Prevalence and predictors of healthcare utilization among older people (60+): Focusing on ADL dependency and risk of depression.

Sandberg, Magnus; Kristensson, Jimmie; Midlöv, Patrik; Fagerström, Cecilia; Jakobsson, Ulf

Published in:
Archives of Gerontology and Geriatrics

DOI:
10.1016/j.archger.2012.02.006

2012

Prevalence and predictors of healthcare utilization among older people (60+); Focusing on ADL dependency and risk of depression

Magnus Sandberg, RN, Doctoral Student [a, b, *], Jimmie Kristensson, RN, PhD [a], Patrik Midlöv, MD, PhD, Associate Professor [c, d], Cecilia Fagerström, RN, PhD, Associate Professor [e], & Ulf Jakobsson, RN, PhD, Associate Professor [c, d]

[a] Department of Health Sciences, Faculty of Medicine, Lund University, P.O. Box 157, SE-221 00 Lund, Sweden

[b] Vårdalinstitutet, The Swedish Institute for Health Sciences, Lund University, P.O. Box 187, SE-221 00, Lund, Sweden

[c] Department of Clinical Sciences in Malmö, Faculty of Medicine, Lund University, SE-205 02, Malmö, Sweden,

[d] Center for Primary Health Care Research, Faculty of Medicine, Lund University, SE-205 02 Malmö, Sweden

[e] School of Health Science, Blekinge Institute of Technology, SE-371 79 Karlskrona, Sweden

[*] Corresponding author. Tel.: +46 46 222 19 71; fax: +46 46 222 19 34,

E-mail address: Magnus.Sandberg@med.lu.se. (M. Sandberg)

Abstract

The aim of this study was to investigate healthcare utilization patterns over a six-year period among older people (60+), classified as dependent/independent in Activities of Daily Living (ADL) and/or at/not at risk of depression and to identify healthcare utilization predictors.

A sample (n=1402) comprising ten age cohorts aged between 60 and 96 years was drawn from the Swedish National study on Aging and Care (SNAC). Baseline data were collected between 2001 and 2003. Number and length of hospital stays were collected for six years after baseline year. Group differences and mean changes over time were investigated. Healthcare utilization predictors were explored using multiple linear regression analysis. The results revealed that 21-24% had at least one hospital stay in the six years after baseline, 29-37% among ADL dependent subjects and 24-33% among those at risk of depression. There was a significant increase of hospital stays in all groups over time. ADL-dependent subjects and those at risk of depression had significant more hospital stays, except for those at/not at risk of depression in years 2, 4 and 5. The healthcare utilization predictors 5-6 years after baseline were mainly age, previous healthcare utilization and various symptoms and, in 1-2 and 3-4 years after baseline, age, various diagnostic groups and various physical variables. Thus healthcare utilization patterns seem to be similar for the different groups, but it is difficult to find universal predictors. This suggests that different variables should be considered, including both ADL and psychosocial variables, when trying to identify future healthcare users.

Keywords: Older people, Healthcare utilization, Activities of daily living, Depression

1. Introduction

It is well known that severe disability (e.g. dependency in Activities of Daily Living, ADL) in older people is an important predictor of acute disease and illness, which in turn leads to a increased utilization of healthcare (Ferrucci, et al., 1997). However, physical problems may not be the only cause of poor health. The World Health Organization (WHO) has predicted that by the year 2020 depression will be the second leading cause of disability and death globally (Murray & Lopez, 1996), which means that depressive symptoms may also be an important factor behind high healthcare utilization. Older people constitute a vulnerable group and may have difficulties with both decreased physical ability (Leon-Munoz, et al., 2007) and psychosocial problems such as depression (Zunzunegui, et al., 2007). However, little is known about the relationship between psychosocial problems as depression and healthcare utilization and how the patterns of healthcare utilization vary between those with and without psychosocial problems and also whether or not these differ from the patterns among those with and without reduced physical ability. This knowledge is important for improving health and preventing illness, which in turn may have an impact on healthcare utilization.

A large proportion of today's healthcare is utilized by a relatively small group of older people (Evercare, 2004; Condelius, et al., 2008) but few studies have investigated the rate of healthcare consumption for those with documented frequent usage or whether healthcare utilization is a predictor of future usage. In a large study of National Health Service hospital trusts in England with a sample of emergency admissions in the course of one year (n=2 895 234), Bottle et al. (2006) found that hospital admission itself could be a risk factor for subsequent utilization and becoming a high-impact user, e.g. emergency admission patients went on to have at least two further emergency hospital admissions in the next 12 months. This was predicted by the number of emergency admissions in the 36 months prior to the inclusion emergency admission. This has been showed by several other authors (Roos, et al., 1989; Roland, et al., 2005; Condelius, et al., 2011) but they also discovered that the admission rate decreased progressively in the following years. For example Roland et al. (2005) investigated hospital episode statistics records for people age 65 or above (n=11 544 551) and who were high users with two or more emergency visits (n=227 206) and followed them from 1998/99 to 2002/03. Despite this group accounting for 38% of admissions in the index year, they accounted for fewer than 10% of admissions in the following year and just over 3% five years later. This implies that longitudinal studies, especially with a long-term perspective, are needed and that it is important to include both a variety of factors associated with healthcare utilization and previous healthcare utilization as variables when trying to predict future utilization.

The correlation between ADL and healthcare utilization has been showed in number of studies. For example a Spanish cohort study (n=2806) with people aged 60 or older, showed that those in need of help with Instrumental Activities of Daily Living (IADL) had a higher utilization two years later, both of home services, i.e. home visits by nurses and physicians (OR=2.64, 95% CI 1.73-4.03) and non-home services, i.e. visits to primary care physician, hospital admissions, emergency care etc. (OR=2.02, 95% CI 1.04-3.93) (Leon-Munoz, et al., 2007). However, reduced functional ability does not always explain healthcare utilization. Karlsson et al. (2008) showed in a Swedish study (n=1958, aged 65+) that older people cared for at home utilized more hospital and outpatient care during a twelve-month period than those in special accommodation (35% of those living at home were admitted to hospital and 76% had contact with outpatient care from a physician versus 26% and 87% respectively of those in special accommodation), despite those in special accommodation having less physical ability than the elderly cared for at home. Older people with reduced physical ability have been identified as a vulnerable group but Covinsky, et al. (1997) showed in an American study that older people with symptoms of reduced mental health/depression also constitute a hospitalized group at risk. They studied hospitalized medical patients older than 70 years of age (n=572) with six or more symptoms of depression on admission (n=196) and they found that a greater number of symptoms of depression on admission was strongly associated with worse health status outcomes on discharge, and 30 and 90 days after discharge. They also showed that these patients were more likely to be dependent in basic activities of daily living than patients with 0 to 2 symptoms (n=181), after controlling for demographics and severity of illness (OR=2.47, 95% CI 1.58-3.86) (Covinsky, et al., 1997). Furthermore depression has been showed to be correlated with mortality (Beyer, 2007) and there are also studies showing that depression and physical ability is associated with each other (Dalle Carbonare, et al., 2009). This means that depression can affect health and therefore also healthcare utilization.

Healthcare utilization is therefore far too complex to study by focusing on one single factor. When Sandoval et al. (2010) compared frequent and infrequent visitors (n=168) to an urban emergency department they found that frequent users (with at least three visits to the specific emergency department in the previous twelve months) were significantly more likely to screen positive for depression (47% vs. 27%). They also reported higher levels of stress, lower levels of social support, and worse general health status and were more likely to have a primary care physician (75% vs. 66%, respectively). The complexity of healthcare utilization was also shown in a study by Stoddart (2002), where the determinants of use of public and private home care services in the previous three months in an older English population (n=1540) were investigated. Factors such as poorer physical functioning, poor emotional health, problems with cognition, foot problems and number of falls were all determinants associated with health utilizations in terms of private and government healthcare and social services. This indicates that not only physical ability but other factors, including mental health symptoms, may be of interest when studying healthcare utilization.

Other studies have showed that other factors can be important when investigating healthcare utilization patterns. In an longitudinal cohort study of older patients (n=1291) Landi et al. (2004) showed in their 12-month follow-up that the rate of hospitalization was about 26 percent in the sample and that those living alone were more likely be admitted to hospital than those living with an informal caregiver (OR=2.59, 95% CI 1.82-3.69) and those suffering economic hardship were more frequently hospitalized than those without such problems (OR=3.01, 95% CI 1.75-5.18). The number of diseases present is also found to be a strong predictor for healthcare utilization. A literature review by Vogeli et al. (2007) showed that people with one chronic disease visited physicians four times a year while those with five or more such diseases had fourteen visits. In Sweden hospital admissions and visits to outpatient physicians have also been showed to be mainly associated with medical diagnoses (Kristensson, et al., 2007) and co-morbidity (Rennemark, Holst, et al., 2009). This means that not only physical health symptoms, but also mental health symptoms, medical diagnosis and demographic data should be considered when studying healthcare utilization.

