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## Medical Crises in Older People

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**Umbrella review of tools to assess risk of poor outcome in older people  
attending acute medical units**

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**Medical Crises in Older People: a NIHR research programme 2008-2013  
And  
Better Mental Health: a SDO research study 2008-2011**

Undertaken by the University of Nottingham and the Nottingham University Hospital NHS Trust, UK

Workstream 1: towards improving the care of people with mental health problems in general hospitals.  
Development and evaluation of a medical and mental health unit.

Workstream 2: Development and evaluation of interface geriatrics for older people attending an AMU

Workstream 3: Development and evaluation of improvements to health care in care homes

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## Summary

### *Introduction*

Over half the people attending acute medical units are over 70 years old and many have some degree of frailty. Some frail older people are discharged rapidly and have poor outcomes with high resource use. To identify such patients for the Acute Medical Unit work stream of the Medical Crises in Older People (MCOP) NIHR Programme Grant for Applied Research, an umbrella review of reviews was conducted comparing tools that predicted high risk of adverse outcome.

### *Method*

A literature review was conducted to identify relevant systematic reviews of appropriate tools to assess risk of functional decline in older people attending acute medical units. Papers were selected providing they included older people, who were in hospital and used screening tools to assess risk of functional decline and then reviewed by one researcher using the QUOROM checklist for systematic reviews. Assessment screening tools were compared for the aspects of decline they predicted and evidence of validity, reliability and clinical utility.

### *Results*

Four systematic reviews were included, reviewing nine different assessment tools to assess adverse health outcomes. Three assessment tools were considered to be potentially suitable for use for the MCOP study. The Identification of Seniors at Risk (ISAR) was the only tool with evidence to predict all aspect of adverse health outcomes, i.e. death, institutionalisation, readmission, resource use and decline in physical or cognitive function. From these reviews, the Identification of Seniors at Risk tool was found to be "fair" in terms of the sensitivity, specificity and area under a ROC curve.

### *Conclusions*

The ISAR is the most appropriate screening tool to assess risk of adverse health outcomes in older patients being discharged from an acute medical unit. However, this tool needs to be validated in a UK population.





## Introduction

Almost all UK acute hospitals operate a system whereby emergency medical admissions are first assessed on a single admissions ward, or 'Acute Medical Unit'. Functions will include immediate management of severely ill patients, directing patients to appropriate specialty wards, and treating, making plans for, and discharging less ill patients who might be managed on an ambulatory or out-patient basis.

Older people constitute approximately 70% of all attendees at acute medical units (AMU), and 10% of all attendees will have some degree of frailty, as indicated by the presence of one or more geriatric syndromes (1-3). Some frail older people, who present with a crisis to an acute medical unit but who are discharged rapidly, may have poor outcomes and high resource use: in one series 58% subsequently re-presented to the AMU and 29% died over the 12 months from the index presentation (3).

The development of cost-effective services to prevent adverse outcomes in older people discharged from acute medical units requires those at high risk to be identified. The Acute Medical Unit work stream of the Medical Crises in Older People NIHR Programme Grant for Applied Research aimed to develop such a service and evaluate it in the AMIGOS trial (4), and this required a tool to identify high risk patients. This paper presents the findings of an "umbrella review" (5) - a review of reviews - of such tools used for this purpose.

## Method

A literature review was conducted to identify relevant systematic reviews of appropriate tools to assess risk of functional decline in older people attending acute medical units.

The following databases were searched:

- Medline (1946 to February Week 1 2012)
- PsycINFO (1806 to February Week 2 2012)
- CINAHL
- EMBASE (1980 to 2012 Week 07)





Web of Science  
 Cochrane Library  
 Cochrane Database of Systematic Reviews (CDSR)  
 Database of Abstracts on Reviews and Effectiveness (DARE)  
 Cochrane Controlled Trial Register (CCTR)

The following search strategy was used, based on previous relevant reviews (6-7):

- 1 exp Aged/
- 2 (aged, 80 and over).mp.
- 3 aged.mp.
- 4 age\*.mp.
- 5 elder\*.mp.
- 6 aging\*.mp.
- 7 exp Aging/
- 8 geriatric\*.mp.
- 9 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
- 10 exp Hospitalization/
- 11 hospitali?ed patient.mp.
- 12 hospital admission.mp.
- 13 older patient.mp.
- 14 10 or 11 or 12 or 13
- 15 9 and 14
- 16 screening.mp.
- 17 screening instrument.mp.
- 18 exp Risk Assessment/
- 19 geriatric screening.mp.
- 20 risk assessment.mp.
- 21 predictors.mp.
- 22 predict\*.mp.
- 23 predicting,mp.
- 24 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23
- 25 functional decline.mp.





