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# Factors associated with improvement in depressive symptoms among older persons after hospitalisation – a prospective design with two follow-ups

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## Factors associated with improvement in depressive symptoms among older persons after hospitalisation – a prospective design with two follow-ups

**Background:** Depression is a common disorder in old age and increases with hospitalisation. The aim was to investigate whether improvement in depressive symptoms after hospitalisation is associated with education level, age, gender, living situation, self-efficacy, activities in daily living and quality of life by (1) examining the prevalence of depressive symptoms at baseline and at 1st and 2nd follow-up (2) examining different factors' association with depressive symptoms at baseline and (3) examining different factors' association with improvement in depressive symptoms at baseline and at 1st and 2nd follow-up.

**Methods:** The study consisted of 145 patients, 65 years and older. Data were collected between February 2015 and September 2016 through interviews conducted using structured protocols. The instrument used was Katz index of ADL, Geriatric Depression Scale-20, Life Satisfaction

Questionnaire and the General Self-Efficacy Scale. The participants were interviewed before discharge from hospital, after 1.5 month and after 3 months.

**Results:** The prevalence of depressive symptoms in older persons was high after hospitalisation. Factors associated with improvement of depressive symptoms after hospitalisation were higher educational level, improvement in activities in daily living and quality of life. Non-significant results were found for improvement of depressive symptoms and gender, age, living situation or self-efficacy.

**Conclusions:** Depression is a common health problem in older persons, especially after hospitalisation. It is therefore important that healthcare staff screen older persons for depression during hospitalisation, as this allows identification of those in need and a possibility to help them in an appropriate manner. Persons with lower educational level and depressive symptoms need special attention.

**Keywords:** depression, hospitalisation, older persons.

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## Background

There are data showing that more than 300 million people worldwide are living with depression, with an increase of more than 18% between 2005 and 2015 (1). Depression has also been found to be the most common psychiatric disorder in old age (2). The prevalence of depression symptoms in older persons varies across studies between 30% and 45% and has been found to be

higher among women (3–7). However, one study found no gender difference in prevalence (8). Older persons often think depression is part of normal ageing and depression is often underdiagnosed as it is common for it to coexist with other diseases (9,10). Depression can lead to suicide or suicide attempts (1, 11). Factors found to increase the risk of depression are not seeing friends, having no children (5), low education level, living alone, low economic status, co-morbidity (4, 7, 12), dependency in activities of daily living (ADL) and in instrumental activities of daily living (IADL) (3) as well as low physical activity (12, 13). Cao et al. (2016) found that the physical, psychological and environmental quality of life (QoL) domains were all significant negatively related to

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depression in a community-based study in China including people aged 60+, whereas the social QoL domain was not. Among the sociodemographic variables, older age, less educated, lower monthly income and insomnia were related to depression (8).

Few studies have examined depression after hospitalisation or the factors associated with improvement in depressive symptoms after hospital discharge. The studies that have been found looked either at depression and cardiac condition, including all ages and showing a prevalence about 30% in 75+ (14), or at associations between depression and ADL function after hospitalisation (15, 16). Because the prevalence of depression is high among older people and even higher among older people after hospitalisation, depression is an essential healthcare issue. It is easy to screen for depression while the person is at the hospital, and based on knowledge about which factors are of importance to improvement, interventions could target each individual at risk. Thus, it is of great importance for healthcare that we acquire more knowledge about depression prevalence during and after hospitalisation among older people as well as about the factors of importance to improvement.

The aim of the present study was to investigate whether improvement in depressive symptoms after hospitalisation is associated with education level, age, gender, living situation, self-efficacy, ADL and QoL by (1) examining the prevalence of depressive symptoms at baseline and at 1st and 2nd follow-up, (2) examining different factors' association with depressive symptoms at baseline and (3) examining different factors' association with improvement in depressive symptoms at baseline and at 1st and 2nd follow-up.

## Methods

### Design

A prospective design was used with two follow-ups.

