharged from the ED. *Am J Emerg Med* 2001;19:125–129.
- 12 McCusker J, Cardin S, Bellavance F, et al: Return to the emergency department among elders: patterns and predictors. *Acad Emerg Med* 2000;7:249–259.
- 13 McCusker J, Bellavance F, Cardin S, et al: Prediction of hospital utilization among elderly patients during the 6 months after an emergency department visit. *Ann Emerg Med* 2000;36:438–445.
- 14 Hoogerduijn JG, Schuurmans MJ, Duijnste, et al: A systematic review of predictors and screening instruments to identify older hospitalized patients at risk for functional decline. *J Clin Nurs* 2007;16:46–57.

- 15 Salvi F, Morichi V, Grilli A, et al: Screening for frailty in elderly emergency department patients by using the Identification of Seniors at Risk (ISAR). *J Nutr Health Aging* 2012;16:313–318.
- 16 De Saint-Hubert M, Jamart J, Boland B, et al: Comparison of three tools predicting functional decline after hospitalization of older patients. *J Am Geriatr Soc* 2010;58:1003–1005.
- 17 Beaton K, Grimmer K: Tools that assess functional decline: systematic literature review update. *Clin Interv Aging* 2013;8:485–494.
- 18 Sutton M, Grimmer-Somers K, Jeffries L: Screening tools to identify hospitalised elderly patients at risk of functional decline: a systematic review. *Int J Clin Pract* 2008;62:1900–1909.
- 19 Braes T, Moons P, Lipkens P, et al: Screening for risk of unplanned readmission in older patients admitted to hospital: predictive accuracy of three instruments. *Aging Clin Exp Res* 2010;22:345–351.
- 20 Di Bari M, Salvi F, Roberts AT, et al: Prognostic stratification of elderly patients in the emergency department: a comparison between the 'Identification of Seniors at Risk' and the 'Silver Code'. *J Gerontol A Biol Sci Med Sci* 2012;67:544–550.
- 21 Warburton RN, Parke B, Church W, et al: Identification of seniors at risk: process evaluation of a screening and referral program for patients aged > or = 75 in a community hospital emergency department. *Int Health Care Qual Assur Inc Leadersh Health Serv* 2004;17:339–348.
- 22 Salvi F, Belluigi A, Cherubini A: Predictive validity of different modified versions of the Identification of Seniors at Risk. *J Am Geriatr Soc* 2013;61:462–464.
- 23 Moons P, De Ridder K, Geyskens K, et al: Screening for risk of readmission of patients aged 65 years and above after discharge from the emergency department: predictive value of four instruments. *Eur J Emerg Med* 2007;14:315–323.