The objectives of this study were to investigate healthcare utilization patterns, in terms of hospital stays and length of stays over a six-year period, among older people (aged 60 years and older) classified as dependent/independent in ADL, and/or at/not at risk of depression. The aim was also to identify predictors for healthcare utilization.

2. Method

2.1. Settings

The health care system in Sweden is highly decentralized. Mainly the 20 county councils and 290 municipalities provide health care and services at regional and local level respectively. Health policy is a national level responsibility that rests with the Government and the Parliament and there are two laws, *the Swedish Social Services Act* and t*he Health and Medical Services Act*, regulating the care and services. The care and services in Sweden are based on a welfare system and are overwhelmingly funded by taxes. For example patient fees charged by the county councils accounts only for 2.7% of the revenues and private insurance covers less than 1% of the population and accounts for approximately 2 thousandths of total financing (Molin & Johansson, 2005). Long term care and social services are provided by the municipalities either at home or at special accommodations. They can also provide healthcare and by responsible for nursing home care, except the care given by the physician (Lagergren, 2002). This care, together with health care, treatment and specialized medical care in inpatient or outpatient settings are provided by the county council. In Sweden the hospitals are in most cases run by the county councils. There are however a few private hospitals that generally have contracts with the county councils. Older people have the right to ask for and receive municipal care and/or social services but the decision is made by municipal employed help officers.

2.2. Sample

The sample was drawn from one of four centers in a longitudinal multi-centre cohort study, the Swedish National Study on Aging and Care (SNAC) (Lagergren, et al., 2004). This study, performed in the county of Blekinge included ten different age cohorts; 60, 66, 72, 78, 81, 84, 87, 90, 93 and 96 years; the four youngest age cohorts were randomly selected and the six oldest cohorts included all inhabitants in those age groups (Halling & Berglund, 2006). The response rate varied between 55-75% in the different cohorts, with a higher response rate in the younger groups. Thus, an oversampling in the oldest cohorts resulted in an age distribution of 28.3% for those aged 60-69 years, 24.5% for those aged 70-79 years, 36.0 for those aged 80-89 years and 11.2% for those aged 90-96 years (Fagerström, et al., 2008). The sample comprised one municipality with approximately 60 600 inhabitants in the south-eastern part of Sweden, including both urban and rural areas. In total of 2312 people were invited to participate and 61% consented to do so, giving a total sample of 1402 (Rennemark, Lindwall, et al., 2009). Those who were invited but did not participate 39% were men and 61% women. The reasons for not participating were unwillingness (83%), considering themselves as too sick to participate (10%) and could not be contacted (7%). No statistical difference was found for gender and age among participants aged 60-69 years and the dropouts but in the age groups 70–79 and 80–89 the participants were younger ($p<0.019$) and more often men ($p<0.001$) than the dropouts (Fagerström, 2007).

2.3. Data collection

The baseline data collection was carried out during the years 2001-2003. The participants received an invitation by mail to come twice to a primary health centre to participate in the study (Rennemark, Holst, et al., 2009). Those who did not respond were contacted again, this time by telephone. During the sessions, each lasting about three hours, structural interviews, medical and mental examination were carried out by nurses and physicians. After the first session a time for the second session was booked, and the participants were given a questionnaire to complete during the time between the sessions. Those who were unable to come to the primary health centre were offered the examinations in their own homes. Informed written consent was obtained from all participants at the first session (Rennemark, Holst, et al., 2009). The study was conducted in accordance with the Helsinki Declaration ("Declaration of Helsinki. Ethical principles for medical research involving human subjects," 2009) and the study was approved by the Ethics Committee at Lund University (Nos. LU 605-00, LU 744-00).

Data collection in the present study included demographic data, functional ability, depression rating, Health Related Quality of Life, health complaints, Sense of Coherence, cognitive impairment and care and services used. Demographic data included age, gender, marital status, living conditions (ordinary home or special accommodation), education (up to and including primary school, secondary school, upper secondary school or vocational school, or college or above) and finances ("Can you obtain SEK 14 000 (approx. 1500 €) within a week to cover any unforeseen expenditure?" and "Have you had difficulties covering daily expenses, rent, bills etcetera during the last 12 months?").

Data concerning healthcare provided by the county in terms of number of hospital stays and length of stays (LOS) in days were collected from SysTeam Cross, earlier Pas-origo, and added to the SNAC–Blekinge database. Both SysTeam and Pas-origo are administrative registers for care and treatment provided by the County Council of Blekinge on an individual level. An individual could have several registrations within an in-hospital period due to changing clinic during that time. A hospital stay is a continuous stay and has one date for admission and one date for discharge regardless of the number of registrations. Length of stay (LOS) was the number of days from admission to discharge. Both LOS and number of hospital stays were collected for the six years after baseline. The total number of hospital stays and the LOS were calculated for each year and also summarized for year one and two, three and four, and five and six respectively.

Data concerning primary diagnosis for each hospital visit during the baseline year were also collected from SysTeam Cross/Pas-origo and added to the SNAC–Blekinge database. The diagnoses were registered as a unique code according to WHO's ICD-10 (International Classification of Diseases 10th Revision) (World Health Organisation, 2007) system code. Numerous ICD-10 codes can be entered for each registration. In general the primary code is the main reason for the registration. However, each hospital visit could yield several registrations, thus an individual could have several primary diagnoses for each hospital stay. For this reason the primary ICD-10 codes were dichotomized and counted on an ICD-group level (i.e. one letter and two digits) and on chapter level, according to the main category in the ICD-10 system.

2.4. Measurements and instruments

2.4.1. Functional status

Functional status was assessed using a modified ADL staircase (Åsberg & Sonn, 1989). This is a further development of Katz's Activities of Daily Living index (Katz, et al., 1963). The scale assesses functional performance in means of dependency, or independence, for ten different activities. Six questions are related to personal care, referred to as Personal Activities of Daily Living (PADL) and includes bathing, dressing, toileting, transfer, continence and feeding, while four questions are related to household activities, referred to as Instrumental Activities of Daily Living (IADL), and include cleaning, shopping, transportation and cooking. The level of dependency is graded hierarchically in a ten-grade scale (each question is scored 0 or 1) where zero signifies independent and one dependence. In the present study the number of activities in which the person has been graded as dependent is summarized in each section, i.e. PADL and IADL, and as a total, with subscale ranges of 0-6 and 0-4 and a total range of 0-10 respectively, giving the number of activities in which the respondents are dependent.

2.4.2. Depression rating

Risk of depression was measured with the Montgomery & Åsberg Depression Rating Scale, MADRS (Montgomery & Åsberg, 1979) which is based on the 65-item Comprehensive Psychopathological Rating Scale, CPRS (Åsberg, et al., 1978). MADRS is a 10-item scale where each item can be scored 0-6 with a total score of 0-60 where a higher score indicates a higher risk of depression (Åsberg, et al., 1978). In the present study a 9-items version of the scale was used, due to low interitem correlation for the sixth item (the question about difficulties concentrating) (Lindwall, et al., 2007), yielding a score of 0-54. The cut-off for the MADRS score was based on the cut-off criteria for the 10-item scale suggested by (Snaith, et al., 1986) where 0-6 represents absence of risk of depression; 7-19 mild risk of depression; 20-34 moderate risk of depression and 35 and above severe risk of depression.

2.4.3. Health Related Quality of Life

SF-12 was used to measure Health Related Quality of Life (HRQoL). This is a short form of health survey and a shorter version of the SF-36 which was designed for use in clinical practice and research, health policy evaluations, and general population surveys (Ware & Sherbourne, 1992). The shorter version contains a Physical Component Summary Scale (PCS), which includes questions about Physical functioning, Role-physical, Bodily pain and General health, and a Mental Component Summary Scale (MCS) including questions about Vitality, Social functioning, Role-emotional and Mental health (Ware, et al., 1996). For each scale respectively a score between 0 (poorest wellbeing) to 100 (highest well being) is obtained.

2.4.4. Health complaints

Health complaints were assessed using 31 dichotomized questions about various symptoms and whether the participant had suffered from any of these symptoms in the last three months. The questions were inspired by questions presented by Tibblin et al. (1990). The ten most common health complaints in the sample were used in the analyses.

2.4.5. Sense of Coherence

To assess people's ability to manage and adapt to their situation the short form of the Sense of Coherence (SOC) was used (Antonovsky, 1993). This containing 13 items where for each item the respondents have seven alternative choises (1-7). The summarized score is 13-91 where a higher score indicates a greater sense of coherence (Antonovsky, 1993). A high SOC score indicates that the individual has the possibility of finding the best way to deal with a given situation (Antonovsky, 1993).

