

# **Screening for depression in older people on acute medical wards: the validity of the Edinburgh Depression Scale**

Collins Esiwe<sup>1</sup>, Sarah Baillon<sup>2\*</sup>, Aniruddha Rajkonwar<sup>3</sup>, James Lindesay<sup>2</sup>, Nelson Lo<sup>4</sup>,  
Michael Dennis<sup>5</sup>

<sup>1</sup> Lincolnshire Partnership NHS Foundation Trust, Sleaford, Lincolnshire, UK

<sup>2</sup> Department of Health Sciences, University of Leicester, Leicester, UK

<sup>3</sup> Tees, Esk and Wear Valley NHS Trust, County Durham, UK

<sup>4</sup> Department of Geriatric Medicine, University Hospitals of Leicester NHS Trust, Leicester, UK

<sup>5</sup> College of Medicine, Swansea University, Wales, UK

\*Corresponding Author:

Sarah Baillon, Research Fellow, Department of Health Sciences, University of Leicester,  
Centre for Medicine, University Road, Leicester, LE1 7RH

Email: [sfb5@leicester.ac.uk](mailto:sfb5@leicester.ac.uk)

Tel. 0116 2588161, Fax. 0116 2584078

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## **ABSTRACT**

### **Background**

Depression is common in people with poor physical health, particularly within the acute medical in-patient setting. Co-morbid depression contributes to poor outcomes, and screening for depression in acute medical in-patients has been advocated. The Edinburgh Depression Scale (EDS) has been validated in a variety of general hospital patient groups, but not previously in older acute medical in-patients.

### **Methods**

One hundred and eighteen patients aged 65 years and older on acute medical wards were assessed using a standardised diagnostic interview (Present State Examination – Schedules for Clinical Assessment in Neuropsychiatry) to identify depression according to ICD-10 criteria. They subsequently completed the EDS. The performance characteristics at a range of thresholds were compared, and receiver operating characteristic curve analysis performed.

### **Results**

The optimal EDS cut-off for identifying ICD-10 depressive episode was 7/8, with a sensitivity of 88%, specificity of 77%, positive predictive value of 52%, and negative predictive value of 96%. The area under the receiver operating characteristic curve was 0.91.

### **Conclusions**

The EDS was shown to be a useful instrument for detecting clinical depression in older people on acute medical wards in this study. Its performance was equivalent to other

validated screening instruments in this population. Our findings add further weight to using the EDS as a screening instrument for depression in multiple general hospital settings.

**Running title:** The Edinburgh Depression Scale in older people on acute medical wards

**Keywords:** Depression, screening, older people, acute medical wards

## INTRODUCTION

Depression in older people is common in the acute medical in-patient setting, with a mean prevalence of 29% [1]. Recognising depression is an important first step in improving depression management, and screening high-risk patient groups has been advocated in those with physical health problems [2-4]. There is little research examining screening instruments to identify depression in older people in the acute medical setting: only the Geriatric Depression Scale (GDS) has been explored in detail [5, 6].

The Edinburgh Depression Scale (EDS) was originally devised and validated for use in women in the post-natal period. The EDS comprises of ten items relating to cognitive-affective rather than somatic symptoms of depression that could be unreliable in this setting [7]. Each item is scored on a four-point scale (0-3), with a total score range from 0-30, and takes less than five minutes to complete. In recent years the EDS has been validated in other clinical populations, particularly in people with poor physical health; it has been shown to be useful in palliative care [8, 9] and Parkinson's Disease [10].

This study examines the utility of the EDS as a screening instrument for clinical depression in older people within acute medical wards; if one instrument is valid in multiple settings within the general hospital this would be particularly advantageous for clinicians.

## **METHODS**

### *Study participants*

This study was one component of a project previously described in detail [6], and was approved by the local Research Ethics Committee (Leicestershire, Northamptonshire and Rutland, Ref 06/Q2501/39). To summarise, participants were in-patients on acute medical wards at the Leicester General Hospital, UK. Most admissions to these wards were older people with unscheduled care. Patients were eligible to participate if they were aged 65 years or over, English-speaking, medically fit to be interviewed, and able to give informed consent. All patients who were potentially eligible were approached their medical care team and asked if they were willing to participate. Those who were interested were given an Information Sheet; if they subsequently indicated that they were willing to participate they were visited on the ward by a research psychiatrist (CE or AR) who then obtained written informed consent.