- 26 functional status decline.mp.
- 27 ADL decline.mp.
- 28 decreased physical function.mp.
- 29 decreased physical outcome.mp.
- 30 impaired physical outcome.mp.
- 31 ADL status decline.mp.
- 32 25 or 26 or 27 or 28 or 29 or 30 or 31
- 33 15 and 24 and 32
- 34 limit 33 to (english language and humans)
- 35 limit 34 to "review"

## Findings

The number of papers yielded from the searches yielded as shown in table 1.

**Table 1 Search results**

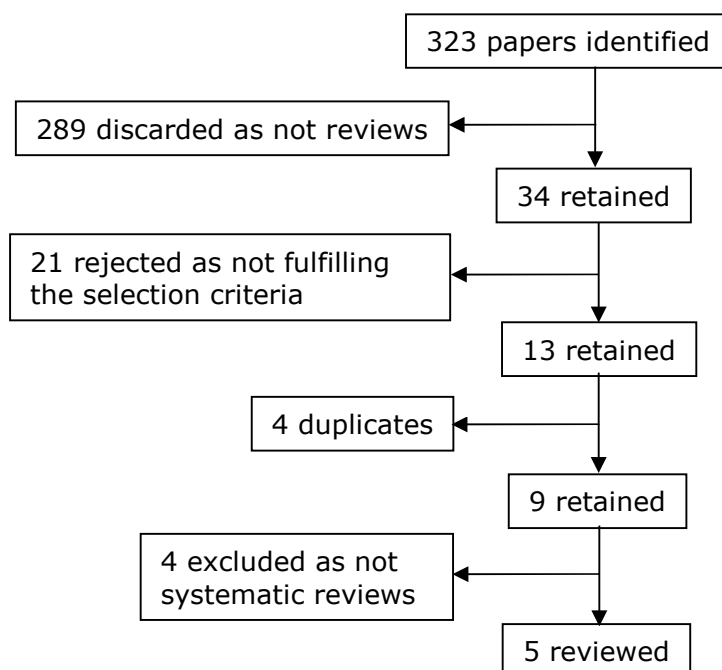
Database	No. English language and humans	No. reviews	No. relevant
Medline	92	12	5
Embase	99	14	3
PsycINFO	22	0	0
Cinahl	6	0	0
Web of Science	104	7	4
Hand search		1	1
Cochrane Library			0
Cochrane Database of Systematic Reviews (CDSR)			0
Database of Abstracts on Reviews and Effectiveness (DARE)			0
Cochrane Controlled Trial Register (CCTR)			0



### Selection

Papers were selected from their title and abstract by one researcher, providing they included older people, who were in hospital and utilised screening tools to assess risk of functional decline. Papers relating to specific conditions that were not generalisable to all older people were excluded, as shown in figure 1.

**Figure 1 Screening of papers**



### Reviews

Four of the five papers (6-9) identified were reviewed by one researcher using the QUOROM checklist for systematic reviews (10). One was not reviewed as it only the outcome measure considered was activities of daily living (11). A summary of these four reviewed papers is shown in table 2.

**Table 2 Summary of systematic reviews**

	<b>McCusker et al 2002 (6)</b>	<b>Hoogerduijn et al 2007 (7)</b>	<b>Sutton et al 2008 (8)</b>	<b>de Saint-Hubert 2010 (9)</b>
<b>Objective</b>	Predict functional decline in older hospitalised patients, >60yrs physical decline, nursing home admission	Identify valid, reliable and clinical user-friendly tool for functional decline in older people	Identify screening tools, in emergency department, elderly patients, risk of functional decline, >65yrs, any condition	Identify tools to detect risk of functional decline at and after discharge
<b>Aspects of functional decline considered</b>	ADL ability, NH admission, Death	ADL ability NH placement Mortality Hospital resource costs	ADL ability Physical function Cognitive function NH admission Quality of life	ADL ability NH admission Death
<b>Inclusion criteria</b>	Elderly patients Longitudinal design One or more predictors of functional decline	Predictors of functional decline Tested in hospital setting Tools to identify risk of functional decline	Aged >65 years Admitted to emergency department Any condition Tools with predictive validity, generalisability, clinical utility, reliability	Prospective, aged >65, Admitted to hospital Cohort study Risk assessment Early evaluation Functional decline Follow up and/or after discharge
<b>Search used in review</b>	1976-1998 MEDLINE and hand search	1990-Feb 2005 MEDLINE PsychINFO Cinahl, Cochrane Library, DARE, CDSR, CCTR Refs list of selected articles	1990-Nov 2007 MEDLINE Cinahl, Ageline PsychINFO Embase Cochrane Library, DARE, CDSR, CCTR	1970-2007 MEDLINE and 1981-2007 Web of Science plus reference lists of relevant papers
<b>Exclusion criteria</b>	Not original study, restricted to specific condition or procedure, intervention as predictor, not hospital setting, not in English	Case reports, commentaries, guidelines	Includes risk factors only Not a screening tool	Studies restricted to a particular setting (e.g. heart failure, hip fracture) Community or rehab setting Risk factors only