2.4.6. Cognitive impairment

Cognitive status was measured using the Mini Mental State Examination (MMSE) (Folstein, et al., 1975). The instrument covers cognitive areas of orientation, memory, attention, name, following verbal and written commands, writing a sentence spontaneously and copying a complex polygon and has a maximum score of 30 where a lower value indicates a greater cognitive impairment (Folstein, et al., 1975). Different cut-offs have been suggested but according to Folstein, et al. (2001) the most widely used and accepted cut-off for MMSE is ≤ 23.

2.4.7. Care and services

Data concerning informal care were also recorded and covered by yes/no questions asking whether, due to reduced health, they received help with home care, other activities of daily life, nursing or personal care from relatives or friends or if during the last month, due to reduced health, they had received help from relatives or friends with home care or other activities of daily life.

Data concerning formal care, covering public care and services provided by the municipality and related to decisions made in accordance with the Swedish Social Services Act and Health and Medical Services Act, were covered by dichotomized questions about receiving any help with home care, other activities of daily life, nursing or medical home care from the municipality or county or whether they received any help with personal care from the municipality.

2.5. Statistical analysis

The sample was divided into two pairs of groups; those who were dependent in ADL (ADL>0) and those who were not dependent (ADL=0) and those not at risk of depression with a MADRS score of 0-6 and those with a higher score, who were. The pairs of groups were compared separately regarding demographics, Health Related Quality of Life, functional status, cognitive ability, reported health complaints, diagnosis groups, Sense of Coherence, risk of depression, formal and informal care at baseline and hospital stays and length of stay (LOS) 1-6 years after baseline. When comparisons were made for LOS only those with at least one hospital stay in each year after baseline was included. Comparisons were performed using the Chi-square test for nominal data, the Mann-Whitney U-test for ordinal data and numeric data that were not normally distributed, and Student’s t-test for interval and ratio data. Because of internal drop out for both grouping variables e.g. dependent/independent in ADL and at/not at risk of depression, and for the other variables the number of respondents varied. The total number of respondents for each variable is presented, together with the number for each grouping variable. The internal drop out (missing/not known) of the total number of respondents are presented in percentage as footnote.

Multiple linear regression analyses (Forward method) were carried out to explore predictors of healthcare utilization. Total hospital stays and LOS for year one and two, three and four, and five and six years after baseline respectively were used as dependent variable, yielding a total of six different regression analyses and therefore six separate final models. Gender, age, living condition, marital status, total SOC sum, total IADL sum, total PADL sum, SF12 MCS, SF12 PCS, total MMSE sum, total MADRS sum (9 item version), the ten most common self-reported health complaints (fatigue, pain in the legs, back pain, joint pain, impaired hearing, impaired vision, walking problems, sleeping problems, breathlessness, cough), finances ("Can you obtain SEK 14 000 (approx. 1500 €) within a week to cover any unforeseen expenditure?" [yes/no]), formal help ("Do you get any help with home care, other activities of daily life, nursing or medical home care from the municipality or county?" [yes/no]), informal help ("Do you get help with home care, other activities of daily life, nursing or personal care from relatives or friends due to reduced health?" (yes/no)) and main diagnosis groups for baseline year were entered as independent variables in all regression models. Dummy variables were constructed for the marital status variable, with "married" as reference. When hospital stays and LOS for years five and six were used as dependent variables, hospital stays and LOS for years one and two, and three and four were used respectively as independent variables. When analyzing hospital stays and LOS for years three and four only hospital stays and LOS for years one and two respectively were used as independent variables. Analyses were made to ensure there was no violation of the assumptions of multicollinearity, normality and homoscedasticity. Due to high correlation between the total IADL sum and formal care (r=0.743) the latter was removed from the analyses. Bivariate correlations and correlation tests (VIF and Tolerance tests) revealed no other multicollinearity problems. Normal Probability Plot of the Regression Standardised Residuals, Normal P-P Plot and the Standardised Residuals histogram showed some problems with the assumptions of normality and homoscedasticity. Therefore analyses were made using only data within 3 sd from the mean of the dependent variable, excluding all outliers. After this no major threats to the assumptions of normality and homoscedasticity were found.

Changes in the mean number of hospital stays and mean LOS in the six years following baseline were investigated using Friedman’s test. Only those with at least one hospital stay were included in the analyses of LOS. As a post hoc test for Friedman’s test the Wilcoxon signed-rank test was conducted, with corrections of the p-value according to the Bonferroni method to avoid mass-significance (Bland & Altman, 1995). Only those who had valid data for all six years were included in the Friedman’s test. Those with missing data (i.e. those who died during the six year period) were automatically excluded. A survival analysis was made using a Cox regression to compare those included in the Friedman’s test analysis and those who died during the follow-up period (the six years after baseline). A forward LR method was used and the variables entered in the Cox regression were age, gender, living conditions (ordinary housing/special accommodation), total IADL and PADL score, total MADRS score, SF-12 MCS and PCS score, number of self-reported health complaints at baseline and the questions “Do you get any help with home care, other activities of daily life, nursing or medical home care from the municipality or county?” (yes/no) and “Do you get help with home care, other activities of daily life, nursing or personal care from relatives or friends due to reduced health?” (yes/no).

A p-value of ≤0.05 was considered significant (Altman, 1991) except when post hoc analyses were used when a corrected p-value according to the Bonferroni method of 0.003 was used. All statistical analyses were performed using SPSS 18.0.

3. Results

3.1. Total sample

The total sample comprised 1402 people with a mean age of 76.7 years (SD 10.2), 58.3% (n=817) were women, 51.6% (n=678) were married and 93.4 (n=1212) lived in ordinary homes. Descriptive statistics and differences between dependent and independent in ADL and being at risk, and not being at risk of, depression for all the included variables are presented in Table 1.

A total of 276 participants (19.7 %) had at least one hospital stay with at least one registered diagnosis during their baseline year. A total of 140 different diagnosis categories in 16 main diagnosis groups were registered for the baseline year with diseases of the circulatory system being the most common. The fifth and the sixth main diagnosis groups were found to be equally common which means that six groups are presented in Table 3.

Between 20.9 and 24.3 percent of the sample was admitted to hospital in each of the six years after baseline year (Table 4). The mean number of hospital stays during the six years varied between 0.36 and 0.60 per year (range 0-24) and the mean LOS of stay for those admitted varied between 13.67 and 18.28 days per year (range 1-159) (Table 4).

3.2. Utilization of healthcare over time for those dependent and independent in ADL, and for those at risk and not at risk of depression

There was a significant ($p<0.01$) difference for both hospital stays and LOS across time for the whole group as well as for those dependent and independent in ADL, and for those at risk and those not at risk of depression (Table 5). The post hoc test showed that there were significant differences between the sixth year and years 1-4 for all of groups for both hospital stay and LOS. For hospital stays there was also a significant difference between years five and six for all groups. Five of the eight subgroups also showed significant differences between one or more of years one, two and/or three and five (Table 5).

For the variables entered in the Cox regression model significant values were obtained for age ($p<0.001$) with a HR=1.075 (95% CI 1.053-1.098), gender ($p<0.001$) with a HR=2.237 (95% CI 1.611-3.105), total IADL sum ($p<0.001$) with a HR=1.344 (95% CI 1.182-1.528) and total PADL sum ($p=0.049$), HR=1.194 (95% CI 1.001-1.425) suggesting that old age, being male and dependence in terms of both IADL and PADL increase the risk of dying.

3.3. Comparison between dependence and independence in ADL

In the total sample 792 (57.7%) were classified as independent in ADL compared to 581 (42.3%) who were classified as dependent in one or more ADL. Those independent in ADL differed significantly from those classified as dependent in ADL in all demographic variables apart from one of the questions about finances (Table 1). They also differed significantly in Quality of Life and Sense of Coherence and had a better cognitive status (Table 2). Compared to those dependent in ADL those who were independent also reported significantly fewer health complaints (mean 5.9 vs. 9.2) and among the ten most common health complaints the most usual types among those independent in ADL group were various types of pain, while those dependent in ADL reported instead a high rate of fatigue, problems associated with lower extremities (pain in the legs, walking problems), and problems with their senses (impaired vision, impaired hearing) (Table 3). Those independent in ADL and those dependent in ADL differed significant regarding diagnosis during baseline year, on the main diagnosis level ($p<0.05$), where the dependent group had a higher rate of all six of the most common main diagnosis groups (Table 3). Those dependent in ADL reported significanly more often that they received informal help from friends or relatives and from the municipality or county (Table 4) and a significantly higher proportion were admitted to hospital at least once for each of the six years after baseline. Furthermore this group also showed a significantly higher proportion of healthcare utilization in terms of hospital stays for each of the six years after baseline. This was, however, not seen in LOS for those admitted to hospital, where there only were significant differences between the two groups for years two and six after baseline (Table 4).