### *Procedure*

Participants were assessed on two occasions. At the first assessment they completed section 21 of the Present State Examination - Schedules for Clinical Assessment in Neuropsychiatry (SCAN) [11]; this incorporates the Mini-Mental State Examination [12]. Those who scored less than 24 on the MMSE were excluded; this cut-off was chosen as this is the most widely used in research to exclude patients with dementia [13, 14, 15]. Next, the sections of the SCAN interview pertaining to depression (sections 6, 7 and 8) were completed. An ICD-10 diagnosis [16] of mild, moderate or severe depressive episode was derived as the gold standard in this study.

Within five days of the initial SCAN assessment the participant was visited by another researcher on the ward and completed the EDS. This second researcher was blind to the outcome of the SCAN interview. Participants were given the choice of completing the questionnaire themselves, reading the items and indicating their response verbally or having the items and responses read to them verbatim.

### *Statistical analysis*

The sensitivity (Se), specificity (Sp), positive and negative predictive values (PPV and NPV) were calculated at various different cut-off points for the EDS as well as the positive and negative likelihood ratios (PLR and NLR) and diagnostic odds ratio (DOR). A receiver operating characteristic (ROC) curve was generated in order to calculate the area under the curve (AUC). Data were analysed using the Statistical Package for the Social Sciences version 18.0.

## **RESULTS**

A total of 139 participants consented to take part, 8 did not meet eligibility criteria, and 13 did not complete all the assessments [6]. Of the remaining 118, 41 (35%) were male and 77 (65%) female. The median age was 82 years (IQR 76.8-86.0), and median MMSE 27 (IQR 26-28). Twenty-six (22%) participants met ICD-10 criteria for a depressive episode – 16 (13.5%) had a diagnosis of mild depressive episode, 10 (8.5%) of moderate depressive episode and none received a diagnosis of severe depressive episode. Participants who were depressed were similar in terms of gender (Pearson  $\chi^2$  (two-tailed) =0.23, df =1, P=0.63), age (Mann-Whitney U test, NS), and MMSE score (Mann-Whitney U test, NS).

Table 1 summarises the performance characteristics of the EDS when different threshold scores are used to identify cases with depression according to ICD-10 criteria. The optimal cut-off for the scale was 7/8 (Youden's index 0.66); this identified 23/26 (88%) depressed participants but incorrectly identified 21/92 non-depressed. A cut-off of 8/9 (Youden's index 0.62) had both good sensitivity and specificity (above 0.8): this correctly identified 21/26 (81%) participants who were diagnosed with depression, and incorrectly identified 17/92 (18%) non-depressed participants. When considering mild depression alone (n=16) a 7/8 cut-off achieved a sensitivity of 0.81, specificity of 0.77, PPV of 0.38 and NPV of 0.96. As expected the performance for moderate depression (n=10) is better, with the 7/8 cut-off sensitivity is 1.0, specificity 0.77, PPV 0.32, and NPV 1.0.

Figure 1 shows the ROC curve for the EDS identification of ICD-10 depression. The area under the curve was 0.912 ( $p < 0.001$ , 95% confidence interval 0.857 - 0.967). The EDS and 15-item Geriatric Depression Scale (GDS-15) were significantly correlated in this sample (2-tailed Spearman correlation coefficient -0.63,  $P < 0.001$ ).

## **DISCUSSION**

### *Main Findings*

In this study examining the validity of the EDS for identifying depression in older people admitted to acute medical wards we found an optimum cut-off of 7/8 corresponding to an acceptable sensitivity of 0.88 and specificity of 0.77. If the EDS were to be used as an initial screening process to alert the clinician to a patient who would benefit from a further detailed assessment then a lower threshold maximising sensitivity may be more appropriate such as 6/7.

### *Limitations*

The limitations of the methodology have been discussed in detail previously [6]. Key issues include the opportunistic use of ward medical teams to identify potential participants, the exclusion of cognitively impaired patients, and the absence of any cases of severe depressive episode. Cases of severe depression may have been excluded because of cognitive impairment relating to depression, lack of capacity, or unwillingness to volunteer. However, the prevalence of depression in this study sample is similar or higher than that of other U.K. studies of older medical in-patients that used ICD-10 depression criteria [17, 18], and the age and gender characteristics of the participants are similar to studies of older people with unscheduled care admissions in England [19, 20].