The QUOROM quality checking of the four systematic reviews indicated that all were of reasonable quality although none of the systematic reviews searched databases from inception, all considered English language papers only and none carried out meta-analysis due to the heterogeneity of the assessment tools identified. The number of





databases searched varied from one (8) to eight (6-7) indicating that the latter two reviews considered a wider choice of papers. However, only two of the reviews used any form of quality scoring system to evaluate the papers included in their reviews (7-9). Hoogerduijn et al (6) gave no explanation of how papers were reviewed and having identified 37 papers they only describe 10 papers regarding functional decline and 3 regarding assessment tools.

### **Review of assessment tools considered in reviews**

Nine different assessment tools to assess adverse health outcomes were included in the four systematic reviews:

- Blaylock Risk Assessment Screening Score (BRASS) (12)
- Care Complex Prediction Instrument (COMPRI) (13)
- Hospital Admission Risk Profile (HARP) (14)
- Inouye (15)
- Identification of Seniors At Risk (ISAR) (16-18)
- Score Hospitalier d'Evaluation du Risque de Perte d'Autonomie (SHERPA) (19)
- Triage Risk Screening Tool (TRST) (20-21)
- Variable Indicative of Placement Risk (VIP) (22)
- Zureik (23)

Three of the assessment tools were developed for patients being discharged  $\geq 48$  hours after attendance at emergency department (BRASS, Inouye, SHERPA), two were designed to aide decision for nursing home placement (VIP, Zureik) and one was to assess complex care needs in hospital (COMPRI).

The remaining three assessment tools (see appendices 1-3) were compared in terms of what aspects of decline they predicted and evidence of validity, reliability and clinical utility as shown in table 3.





**Table 3 Comparison of assessment tools**

	HARP (14)	ISAR (16-17)	TRST (20-21)
Mortality		✓	
Institutionalisation		✓	✓
Readmission		✓	✓
Resource use		✓	✓
Decreased physical function	✓	✓	✓
Decreased mental function		✓	
Setting	Hospital wards	Emergency Department	
When assessed	Within 48 hours after admission, discharge, 3 months after discharge	Admission, 3 and 6 months after discharge	Admission, one and 4 months after discharge
Evidence of validity	✓	✓	✓
Evidence of test-retest reliability		✓	
Clinical utility	✓	✓	✓

From these reviews, the Identification of Seniors at Risk was the only tool for which there was evidence to predict all aspect of adverse health outcomes, i.e. death, institutionalisation, readmission, resource use and decline in physical or cognitive function.

To indicate the strength of evidence of this tool, the sensitivity, specificity and area under the curve were considered. An ideal tool aims to have 100% sensitivity (i.e. predicts all people at high risk of functional decline as being high risk) and 100%





specificity (i.e. does not predict anyone from the low risk group as being high risk). The receiver operating characteristic (ROC) curve compares the sensitivity (true positives) with (1-specificity) (specificity= true negatives), with the area under the curve being a measure of discriminating ability. Results are interpreted as excellent (0.90-1), good (0.80-0.90), fair (0.70-0.80), poor (0.60-0.70) or fail (0.50-0.60).

**Table 4 ISAR sensitivity, specificity and area under the curve according to systematic reviews**

	Sensitivity (%)	Specificity (%)	Area under the curve (95% confidence interval)
McCusker et al 2002 SR <i>n</i> =509			0.66 (0.61-0.71)
Cut off 2	70	62	
Cut off 3	41	83	
Cut off 4	22	94	
Hoogerduijn et al 2007 SR <i>n</i> =1673			0.71
Cut off 2	71	57	
Cut off 3	44	79	
Cut off 4	25	91	
Sutton et al 2008 SR <i>n</i> =1673			0.71 (0.68,0.74) IRR 0.78
Cut off 2	72	58	
Cut off 3	44	80	
Cut off 4	23	92	
de Saint-Hubert 2010 SR <i>n</i> =1673			0.66 (0.61,0.71) IRR 0.78
Cut off 2	74	45	
Cut off 3	48	69	





Table 4 shows the sensitivity, specificity and area under the curve for the ISAR according to the four systematic reviews, highlighting the differences at different cut-off levels. This indicates that a cut-off of 2 indicates higher sensitivity and lower specificity that at higher cut-off scores with area under the curve being fair.