3.4. Comparison between those at risk and those not at risk of depression

A total of 1162 had valid data for all the MADRS questions. Based on the cut-off criteria for MADRS a total of 228 (19.6%) were classified as at risk of mild, moderate or severe depression, i.e. they had a score higher than six, while 934 (80.4%) were classified not being at risk of depression. Of those 228 classified as at risk 132 (57.9%) were also classified as dependent in ADL. Compared to those at risk for depression those with a reported MADRS score of six or below were significantly younger, included fewer women, had a different marital status (Table 1), higher Quality of Life and Sense of Coherence scores and a better cognitive status (Table 2). Both the IADL sum and the PADL sum differed significantly between the groups, with those classified as at risk of depression having a higher rate of dependency (mean IADL sum 1.19 vs. 0.62; PADL sum 0.29 vs. 0.16). They also reported a significantly higher rate of self-reported health complaints. Compared to those not at risk of depression all ten health complaints were reported by significantly more of those at risk of depression and over 50% in this group reported eight out of the ten most common health complaints (Table 3). Regarding baseline year diagnosis, those with a MADRS score over six had a significantly higher proportion of injury, poisoning and certain other consequences of external causes on the main diagnosis group level (4.8 vs. 2.4%) than those with a MADRS score of six or lower (Table 2). Just as for those dependent in ADL, those with a MADRS score higher than six reported significantly more informal help from friends or relatives and help from municipality or county. They also had a higher proportion of hospital stays for all years after baseline, but the differences were only significant for the first, third and sixth years. The proportion with at least one hospital stay was also higher for those at risk of depression for all six years, but here also significance was only reached for years one, three and six (Table 4).There were, however, no differences in LOS for those admitted to hospital except for the sixth year after baseline when there was significantly higher LOS for those at risk of depression.

3.5. Predictors of healthcare utilization

Due to the exclusion of outliers, incomplete answers in some questionnaires and lack of valid health utilization data (i.e. died), between 688 and 847 were included in the final regression analyses (49% - 60% of the complete sample) (Table 6). The multiple linear regression analysis showed that age is a predictor in all six models, and that previous healthcare utilization is a predictor for future utilization in the four regressions where utilization was entered as an independent variable (Table 6, regression 1, 2, 4 & 5). Various symptoms, such as pain, difficulties in moving and breathlessness, occur in the models for healthcare utilization 3-4 years and 5-6 years after baseline, but not in the short-term models for utilization, e.g. 1-2 years after baseline. ADL and SF-12 are both predictors of healthcare utilization in the short term (Regression 3 and 6), but are not present in any other model (Table 6). In contrast to IADL, the PADL score has a negative impact on healthcare utilization, e.g. higher scores mean less healthcare utilization. Different diagnosis at baseline is also present in models three and six and as well as in models two and five, but no diagnosis groups are predictors of healthcare utilization in the long term. The models showed rather low explanation rates with the highest value for model 4 ($R^2 = 0.146$) and the lowest for model 3 ($R^2 = 0.110$) (Table 6).

4. Discussion

Between 21-24 percent of the individuals had at least one hospital stay each of the six years, which means that 76-79 percent did not have any admissions. This together with the wide range of hospital stays (0-24) in the total sample and the wide range of LOS among those admitted (1-159) indicates that older people are a heterogeneous group when it comes to healthcare utilization. The results slightly higher than previous studies showing that 19.6 percent were hospitalized during 12 months in a Swedish sample (n=414) of people aged 70 and older (Vadla, et al., 2011) and 15% of those aged 65 and older reported been admitted to hospital in the past 12 months reported in Health survey for England 2005: Health of older people (Craig, 2007). The reason for this could be prevalence of self-reported hospital admissions, when the present study reports actual admission data from the county council. A hospital admission cans it self result in a new admission. Marcantonio et al. (1999) found that the unplanned readmission rate within 30 days after discharge was 11% among patients aged 65 years and older. The association between earlier hospitalization and readmissions has also been explored by for example Kellogg et al. (1991). They found that a hospital stay in the 6 months preceding the index admission was a significant predictor for readmission (OR=3.3, 95% CI 2.0-5.4). This could be one reason for the wide range of hospital stays and LOS that we found and indicates that the group of older people seems to be heterogeneous with healthcare utilization varying between a lot in and, in many cases, none at all. This means that age is an important factor but due to the heterogeneity and size of the group of older people it should not be the only criteria when trying to target healthcare utilization among older people.

Only ADL, and not risk of depression, predicted healthcare utilization in the regression models (Table 6). This suggests that ADL is a stronger factor than the risk of depression in the regression. However, as the bivariate analysis showed, the risk of depression can not be ignored. The rate of healthcare utilization increases for all subgroups across time, i.e. with higher age, for both hospital stays and for LOS. Those classified as dependent in ADL and those at risk of depression had similar healthcare utilization patterns and they also had the highest rates and the biggest increase over the six years (Table 4). To date many interventions aimed at reducing healthcare utilization among frail older people have targeted those with lowered functional status (Hallberg & Kristensson, 2004; Markle-Reid, et al., 2006). There is a lack of studies focusing on those with poor mental health. There was, however, one study by Bouman et al. (2008) that had mental health as one inclusion criterion. This study included those with a poor self-rated health, where self-rated health represented an overall measure of functional health abilities, including physical, mental and social functioning. In the present study 132 participants were classified both as at risk of depression and as dependent in ADL which could be one of the reasons for the high level of health utilization both for those dependent in ADL and those at risk of depression in this study. The connection between lowered ADL and poor mental health is shown, for example in an Italian community-based cohort study with people aged 65-84 (n=5 632) (Dalle Carbonare, et al., 2009). This study showed that depressive symptoms were associated with higher rates of ADL disability both for men (OR=1.73, 95% CI 1.12-2.66) and for women (OR=1.81, 95% CI 1.28 -2.55) after a mean follow-up of 3.5 years (Dalle Carbonare, et al., 2009). But when comparing those dependent with those independent in ADL there were significant differences between all the top six diagnosis groups. For those at risk of depression and those not at risk there was only one significant difference between the diagnosis groups (Table 3). This suggests that those at risk of depression do not have a medical diagnosis that could explain the higher rate of healthcare utilization compared to those not at risk of depression. Depression has also been reported to be an important factor when it comes to healthcare utilization.

The present study shows that both IADL and PADL were significant predictors in two of the regression models (regression models 3 and 6) where increased IADL predicted higher healthcare utilization while increased PADL predicted lower use. This has been demonstrated earlier (Landi, et al., 2004; Condelius, et al., 2010) and the reason may be that those dependent in IADL are still capable of contacting and seeking medical healthcare, but when the dependency increases and also includes PADL they have more difficulties actually doing so. Another reason may be that those dependent in PADL have more formal help and therefore both less self-determination (Hellstrom & Sarvimaki, 2007) and a loss of power (Kristensson, et al., 2010) with the staff possibly having a moderating effect on healthcare utilization.

The present study also shows that age is a universal predictor of healthcare utilization, both in terms of hospital stay and in LOS. Furthermore, previous healthcare utilization is a predictor, especially utilization in the two previous years. There are also trends showing that various symptoms predict mainly long-term healthcare utilization while diagnosis and reduced physical functioning predict short-term use. Apart from this numerous of factors are shown to predict healthcare utilization, either in the short or in the long term. The differences may be caused by the heterogeneity of the group of older people, which is also shown in the wide range of healthcare utilization within the groups. One thing the group of older people does have in common is high age. There are several factors associated with increased age which in turn may influence the use of healthcare. The differences within the group of older people may, therefore, also be one reason for the difficulties in finding universal predictors. For example, increased age has been shown to be a risk factor for developing cardiovascular diseases (Lakatta, 2002) which in turn are a risk factor for healthcare utilization (Nagga, et al., 2011). Cornette and colleagues (2005) found that previous hospitalization was a predictor for readmission but so too were diagnoses concerning the genitourinary, respiratory and circulatory systems and a poor pre-admission IADL score. Marcantonio and colleagues (1999) found four baseline patient characteristics to be independently associated with unplanned readmission within 30 days; aged 80 years and older, previous admissions within 30 days, a history of depression and five or more medical cormorbidities. Diagnoses are important factors since they are supposed to be the major reason for receiving health and medical care. Reid and colleagues (1999) showed that the proportion of those who were chronically ill was significantly independently associated with both emergency admissions and overall admissions and they interpreted this as a reflection of the underlying morbidity. Previous healthcare utilization, multimorbidity and various diagnoses are different results of poor health, which makes them good predictors of healthcare utilization. Previous healthcare utilization and also some diagnoses groups were both found in the present study as predictors in the different models (Table 6). But as mentioned earlier, studies have shown that healthcare utilization is not a good predictor of future utilization in the long term (Roos, et al., 1989; Roland, et al., 2005; Condelius, et al., 2011). It was therefore interesting to find that healthcare utilization is a predictor in all our short-term models and also to find that LOS during years one and two is a predictor for LOS in years five and six in our sample of older people. The fact that healthcare utilization itself predicts additional utilization suggests that that this group of older people may be a suitable target for interventions that try to reduce rehospitalizations.