In view of physical frailty the participants were also given the option to respond to EDS items orally rather than completing the questionnaire; it is possible this may influence results as oral versus written presentation of the GDS has suggested participants report less depressive responses [21].

### *Implications*

When comparing the performance of the EDS with other studies using different depression screening instruments in older people in a similar clinical setting, the EDS in our study performed slightly better than the 15-item GDS (cut-off 5/6: Se 0.79, Sp 0.77, AUC 0.84) and comparable with the full (30 item) GDS (cut-off 10/11: Se 0.85, Sp 0.82, AUC 0.9) according to pooled analyses performed for a recent systematic review [5]. However, the GDS performed marginally better in the same patient group – this component of our study has



been previously published [6]; the GDS had an optimum cut-off of 6/7 recording a sensitivity of 0.8, specificity of 0.86, PPV of 0.62 and NPV of 0.94 but with a lower AUC of 0.88.

The optimal cut-off for the EDS in our study was 7/8; this is a lower threshold for depression compared to other clinical general hospital settings. In the original validation of the EDS in post-natal women, Cox et al., [7] described a cut-off of 12/13, in the palliative care setting a similar threshold performed best [8, 9], though in out-patients with Parkinson's Disease a cut-off score of 10/11 gave maximal discriminant validity [10]. However, lower thresholds have been reported in a large community sample of post-natal women [22], though a general population study found a similar cut-off of 7/8 had the best performance [23]. Our lower threshold could be partly explained by differences in gold standard depression criteria, and a much older population than other studies as there are known to be minor differences in symptoms of late-life depression including reduced sadness [24].

### *Conclusions*

Our study has shown the EDS to have a good performance as an instrument to identify clinically relevant depression in older people in the acute medical setting. This adds further evidence to support the use of the EDS in a growing number of general hospital patient groups though cut-off thresholds will be specific to the individual setting. An additional advantage of the EDS is the inclusion of a self-harm screening question (as well as pessimism) as older people with depression and poor physical health are at a high risk of suicide [25].

## **Key Points**

- The EDS has been validated in a variety of hospital settings, but not previously in older acute medical in-patients.
- This study shows the EDS as useful for detecting depression in older people on acute medical wards with an optimal cut-off of 7/8.
- The EDS could be used for screening for depression in multiple general hospital settings with varying cut-offs.