### Sample

The sample consisted of 145 patients, 65 years and older, from two regional hospitals in Sweden. Inclusion criteria for participating in the study were as follows:  $\geq 65$  years, eligible for care planning with rehabilitation after hospitalisation, and plans to return to normal residence. Exclusion criteria were as follows: cognitive decline making the questions (posed by the researcher) difficult to answer and need for palliative care or nursing home placement. The sociodemographic characteristics of the study population are presented in Table 1. The primary reasons for the hospital stay were hip or other fractures (61%), various pain conditions, for

**Table 1** Sociodemographic characteristics N = 145

<i>Characteristics</i>	
Female gender n (%)	102 (70.3)
Age	
Age range, years	65–95
Age in years, mean (SD)	81.2 (7.4)
Educational level, n (%)	
6-year Elementary school	71 (49.0)
9-year Elementary school	25 (17.2)
High school	28 (19.3)
University	21 (14.5)
Living alone, n (%)	106 (73.1)

n, number; SD, standard deviation.

example, following a fall (14.5%) as well as other causes, including sepsis, pneumonia, cardiovascular symptoms and amputation.

### Data collection and study variables

Data were collected between February 2015 and September 2016 through interviews conducted using structured protocols. The protocol consisted of several validated instruments, all of which have been found to have good psychometric properties. The researchers interviewed the participants prior to hospital discharge, after 1.5 months (1st follow-up) and after 3 months (2nd follow-up). The interviews after hospitalisation were made in the person's home or short-term care, depending on where the person was living at the time.

*Social characteristics.* Sociodemographic factors were as follows: age, gender, education (6-year and 9-year elementary school, high school/university) and living situation (living alone or together with someone).

*Physical functioning and mobility.* Physical functioning was measured using the Katz index of ADL to assess dependency in six basic activities: bathing, dressing, going to the toilet, transferring, feeding and continence (17). The scale has been found to have good reliability and construct validity (18).

*Depressive symptoms.* The 20-item Geriatric Depression Scale (GDS-20) was used to identify depressive symptoms among the participants (19); it is a modified version of the 15-item GDS (20). The GDS-20 has 20 questions, each giving 0 or 1 points. A score higher than 5 points indicates that the person may be suffering from depression. The questions concern the person's mental state during the past two weeks. The validity of the instrument is good and the inter-rater reliability of the English

version has been found to be high, Cronbach's alpha 0.94 (21).

*Quality of Life.* QoL was measured using the Life Satisfaction Questionnaire (LSQ), which consists of 34 items rated on a 7-point Likert scale. Factors included in the instrument are physical symptoms, sickness impact, quality of everyday activities, quality of everyday activities/fun, quality of everyday activities/meaningful, socio-economic situation, quality of family relations and quality of close friend relations. The factor scores are transformed to a 0–100 scale, where a higher score indicates better QoL. The instrument has been found to have good reliability and validity (22).

*Self-Efficacy.* Participants' trust in their own ability was measured using the General Self-Efficacy Scale (GSE). This scale consists of 10 statements rated on a 4-point Likert scale. The responses range from 'not at all true' to 'exactly true'. The score is calculated by dividing the total sum of the 10 statements by ten. The Swedish version has been shown to have good reliability (23).

#### *Ethical considerations*

The study was approved by the research ethics committee in Uppsala (reg. no. 2014/489). The participants received oral and written information before deciding to participate in the study. The written information included the purpose of the study, contact information for the researchers in case participants had any questions or wanted more information. Participants were also informed orally and in writing that the study was voluntary and that they could withdraw their participation at any time. All participants gave their written informed consent.

#### *Data analysis*

Binary logistic regression analysis was used to calculate the odds ratios (OR) and 95% confidence intervals (CIs) for possible factors associated with depressive symptoms at baseline and improvement in depressive symptoms. The associations were evaluated separately for each possible factor and thereafter adjusted for age, gender and education. The binary logistic regression analysis was performed using the GDS scale as a dichotomised variable, where only persons with a GDS score  $> 5$  were followed to assess who had recovered (GDS score  $\leq 5$ ) or remained depressed (GDS score  $> 5$ ). In the regression analysis for LSQ, the mean scores for at least 7 of the 8 factors calculated. The reason for this was that a majority of the participants had missing data in the factors 'Close friend relation' because they felt they did not have any close friends left. Statistical significance level was set at

$p < 0.05$  (2-tailed). Statistical analyses were performed using SPSS 22.0 (IBM SPSS Statistics).

## Results

At the hospital interview (baseline), 145 persons participated in the study. Of these, 116 persons participated in the 1st follow-up 1.5 months and 104 persons in the 2nd follow-up 3 months after hospitalisation. Reasons for dropout were that the person could not be contacted, did not wish to participate, was hospitalised or had died. There were no significant differences in depression symptoms at baseline ( $p = 0.373$ ) between the persons who dropped-out during the study and the persons who participated all three occasions.