There are few studies that have found that various symptoms or health complaints are predictors of healthcare utilization. A French study of hospital stays (n=908) by Lang et al. (2006) found that a set of simple items, including walking difficulties, enables a predictive approach to be taken to the length of stay of older patients hospitalized under emergency circumstances. In the present study health complaints were seen as predictors for health care utilization, especially in the long term (5-6 and 3-4 years after baseline). The reason for this may be that people have different kinds of health complaint for a long time and is usually the reason why they seek healthcare and a prerequisite for obtaining a diagnosis. The result is also interesting because health complaints are usually treatable and since the health complaints were self reported they are probably the problems the respondents think is most important and most troublesome. This may be one reason why all of the ten health complaints differ significantly between those at risk of depression at those who are not at risk and not among the diagnosis. This is not seen in the same extent among those classified as dependent/independent in ADL (Table 3). Back pain was one of the significant predictors in the regression analyses and was also one health complaint that not differs significant in the comparison between dependent/independent in ADL in contrast to risk/not at risk of depression. Also the total sum of reported health complaint is also higher in the risk of depression than those classified as dependent in ADL. This together with the result that some other health complaints being significant predictors in the regression analysis (Table 6) suggests that self reported health complaints may be associated with the risk of depression in higher extent than with dependency in ADL and that self reported health complaints are important factors when it comes to healthcare utilization. A systematic review by de Boer et al (1997) of 53 studies on hospitalization and visits to physician, published between 1966 and 1997 identifying predictors of care utilization in the chronically ill found that symptom severity increased healthcare utilization, but so too did other need factors such as disease severity and complications.

In contrast to the present study de Boer and colleagues (1997) conclude that depression and psychological distress seem to be among the strongest predictors. This is also shown in later studies by Büla et al., (2001) which report that depressive symptoms were associated with hospital readmission, nursing home placement and death during a 6-month follow-up after adjustments for demographics, socioeconomic, functional status and comorbidity. This is also the conclusion in a study by Miu & Chan (2011). They found that older patients with depressive symptoms are associated with increased risk of hospital admissions (OR=2.67, 95% CI 1.31-5.32) and more episodes of unplanned hospital admissions (OR=1.52, 95% CI 1.1-2.12) regardless of their functional status. These contradictory results may have arisen because in the studies reviewed by de Boer et al. (1997) only 31 used multivariate analyses and in 22 studies univariate analyses were used, furthermore some of the studies had small sample sizes (n=30). Unlike the present study most of the reviewed studies had a limited number of examined variables. Nonetheless healthcare utilization seems to be a highly complex area to explore which may be another reason for the contradicting results in the bivariate analyses and in the multiple regression analyses. The association may not be linear which also could give results that seem contradicting. The complexity may also be the need for different types of analyses and different types of variables.

Most of the studies reviewed indicate that predisposing factors such as age, sex and marital status are not predictors of hospital utilization, nor are enabling factors such as income and social support or need factors such as comorbidity and disease duration (de Boer, et al., 1997). All the different predictors reported suggest that it is difficult to find universal predictors for healthcare utilization, especially in the long term. This may explain the lack of universal predictors as well as the low explanation rates for all final models. Nonetheless what the present study shows, which few other studies have reported, is that symptoms can be valuable predictors for healthcare utilization in the long term. Even though mainly physical variables have been found to be predictors of healthcare utilization the conclusion, according to earlier and the present study, must be that many different variables, including mental health problems, should be considered when trying to screen an older population for possible future healthcare users. Healthcare utilization is a manifestation of illness and therefore it is worth striving for a low rate of utilization. The reasons for healthcare utilization are complex and can not fully be described by physical and mental conditions. There are probably also other fundamental personal factors associated with healthcare utilization, for instance personality, coping strategies and perceived health. Different types of personality variables have been demonstrated to be associated with healthcare utilization, for instance have Personality Traits been shown to predict emergency department utilization over three years in older patients (Chapman, et al., 2009) and those identified as “pessimists” have been shown to have longer LOS and more hospital admissions (Ruthig & Chipperfield, 2007). Markle-Reid and colleagues (2008) also showed that coping strategies have impact on healthcare utilization. Even thou SOC has earlier been demonstrated to be a valid predictor for healthcare utilization among frequent attenders in primary care, it was not a significant predictor in the regression models (Table 6). But the bivariate results shows that those at risk of depression both have a lower mean score than those not at risk of depression and lower than those classified as dependent and independent in ADL (Table 2). The reason for SOC not being significant predictor may be caused by SOC not being strong enough as a predictor in relation to the other variables used. I may also be the case that SOC is not the best way to measure coping and personality. There may also be other factors affecting the healthcare utilized. Aday and Andersen (1974) mean in their theoretical framework for the study of access to medical care that several factors affect healthcare utilization. They include need factors, such as physical and mental variables, predisposal factors, such as personality and age, and enabling factors that influence the accessibility to healthcare facilities such as attributes of the community and resources specific to the individual and family in the characteristics of people at risk. They also mean that healthcare utilization can not just be seen in the individual's perspective but that utilization of health services also is affected by characteristics of the health delivery system, health policies and consumer satisfaction (Aday & Andersen, 1974).

4.1. Limitations

One limitation of the present study is the lack of data for out-patient healthcare utilization. The role of the primary care physicians in the healthcare system is usually to make decisions about hospital care and they could therefore be considered gate keepers. Thus, people who visit primary care physician frequently should not have as many hospital stays as often as those without such contacts. This has been investigated for example by McInnes and colleagues (1999) who examined the impact of general practitioners (GPs) on discharge planning for high-risk aged in-patients and showed that the involvement of a GP did not reduce the risk of hospital readmission. However there are also studies showing that those who visit primary care frequently have more hospital admissions and that those who have a high rate of hospital admissions also are those who frequently visit primary care physicians.

Previous studies indicate that high utilization of one provider may also be associated with the utilization of care and services from other providers as well. For example, Huang et al. (2008) showed that in emergency department users in Taiwan frequent users (≥4 visits/year) were more likely to use other healthcare services, with higher odds ratios for 11 or more visits to hospital outpatient departments (OR=10.30, 95% CI 7.53–14.10) and for 13 or more visits to primary care physicians (OR=1.51, 95% CI, 1.14–1.99) and for in-hospital care (OR=4.90, 95% CI, 3.74–6.43). This is in line with (Hansagi, et al., 2001) who in a Swedish sample with 21% aged 65 years or older, showed that 72% of the high emergency department users (≥4 visits/year) also visited primary care versus 57% by rare visitors (1 emergency department visit). The corresponding numbers for hospital admission were 80% and 36%, respectively (ibid.). Other results in line with this high frequency of visits to primary care physician among those with a larger number of hospital stays have also been found in Sweden (Condelius, et al., 2008; Nagga, et al., 2011). It is, therefore, most likely that we would have obtained more or less the same results even if we had been able to include out-patient utilization data. Another source of error is the transformation of registrations in the Swedish national in-patient register, where a person could have many registrations during one hospital visit. To minimize the risk of counting these registrations as multiple hospital stays, and to arrive at a more correct number of hospital stays, the registrations were collapsed into one hospital stay with one admission date and one discharge date.

One strength in the present study is the ability to connect a large data set from the SNAC study to healthcare utilization data for as long a period as six years. Healthcare utilized outside the county of Blekinge was not registered in SysTeam and Cross/Pas-origo, which may be a source of underestimation. The SysTeam and Cross/Pas-origo registers form the basis for budgeting and economic reimbursement in the county of Blekinge and can therefore be regarded as reliable. The validity of the Swedish national in-patient register (IPR) has recently been investigated in a review of 132 papers by Ludvigsson, et al. (2011). They found that that when ICD codes from the IPR were compared with information in the medical records the predictive values were 85-95% for most diagnoses. There was a good agreement (around 90%) between their IPR primary discharge diagnosis and the underlying cause of death for patients dying in hospital.

The present study used a nine-item version of MADRS instead of the ten-item scale for which the cut-offs were suggested. The consequence of this is probably a slight underestimation of the number of those classified as at risk of depression, e.g. more people who scored six on the nine-item version would probably have been classified as being at risk of depression if the ten-item scale had been used. A total of 61 had a score of six on the nine-item version of MADRS, that is they were close to being classified as at risk of depression, representing 5.2 percent of the sample with a valid MADRS score.

Friedman's test was performed to investigate changes in healthcare utilization over time. Those who died during the study period and are therefore not included in these analyses had, in comparison with those included, a significantly higher rate of hospital stays in the first year after baseline (0.89 vs. 0.25). This suggests that those with the poorest health and highest healthcare utilization during the study period may not be included in the analysis. Thus, it is likely that there is an underestimation of healthcare utilization in the Friedman test. There were still, however, significant increases in all the models over time. Those who died also had a significantly higher MADRS score and were dependent in significantly more ADL. ADL was also one of the variables associated with death in the Cox regression. To deal with this in the multiple linear regression analyses the healthcare utilization data were divided into three different variables, 1-2, 3-4 and 5-6 years after baseline, meaning that a individual who died 5 years after baseline was still included when healthcare utilization for 1-2 and 3-4 years after baseline were used as dependent variables. This increased the number of individuals with valid data in the multiple linear regressions for hospital stays from 688 in model four to 847 in model three.