## Discussion

### *Summary of main findings*

Our literature review of reviews of tools to assess risk of functional decline in older people attending acute medical units yielded four systematic reviews (6-9). The systematic reviews were heterogeneous in terms of the aspects of functional decline measured limiting comparisons. Nine different assessment tools (12-23) to assess adverse health outcome were included in the four systematic reviews. Of these nine tools, HARP (14), ISAR (16-18) and TRST (20-21) were considered in terms of the aspects of decline they predicted and evidence of validity, reliability and clinical utility. The ISAR was the only tool to have evidence to predict mortality, institutionalisation, readmission, resource use, decreased physical or cognitive function and evidence of validity, test-retest reliability and clinical utility. Comparison of the ISAR sensitivity, specificity and area under the curve of the ISAR indicated fair predictive value according to the four systematic reviews.

### *Limitations of methods*

The main limitation of this review is that this is a review of reviews and not one aiming at individual studies. Consequently the findings depend upon the rigour of the reviewers of the systematic reviews identified. The systematic reviews were reviewed using the QUOROM checklist for systematic reviews and found to have reasonably high rigour and all were relatively recent (2002-2010), suggesting that it was reasonable to conduct a review of reviews. However, we acknowledge that only one researcher conducted the QUOROM reviews, although this was a researcher experienced in reviewing papers at a national level.





### *What does it mean?*

This review indicates that the ISAR is the most suitable tool to be used to identify high risk patients being discharged from an emergency department. The ISAR includes just six dichotomous questions, is thus quick and simple to use, can be used by any member of staff, and involves little burden on patients as it takes only a few minutes to complete, making it suitable for use in the Acute Medical Unit Interface Geriatrician Outcome Study (AMIGOS).

### *Remaining questions*

The ISAR was originally developed and tested with older patients discharged from emergency departments in Canada and followed up at 3 or 6 months. It has also been tested in Hong Kong emergency departments where it had a sensitivity of 68%, a specificity of 49% and a ROC of 0.62 (24). Given that the predictive value of the ISAR may differ according to unique features of a specific health care system or those who use it, the ISAR needs to be validated in a cohort of older patients discharged from an acute medical unit in the UK to confirm it is suitable for use in the AMIGOS study.

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## Appendix 1

### Identification of Seniors at Risk Tool (McCusker et al 1999)

1. Before the illness or injury that brought you to the Emergency Dept, did you need someone to help you on a regular basis? (**yes**/no)
2. Since the illness or injury that brought you to the Emergency Dept, have you needed more help than usual to take care of yourself? (**yes**/no)
3. Have you been hospitalised for one or more nights during the past 6 months (excluding a stay in the Emergency Department)? (**yes**/no)
4. In general, do you see well? (yes/**no**)
5. In general, do you have serious problems with your memory? (**yes**/no)
6. Do you take more than three different medications every day? (**yes**/no)

Answers in bold = 1

Total score  $\geq 2$  indicates person at high risk of functional decline

0 or 1 indicates person at low risk







## Appendix 2

### Hospital Admission Risk Profile (HARP) (Sager et al 1996)

#### 1. Scoring range 0-5

##### a) Age

Age category	Risk score	
<75	0	
75-84	1	
≥85	2	score =

##### b) Cognitive function (abbreviated MMSE)

MMSE score	Risk score	
15-21	0	
0-14	1	score =

##### c) IADL function prior to admission

Independent IADLs	Risk score	
6-7	0	
0-5	2	score =
		Total =

#### IADLs

1. Telephoning
2. Shopping
3. Cooking
4. Doing housework
5. Taking medications
6. Using transportation
7. Managing finances

#### 2. Risk categories

Total score	Risk of decline in ADL function
4 or 5	high risk
2 or 3	intermediate risk
0 or 1	low risk





### Appendix 3

#### **Triage Risk Screening Tool (TRST)** (Meldon et al 2003, Hustey et al 2007,)

Risk factors:

1. Presence of cognitive impairment (e.g. disorientation, unable to follow directions, diagnosis of dementia or delirium)
2. Lives alone or no caregiver available, willing or able
3. Difficulty walking or transfers or history of recent falls (*Flemish TRST: fall in past 6 months*)
4. Not counting this ED visit, patient/family states that the patient has used ED within past 30 days or has been hospitalised within last 3 months
5. Five or more different medications
6. Professional recommendation (Nurse believes that this patient requires further follow-up at home for any of the following reasons:
  - a) suspected abuse, neglect, self-neglect, exploitation
  - b) noncompliant patient with fewer than five medications who keeps coming back to the ED
  - c) suspected substance abuse (alcohol or drugs)
  - d) problems with meeting instrumental activities of daily living, such as getting prescriptions filled, problems with transportation, problems with getting food or meals etc
  - e) other (please specify)

Score  $\geq 2$  risk factors = high risk of subsequent ED use, hospitalisation, and nursing home admission