#### *Prevalence of depressive symptoms*

The prevalence of depressive symptoms at baseline was 49.0%. It decreased over time, and after 3 months at home, it was 33.0%; see Table 2. The prevalence of depressive symptoms among the 104 persons who remained in the study after 3 months (2nd follow-up) was 47.1% at baseline and 40.4% at the 1st follow-up. The majority of persons with depressive symptoms at baseline also had depressive symptoms later. However, there were also 10 persons without depressive symptoms at baseline who had depressive symptoms at follow-up.

#### *Association with depressive symptoms at baseline*

Factors associated with depressive symptoms at the hospital interview (baseline), adjusted for age and gender, were dependency in ADL (OR 1.26, 95% CI, 1.09–1.45)  $p = 0.002$ , self-efficacy (OR 0.92, 95% CI 0.86–0.98)  $p = 0.008$  and QoL (LSQ) (OR 0.91, 95% CI, 0.87–0.95)  $p = 0.000$ .

An examination of improvement in depressive symptoms at the 1st follow-up showed that 17 of 111 (5 missing) participants had improved their values, that is, lower GDS scores, and at the 2nd follow-up, 19 out of 103 (1 missing) had lower GDS scores.

**Table 2** Depressive symptoms at baseline, 1st follow-up and 2nd follow-up

	Baseline N = 145	1st follow-up N = 111 <sup>a</sup>	2nd follow-up N = 103 <sup>a</sup>
Depressive symptoms <sup>b</sup> 6–20 points n (%)	71 (49.0)	48 (43.2)	34 (33.0)

n, Number.

<sup>a</sup>Data missing for 5 persons at 1st follow-up and 1 person at 2nd follow-up.

<sup>b</sup>Geriatric Depression Scale (GDS-20) with score between 0–20, score more than 5 points indicates depression.

### Factors associated with improvement in depressive symptoms over time

Binary logistic regression analyses were used to examine factors associated with improvement in depressive symptoms. This was performed using the GDS scale as a dichotomised variable, where only persons with GDS scores > 5 (indicating depression) were followed to study who recovered (GDS ≤ 5) or remained depressed (Table 3). Examining only the persons with GDS score > 5 at baseline, that is, indicating depression, we found that improvement in ADL (less dependency in one or more ADL activities) and a higher level of education were associated with improvement in depressive symptoms both at the 1st and 2nd follow-up, while improvement in QoL was only associated with improvement in depressive symptoms at the 2nd follow-up. There were no associations found between improvement in depressive symptoms and age, living situation or self-efficacy at the 1st and 2nd follow-up. Gender was associated with improvement in depressive symptoms only in the multivariate analysis at the 1st follow-up together with education.

### Discussion

The present study revealed a high prevalence of depressive symptoms in older persons after hospitalisation. Factors associated with improvement in depressive symptoms after hospitalisation were higher educational level, improvement in ADL and in QoL after hospitalisation. No significant associations were found between improvement in depressive symptoms and gender, age, living situation (living alone/not living alone) or self-efficacy.

The present finding showing an association between high level of education and improvement in depressive symptoms is consistent with results from other studies indicating that depression is more common among persons with a low level of education (7, 12). Other studies have shown that factors associated with low QoL – for example, low economic status, living alone, not seeing friends and having no children – are also linked to depressive symptoms (4, 5, 8). These factors as well as physical symptoms and sickness impact are included in the LSQ instrument used in the present study to measure the older persons' QoL. In the present study, low QoL was also associated with depressive symptoms at the hospital interview. Improvement in QoL was associated with improvement in depressive symptoms, and this is probably due to improvement in physical symptoms (i.e. reduced pain) as well as in sickness impact, given that the other variables did not change during this time. In the present study, improvement in ADL was associated with improvement in depressive symptoms. Another study also found an association between dependency in ADL and depression in older persons (3), which is probably explained by the fact that persons who are less physically disabled generally feel less depressed.