5. Conclusion

Healthcare utilization patterns seem to be similar for those dependent/independent in ADL and at risk/not at risk of depression, but with significant differences in hospital stays for dependent/independent in ADL for all years, but for only years one, three and six for at risk/not at risk of depression. There were, however, significant differences in LOS only for years two and six for those dependent/independent in ADL and year six for at risk/not at risk of depression. Apart from age there were no universal predictors. Predictors for healthcare utilization 5-6 years after baseline were mainly symptoms and earlier healthcare utilization and for 1-2, but to some extent also for 3-4, years after baseline the predictors were mainly some diagnosis groups and physical measures such as IADL, PADL, SF-12 PCS where a higher PADL score predicted lower healthcare utilization. The difficulties of finding universal predictors and the low explanation rate in the final regression models, suggest that, when trying to target possible healthcare users, many different variables should be considered. The result as a whole, both the bivariate analysis and the regressions analysis suggests that these variables should not be limited to physical variables alone, but also include different mental variables. However the present study shows that utilization of healthcare is a complex field and that these variables only may predict some parts of the healthcare utilized.

6. Conflict of interest statement

None.

7. Acknowledgement

This study was supported financially by the Faculty of Medicine, Lund University, the Governmental Funding of Clinical Research within the NHS (ALF), the Swedish Institute for Health Sciences (Vårdalinstitutet), the Swedish Society of Nursing and the Association Södra Sveriges Sjuksköterskehem. SNAC (www.snac.org) is financially supported by the Ministry of Health and Social Affairs, Sweden and the participating County Councils, Municipalities and University Departments. We are also most grateful to the participants and would especially like to thank Pia Gunnarsson for her administrative help with the database and Patricia Shrimpton for revising the English.

Aday, L. A., & Andersen, R. 1974. A framework for the study of access to medical care. *Health Serv. Res., 9*(3), 208-220.
Altman, D. G. 1991. *Practical Statistics for Medical Research*. London: Chapman & Hall.
Antonovsky, A. 1993. The structure and properties of the sense of coherence scale. *Soc Sci Med, 36*(6), 725-733.
Beyer, J. L. 2007. Managing depression in geriatric populations. *Ann. Clin. Psychiatry, 19*(4), 221-238.
Bland, J. M., & Altman, D. G. 1995. Multiple significance tests: the Bonferroni method. *BMJ, 310*(6973), 170.
Bottle, A., Aylin, P., & Majeed, A. 2006. Identifying patients at high risk of emergency hospital admissions: a logistic regression analysis. *J. R. Soc. Med., 99*(8), 406-414.
Bouman, A., van Rossum, E., Evers, S., Ambergen, T., Kempen, G., & Knipschild, P. 2008. Effects on health care use and associated cost of a home visiting program for older people with poor health status: a randomized clinical trial in the Netherlands. *J Gerontol A Biol Sci Med Sci, 63*(3), 291-297.
Büla, C. J., Wietlisbach, V., Burnand, B., & Yersin, B. 2001. Depressive symptoms as a predictor of 6-month outcomes and services utilization in elderly medical inpatients. *Arch. Intern. Med., 161*(21), 2609-2615.
Chapman, B. P., Shah, M., Friedman, B., Drayer, R., Duberstein, P. R., & Lyness, J. M. 2009. Personality traits predict emergency department utilization over 3 years in older patients. *Am. J. Geriatr. Psychiatry, 17*(6), 526-535.
Condelius, A., Edberg, A. K., Hallberg, I. R., & Jakobsson, U. 2010. Utilization of medical healthcare among people receiving long-term care at home or in special accommodation. *Scand. J. Caring Sci., 24*(2), 404-413.
Condelius, A., Edberg, A. K., Jakobsson, U., & Hallberg, I. R. 2008. Hospital admissions among people 65+ related to multimorbidity, municipal and outpatient care. *Arch Gerontol Geriatr, 46*(1), 41-55.
Condelius, A., Hallberg, I. R., & Jakobsson, U. 2011. Hospital and outpatient clinic utilization among older people in the 3-5 years following the initiation of continuing care: a longitudinal cohort study. *BMC Health Serv Res, 11*, 136.
Cornette, P., D'Hoore, W., Malhomme, B., Van Pee, D., Meert, P., & Swine, C. 2005. Differential risk factors for early and later hospital readmission of older patients. *Aging Clin Exp Res, 17*(4), 322-328.
Covinsky, K. E., Fortinsky, R. H., Palmer, R. M., Kresevic, D. M., & Landefeld, C. S. 1997. Relation between symptoms of depression and health status outcomes in acutely ill hospitalized older persons. *Ann Intern Med, 126*(6), 417-425.
Craig, R., & Mindell, J. (Ed.). (2007). *Health Survey for England 2005: The health of older people* (Vol. 3). Leeds: The Information Centre.
Dalle Carbonare, L., Maggi, S., Noale, M., Giannini, S., Rozzini, R., Lo Cascio, V., et al. 2009. Physical disability and depressive symptomatology in an elderly population: a complex relationship. The Italian Longitudinal Study on Aging (ILSA). *Am. J. Geriatr. Psychiatry, 17*(2), 144-154.
de Boer, A. G., Wijker, W., & de Haes, H. C. 1997. Predictors of health care utilization in the chronically ill: a review of the literature. *Health Policy, 42*(2), 101-115.
Declaration of Helsinki. Ethical principles for medical research involving human subjects 2009. *J. Indian Med. Assoc., 107*(6), 403-405.
Evercare 2004. Implementing the Evercare Programme. Interim Report. Retrieved 20 October, 2011, from http://www.natpact.nhs.uk/cms/186.php
Fagerström, C. 2007. *Life satisfactiom and feeling hindered by health problems at age 60 and above.* Lund University, Lund.

Fagerström, C., Persson, H., Holst, G., & Hallberg, I. R. 2008. Determinants of feeling hindered by health problems in daily living at 60 years and above. *Scand. J. Caring Sci., 22*(3), 410-421.

Ferrucci, L., Guralnik, J. M., Pahor, M., Corti, M. C., & Havlik, R. J. 1997. Hospital diagnoses, Medicare charges, and nursing home admissions in the year when older persons become severely disabled. *JAMA, 277*(9), 728-734.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. 1975. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res, 12*(3), 189-198.

Folstein, M. F., Folstein, S. E., McHugh, P. R., & Fanjiang, G. 2001. *Mini-Mental State Examination user's guide*. Odessa, FL: Psychological Assessment Resources.

Hallberg, I. R., & Kristensson, J. 2004. Preventive home care of frail older people: a review of recent case management studies. *J Clin Nurs, 13*(6B), 112-120.

Halling, A., & Berglund, J. 2006. Concordance between elderly patients' understanding of and their primary healthcare physician's diagnosis of heart failure. *Scand. J. Prim. Health Care, 24*(2), 110-114.

Hansagi, H., Olsson, M., Sjoberg, S., Tomson, Y., & Goransson, S. 2001. Frequent use of the hospital emergency department is indicative of high use of other health care services. *Ann. Emerg. Med., 37*(6), 561-567.

Hellstrom, U. W., & Sarvimaki, A. 2007. Experiences of self-determination by older persons living in sheltered housing. *Nurs. Ethics, 14*(3), 413-424.

Huang, J. A., Weng, R. H., Lai, C. S., & Hu, J. S. 2008. Exploring medical utilization patterns of emergency department users. *J. Formos. Med. Assoc., 107*(2), 119-128.

Karlsson, S., Edberg, A. K., Westergren, A., & Hallberg, I. R. 2008. Older People Receiving Public Long-Term Care in Relation to Consumption of Medical Health Care and Informal Care. *The Open Geriatric Medicine Journal, 1*, 1-9.

Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. 1963. Studies of Illness in the Aged. The Index of ADL: A Standardized Measure of Biological and Psychosocial Function. *JAMA, 185*, 914-919.

Kellogg, F. R., Brickner, P. W., Conley, L., & Conroy, M. 1991. Controlling hospital readmission of elderly persons living at home: a risk factor analysis. *Home Health Care Serv. Q., 12*(2), 5-16.

Kristensson, J., Hallberg, I. R., & Ekwall, A. K. 2010. Frail older adults' experiences of receiving health care and social services. *J. Gerontol. Nurs., 36*(10), 20-28; quiz 30-21.

Kristensson, J., Hallberg, I. R., & Jakobsson, U. 2007. Healthcare consumption in men and women aged 65 and above in the two years preceding decision about long-term municipal care. *Health Soc Care Community, 15*(5), 474-485.