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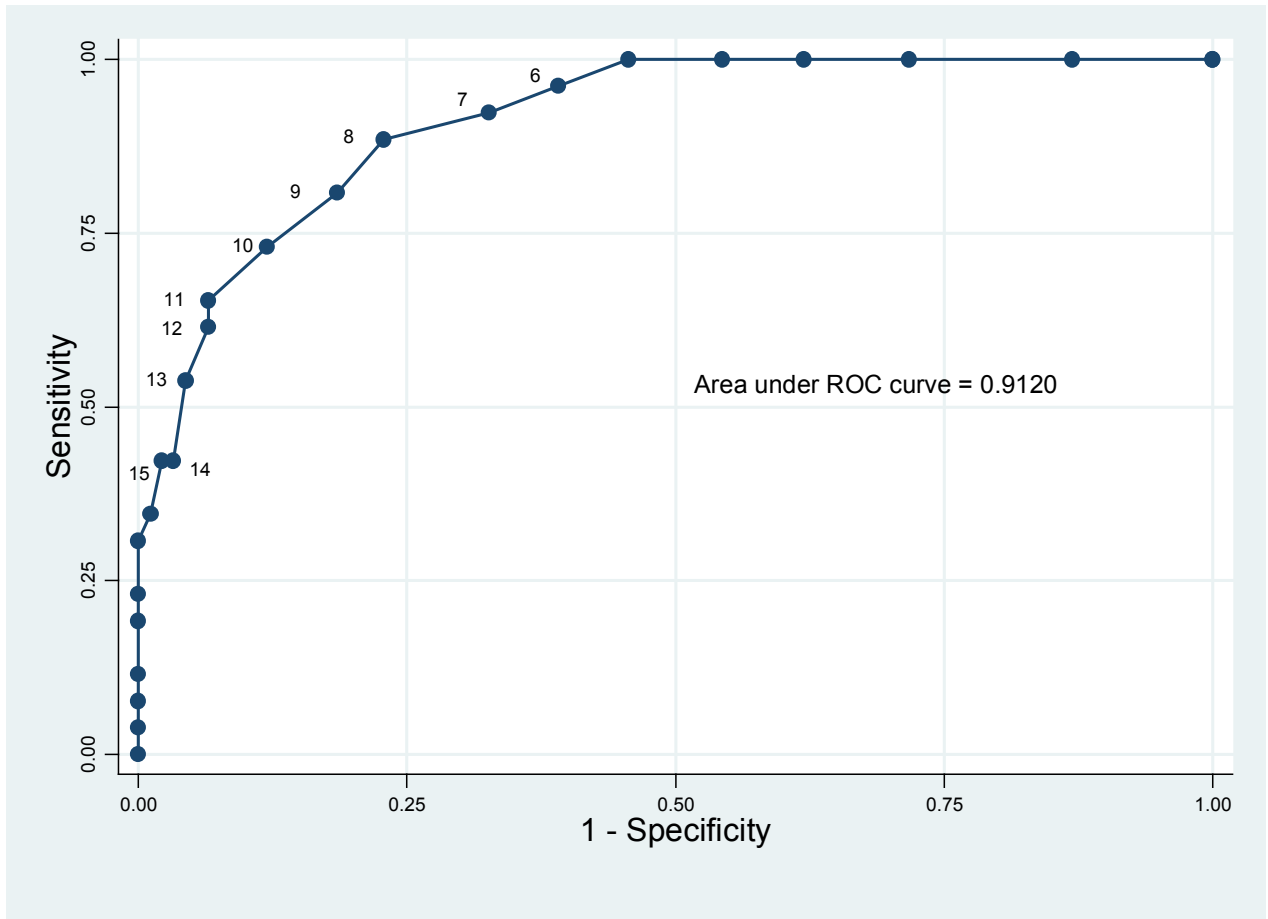
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**Figure 1 – ROC curve for the EDS identification of ICD-10 depressive episode showing the performance at the main cut-off scores for each scale**



**Table 1 - Test characteristics of EDS for identification of depression (according to ICD-10 criteria)**

<b>Cut-off</b>	<b>Se</b> (95% CI)	<b>Sp</b> (95% CI)	<b>PPV</b> (95% CI)	<b>NPV</b> (95% CI)	<b>PLR</b>	<b>NLR</b>	<b>DOR</b>	<b>OMR</b>
6/7	0.92 (0.73-0.98)	0.67 (0.56-0.76)	0.44 (0.31-0.85)	0.97 (0.88-0.99)	2.83	0.11	24.80	0.27
7/8	0.88 (0.68-0.96)	0.77 (0.67-0.85)	0.52 (0.36-0.67)	0.96 (0.87-0.98)	3.88	0.15	25.92	0.20
8/9	0.81 (0.60-0.92)	0.82 (0.71- 0.88)	0.55 (0.38-0.71)	0.94 (0.85-0.97)	4.37	0.24	18.53	0.19
9/10	0.73 (0.51-0.87)	0.88 (0.79-0.93)	0.63 (0.43-0.79)	0.92 (0.83-0.96)	6.11	0.31	19.99	0.15
10/11	0.65 (0.44-0.82)	0.93 (0.85-0.97)	0.74 (0.51-0.88)	0.91 (0.82-0.95)	10.03	0.37	27.07	0.13
11/12	0.62 (0.40-0.79)	0.93 (0.85-0.97)	0.73 (0.49-0.88)	0.90 (0.81-0.94)	9.44	0.41	22.93	0.14
12/13	0.54 (0.33-0.72)	0.96 (0.88-0.98)	0.78 (0.51-0.92)	0.88 (0.79-0.93)	12.38	0.48	25.67	0.14
13/14	0.42 (0.23-0.62)	0.97 (0.90-0.99)	0.79 (0.48-0.94)	0.86 (0.77-0.91)	12.97	0.60	21.76	0.15
OMR (overall misclassification rate)								