We did not find any association between improvement in depressive symptoms and gender, not living alone or higher self-efficacy. Higher self-efficacy was associated with depressive symptoms at the baseline examination, but not with improvement in depressive symptoms over time. The finding that there were no associations between depressive symptoms and gender, age or not living alone may be due to the fact that the majority of participants were females and at the older end of the age

**Table 3** Factors associated with improvement in depressive symptoms

	Participants with depressive symptoms <sup>a</sup> at baseline <i>n</i> = 71			
	OR <sup>b</sup> (95% CIs)	<i>p</i> -value <sup>c</sup>	OR <sup>d</sup> (95% CIs)	<i>p</i> -value <sup>e</sup>
1st follow-up				
Education	2.38 (1.22–4.64)	0.011		
Change over time in ADL <sup>f</sup> dependency	0.64 (0.45–0.89)	0.009	0.62 (0.43–0.90)	0.011
Change over time in LSQ <sup>g</sup>	1.05 (0.98–1.13)	NS (0.19)	1.04 (0.96–1.12)	NS (0.35)
2nd follow-up				
Education	2.18 (1.17–4.09)	0.015		
Change over time in ADL dependency	0.69 (0.49–0.97)	0.032	0.62 (0.41–0.91)	0.016
Change over time in LSQ	1.13 (1.04–1.22)	0.005	1.15 (1.04–1.27)	0.008

CI, confidence interval; OR, odds ratio.

<sup>a</sup>Geriatric Depression Scale (GDS-20) with score between 0–20, score more than 5 points indicates depression.

<sup>b</sup>Adjusted for age and gender.

<sup>c</sup>Binary logistic regression analyses.

<sup>d</sup>Adjusted for age, gender and education.

<sup>e</sup>Binary logistic regression analyses adjusted for education level.

<sup>f</sup>Katz index of ADL.

<sup>g</sup>Life Satisfaction Questionnaire. The factor scores are transformed to a 0–100 scale, higher score indicates better.

range as well as the fact that the majority of participants were living alone.

Depression is a common psychiatric disorder in older persons (2), and the present study found that the prevalence of depressive symptoms was even higher than normal in older persons after hospitalisation. This result has also been reported in other studies (14–16). In the present study, the prevalence of depressive symptoms decreased over time after the person had been discharged from hospital, but it was still high after 3 months. It is important to identify persons who may be suffering from depression. Nurses are responsible for preventing injuries and helping people with disabilities (24). In the case of depression, help can be provided by screening older persons for and identifying for possible depression during their stay at the hospital. The possible reasons why older persons feel depressed are many, and in some cases, it may be difficult for nurses or healthcare staff to help. If depression is due to pain or the person feeling dependent on others, it may be easier to help than if the person is depressed because he/she is a widow/widower and feels lonely. Higher educational level was associated with improvement in depressive symptoms. Persons with low educational level and depression might need more attention from staff and additional follow-ups. Help with rehabilitation after hospitalisation is important for older persons and can reduce the risk of depression. Studies looking at physical inactivity and depression in older persons have found an association between these factors (12, 13, 25). The results of a study examining an intervention including physical activity, arts and crafts and a recreational programme showed improvement in ADL and decreased depression levels (25). A study by Holmqvist et al. (2017) found that older persons who were more disabled and less physically active also had a higher risk for depressive symptoms (13). Even in cases of factors that are difficult for healthcare staff to change, for example if the person feels alone, staff may be able to help the person get in touch with a senior centre that offers daily activities or something similar.

#### *Limitations of the study*

One limitation of the present study may be its sample size. A convenience sample was used, and this may affect generalisability. The study also included only persons who were able to participate in an interview, and thus persons with reduced cognitive abilities were excluded.

Although three months is a rather short time, strengths of the study were the prospective design with two follow-ups and that the attrition rate was relatively low. Another strength was that the study includes persons with different diagnoses, allowing the results to be generalised to a larger group. Validated measurement instruments were used, Cronbach's Alpha levels in the present

study were over 0.70 for GDS, LSQ and GSE, and the data were gathered by only two investigators, all of which are strengths.

## **Conclusions**

Depression is a common health problem in older persons, especially after hospitalisation. It is therefore important that healthcare staff screen older persons for depression during hospitalisation, as this allows identification of those in need and a possibility to help them in an appropriate manner. Persons with lower educational level and depressive symptoms need special attention.

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## **Author contributions**

BMS, AO and ME contributed to the study design. Data collection was conducted by BMS and AO, and the statistical analyses were carried out by BMS and ME. BMS wrote the first draft of the manuscript, and the authors (AO and ME) have critically revised the manuscript drafts. All authors have approved the final manuscript.

## **Ethics approval and consent to participate**

The study was approved by the research ethics committee in Uppsala (reg.no. 2014/489).

Written informed consent was obtained from participants.

## **Conflict of interests**

The author declares no conflict of Interest.

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## **Consent for publication**

The paper contains aggregated data only.

## **Competing interests**

None.

## **Data availability statement**

Data not available.

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