Lagergren, M. 2002. The systems of care for frail elderly persons: the case of Sweden. *Aging Clin Exp Res, 14*(4), 252-257.

Lagergren, M., Fratiglioni, L., Hallberg, I. R., Berglund, J., Elmstahl, S., Hagberg, B., et al. 2004. A longitudinal study integrating population, care and social services data. The Swedish National study on Aging and Care (SNAC). *Aging Clin Exp Res, 16*(2), 158-168.

Lakatta, E. G. 2002. Age-associated cardiovascular changes in health: impact on cardiovascular disease in older persons. *Heart Fail Rev, 7*(1), 29-49.

Landi, F., Onder, G., Cesari, M., Barillaro, C., Lattanzio, F., Carbonin, P. U., et al. 2004. Comorbidity and social factors predicted hospitalization in frail elderly patients. *J Clin Epidemiol, 57*(8), 832-836.

Lang, P. O., Heitz, D., Hedelin, G., Drame, M., Jovenin, N., Ankri, J., et al. 2006. Early markers of prolonged hospital stays in older people: a prospective, multicenter study of 908 inpatients in French acute hospitals. *J Am Geriatr Soc, 54*(7), 1031-1039.
Leon-Munoz, L. M., Lopez-Garcia, E., Graciani, A., Guallar-Castillon, P., Banegas, J. R., & Rodriguez-Artalejo, F. 2007. Functional status and use of health care services: longitudinal study on the older adult population in Spain. *Maturitas, 58*(4), 377-386.
Lindwall, M., Rennemark, M., Halling, A., Berglund, J., & Hassmen, P. 2007. Depression and exercise in elderly men and women: findings from the Swedish National Study on Aging and Care. *J Aging Phys Act, 15*(1), 41-55.
Ludvigsson, J. F., Andersson, E., Ekbom, A., Feychting, M., Kim, J. L., Reuterwall, C., et al. 2011. External review and validation of the Swedish national inpatient register. *BMC Public Health, 11*, 450.
Marcantonio, E. R., McKean, S., Goldfinger, M., Kleefield, S., Yurkofsky, M., & Brennan, T. A. 1999. Factors associated with unplanned hospital readmission among patients 65 years of age and older in a Medicare managed care plan. *Am. J. Med., 107*(1), 13-17.
Markle-Reid, M., Browne, G., Weir, R., Gafni, A., Roberts, J., & Henderson, S. 2008. Seniors at risk: the association between the six-month use of publicly funded home support services and quality of life and use of health services for older people. *Can J Aging, 27*(2), 207-224.
Markle-Reid, M., Browne, G., Weir, R., Gafni, A., Roberts, J., & Henderson, S. R. 2006. The effectiveness and efficiency of home-based nursing health promotion for older people: a review of the literature. *Med Care Res Rev, 63*(5), 531-569.
McInnes, E., Mira, M., Atkin, N., Kennedy, P., & Cullen, J. 1999. Can GP input into discharge planning result in better outcomes for the frail aged: results from a randomized controlled trial. *Fam. Pract., 16*(3), 289-293.
Miu, D. K., & Chan, C. K. 2011. Prognostic value of depressive symptoms on mortality, morbidity and nursing home admission in older people. *Geriatr Gerontol Int, 11*(2), 174-179.
Molin, R., & Johansson, L. (2005). *Swedish Health Care in an International Context*: the Swedish Association of Local Authorities and Regions (SALAR).
Montgomery, S. A., & Åsberg, M. 1979. A new depression scale designed to be sensitive to change. *Br J Psychiatry, 134*, 382-389.
Murray, C. J., & Lopez, A. D. 1996. Evidence-based health policy - Lessons from the Global Burden of Disease Study. *Science, 274*(5288), 740-743.
Nagga, K., Dong, H. J., Marcusson, J., Skoglund, S. O., & Wressle, E. (2011). Health-related factors associated with hospitalization for old people: Comparisons of elderly aged 85 in a population cohort study. *Arch Gerontol Geriatr*. doi:S0167-4943(11)00107-5 [pii]
10.1016/j.archger.2011.04.023 [doi]
Reid, F. D., Cook, D. G., & Majeed, A. 1999. Explaining variation in hospital admission rates between general practices: cross sectional study. *BMJ, 319*(7202), 98-103.
Rennemark, M., Holst, G., Fagerstrom, C., & Halling, A. 2009. Factors related to frequent usage of the primary healthcare services in old age: findings from the Swedish National Study on Aging and Care. *Health Soc Care Community*.
Rennemark, M., Lindwall, M., Halling, A., & Berglund, J. 2009. Relationships between physical activity and perceived qualities of life in old age. Results of the SNAC study. *Aging Ment Health, 13*(1), 1-8.
Roland, M., Dusheiko, M., Gravelle, H., & Parker, S. 2005. Follow up of people aged 65 and over with a history of emergency admissions: analysis of routine admission data. *BMJ, 330*(7486), 289-292.

Roos, N. P., Shapiro, E., & Tate, R. 1989. Does a small minority of elderly account for a majority of health care expenditures? A sixteen-year perspective. *Milbank Q., 67*(3-4), 347-369.
Ruthig, J. C., & Chipperfield, J. G. 2007. Health incongruence in later life: implications for subsequent well-being and health care. *Health Psychol., 26*(6), 753-761.
Sandoval, E., Smith, S., Walter, J., Schuman, S. A., Olson, M. P., Striefler, R., et al. 2010. A comparison of frequent and infrequent visitors to an urban emergency department. *J. Emerg. Med., 38*(2), 115-121.
Snaith, R. P., Harrop, F. M., Newby, D. A., & Teale, C. 1986. Grade scores of the Montgomery-Asberg Depression and the Clinical Anxiety Scales. *Br J Psychiatry, 148*, 599-601.
Stoddart, H., Whitley, E., Harvey, I., & Sharp, D. 2002. What determines the use of home care services by elderly people? *Health Soc Care Community, 10*(5), 348-360.
Tibblin, G., Bengtsson, C., Furunes, B., & Lapidus, L. 1990. Symptoms by age and sex. The population studies of men and women in Gothenburg, Sweden. *Scand. J. Prim. Health Care, 8*(1), 9-17.
Vadla, D., Bozikov, J., Akerstrom, B., Cheung, W. Y., Kovacic, L., Masanovic, M., et al. 2011. Differences in healthcare service utilisation in elderly, registered in eight districts of five European countries. *Scand J Public Health, 39*(3), 272-279.
Ware, J. E., Jr., Kosinski, M., & Keller, S. D. 1996. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care, 34*(3), 220-233.
Ware, J. E., Jr., & Sherbourne, C. D. 1992. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care, 30*(6), 473-483.
Vogeli, C., Shields, A. E., Lee, T. A., Gibson, T. B., Marder, W. D., Weiss, K. B., et al. 2007. Multiple chronic conditions: prevalence, health consequences, and implications for quality, care management, and costs. *J Gen Intern Med, 22 Suppl 3*, 391-395.
World Health Organisation 2007. International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Version for 2007 Retrieved jan 16, 2011, from http://apps.who.int/classifications/apps/icd/icd10online/
Zunzunegui, M. V., Minicuci, N., Blumstein, T., Noale, M., Deeg, D., Jylha, M., et al. 2007. Gender differences in depressive symptoms among older adults: a cross-national comparison: the CLESA project. *Soc. Psychiatry Psychiatr. Epidemiol., 42*(3), 198-207.
Åsberg, K. H., & Sonn, U. 1989. The cumulative structure of personal and instrumental ADL. A study of elderly people in a health service district. *Scand J Rehabil Med, 21*(4), 171-177.
Åsberg, M., Montgomery, S. A., Perris, C., Schalling, D., & Sedvall, G. 1978. A comprehensive psychopathological rating scale. *Acta Psychiatr Scand Suppl*(271), 5-27.

Table 1: Demographics for total sample and comparison between independent (ADL=0) and dependent (ADL>0) and between those with no risk of depression (MADRS≤6) and those who are at risk (MADRS>6).

	Total	Physically independent (ADL=0)	Physically dependent (ADL>0)	p-value	MADRS≤6[e]	MADRS>6[e]	p-value
Number of respondents, n (%)	1402	792 (57.7)	581 (42.3)		934 (80.4)	228 (19.6)	
Gender (n=1402), n (%)				**<0.001[a]**			**=0.031[a]**
Female	817 (58.3)	399 (50.4)	399 (68.7)		516 (55.2)	144 (63.2)	
Male	585 (41.7)	392 (49.6)	182 (31.3)		418 (44.8)	84 (36.8)	
Age (n=1402)							
Mean (SD)	76.7 (10.2)	72.6 (9.1)	82.3 (8.7)	**<0.001[d]**	75.5 (10.3)	78.8 (9.0)	**<0.001[e]**
Marital status (n=1314), n (%)[f]				**<0.001[a]**			**<0.001[a]**
Married	678 (51.6)	485 (63.5)	181 (34.3)		502 (56.2)	83 (40.3)	
Widow/widower	474 (36.1)	185 (24.2)	280 (53.1)		292 (32.7)	91 (44.2)	
Unmarried	85 (6.5)	47 (6.2)	38 (7.2)		45 (5.0)	18 (8.7)	
Divorced	77 (5.9)	47 (6.2)	28 (5.3)		55 (6.2)	14 (6.8)	
Living conditions, n (%), (n=1297)[g]				**<0.001[a]**			=0.101[a]
Ordinary home	1212 (93.4)	757 (99.9)	438 (84.7)		850 (96.3)	194 (93.7)	
Special accommodation	85 (6.6)	1 (0.1)	79 (15.3)		33 (3.7)	13 (5.7)	
Education, n (%), (n=1274)[h]				**<0.001[a]**			=0.610[a]
Up to and including primary school	730 (57.3)	388 (51.3)	327 (66.2)		477 (54.7)	121 (59.9)	
Secondary school	142 (11.1)	85 (11.2)	55 (11.1)		105 (12.0)	22 (10.9)	
Upper secondary school or vocational school	264 (20.7)	188 (24.8)	74 (14.4)		189 (21.7)	39 (19.3)	
College or above	138 (10.8)	96 (12.7)	41 (8.3)		101 (11.6)	20 (9.9)	
Economy, n (%)							
"Can you obtain SEK 14 000 (approx. 1500 €) within a week to cover any unforeseen expenditure?" (n=1248)[i]				**=0.033[a]**			=0.444[a]
Yes	1016 (81.4)	632 (84.0)	369 (77.4)		712 (82.3)	160 (80.0)	
No	232 (18.6)	120 (16.0)	108 (22.6)		153 (17.7)	40 (20.0)	
"Have you had difficulties cover daily expenses, rent, bills etcetera during the last 12 months?" (n=1274)[j]				=0.399[a]			=0.300[a]
Yes	77 (6.0)	41 (5.4)	34 (7.0)		44 (5.0)	14 (6.8)	
No	1197 (94.0)	725 (94.6)	452 (93.0)		837 (95.0)	192 (93.2)	

[a] Chi 2-test , [b] Mann-Whitney U-test , [c] Fisher's exact test, [d] Student's t-test, [e] 9-item version of MADRS.

Missing/not known: [f] 6.3%, [g] 7.5%, [h] 9.1%, [i] 11.0%, [j] 9.1%

Table 2: Comparison of Health Related Quality of Life, Physical dependency, cognitive ability, Life Satisfaction and Sense of Coherence between independent (ADL=0) and dependent (ADL>0) and between those not at risk of depression (MADRS≤6) and those who are at risk (MADRS>6).

		Total	Physically Independent (ADL=0)	Physically dependent (ADL>0)	p-value	MADRS≤6 [d]	MADRS>6 [d]	p-value
Health Related Quality of Life (HRQoL)								
SF-12 (n=1106)[g]								
PCS	Median (q1-q3)	44.27 (33.67-53.07)	48.95 (39.26-54.46)	34.15 (25.57-45.71)	**<0.001[b]**	46.28 (35.71-53.80)	35.62 (27.23-47.15)	**<0.001[b]**
	Range	11.63-62.91	14.61-62.91	11.63-58.72		11.63-62.91	14.61-58.61	
MCS	Median (q1-q3)	56.87 (50.47-60.40)	57.83 (53.01-60.70)	52.99 (44.66-59.14)	**<0.001[b]**	57.85 (52.52-60.76)	50.32 (40.23-54.97)	**<0.001[b]**
	Range	12.70-72.08	12.70-67.61	19.65-72.08		25.00-72.08	12.70-64.53	
Activities of daily living, ADL								
Dependent in IADL (n=1397-1399)[e], n (%)								
	Cleaning	320 (22.9)		310 (53.4)		177 (19.0)	78 (34.2)	**<0.001[a]**
	Shopping	323 (23.1)		313 (53.9)		153 (16.7)	76 (33.6)	**<0.001 [a]**
	Transportation	323 (23.1)		312 (53.7)		156 (16.7)	73 (32.0)	**<0.001 [a]**
	Cooking	214 (15.3)		205 (35.3)		91 (9.8)	45 (19.7)	**<0.001 [a]**
IADL Sum (n=1393)[e]								
	Mean (SD)	0.8 (1.4)	0.0	2.0 (1.6)		0.62 (1.21)	1.19 (1.54)	**<0.001b**
	Range	0-4		0-4		0-4	0-4	
Dependent in PADL (n=1392-1398)[e], n (%)								
	Bathing	175 (12.5)		165 (28.4)		69 (7.4)	30 (13.2)	**=0.005 [a]**
	Dressing	91 (6.5)		87 (15.0)		27 (2.9)	10 (4.4)	=0.253 [a]
	Toileting	86 (6.2)		84 (14.5)		21 (2.3)	7 (3.1)	=0.470 [a]
	Transfer	87 (6.2)		83 (14.3)		10 (1.1)	5 (2.2)	=0.190 [a]
	Continence	368 (26.4)		360 (62.0)		13 (1.4)	4 (1.8)	=0.757 [a]
	Feeding	23 (1.6)		21 (3.6)		18 (1.9)	11 (4.8)	**=0.012 [a]**
PADL Sum (n=1378)[f]								
	Mean (SD)	0.6 (1.2)	0.0	1.4 (1.6)		0.16 (0.71)	0.29 (0.93)	**=0.001[b]**
	Range	0-6		0-6		0-6	0-6	
Total ADL Sum (n=1373)[f]								
	Mean (SD)	1.4 (2.4)	0.0	3.3 (2.8)		0.77 (1.74)	1.50 (2.18)	**<0.001 [b]**
	Range	0-10		1-10		0-10	0-10	
Cognitive ability								
Mini Mental State Examination (MMSE) (n=1364)[f]								
	Mean (SD)	25.8 (5.1)	27.6 (2.4)	23.3 (6.6)	**<0.001 [b]**	26.49 (4.13)	25.24 (4.54)	**<0.001 [b]**
	Range	0-30	14-30	0-30		0-30	4-30	

Sense of Coherence							
Sense of Coherence (SOC) (n=1040)[g]							
Mean (SD)	73.89 (10.51)	74.83 (9.87)	72.21 (11.35)	**=0.001** [b]	75.41 (9.60)	68.03 (11.05)	**<0.001** [b]
Range	35-91	43-91	35-91		44-91	43-91	
Risk of depression							
MADRS* (n=1162)[g]							
Mean (SD)	3.72 (4.55)	2.9 (4.0)	5.0 (5.1)	**<0.001** [b]	1.88 (1.91)	11.25 (4.48)	**<0.001** [b]
Range	0-34	0-34	0-26		0-6	7-34	

[a] Chi 2-test , [b] Mann-Whitney U-test , [c] Fisher's exact test, [d] 9-item version of MADRS.
Missing/not known: [e] 0.2-0.7%, [f] 1.7-2.4%, [g] 17.1-25.8%

Table 3: Comparison of reported health complaints and diagnosis groups between independent (ADL=0) and dependent (ADL>0) and between those not at risk of depression (MADRS≤6) and those who are at risk (MADRS>6).

	Total	Physically Independent (ADL=0)	Physically dependent (ADL>0)	p-value	MADRS≤6 [d]	MADRS>6 [d]	p-value
Health complaints							
Total sum of reported health complaints (n=1064)[f]							
Mean (SD)	7.12 (5.29)	5.9 (4.9)	9.2 (5.3)	**<0.001** [b]	6.18 (4.77)	11.28 (5.70)	**<0.001** [b]
Range	0-29	0-29	0-25		0-29	0-25	
The ten most common reported health complaints (n=1262-1273)[e], n (%)							
Fatigue	624 (49.1)	310 (40.6)	304 (62.3)	**<0.001** [a]	390 (44.2)	149 (72.7)	**<0.001** [a]
Pain in the legs	621 (48.9)	314 (41.0)	296 (61.4)	**<0.001** [a]	403 (45.7)	121 (59.6)	**<0.001** [a]
Back pain	597 (47.1)	333 (43.7)	252 (52.1)	=0.099 [a]	378 (43.0)	130 (63.4)	**<0.001** [a]
Joint pain	587 (46.4)	329 (43.3)	249 (51.6)	=0.057 [a]	376 (42.9)	119 (58.3)	**<0.001** [a]
Impaired hearing	549 (43.3)	283 (37.1)	254 (52.4)	**<0.001** [a]	357 (40.6)	110 (53.9)	**=0.001** [a]
Impaired vision	490 (38.6)	218 (28.6)	263 (54.2)	**<0.001** [a]	303 (34.4)	109 (53.2)	**<0.001** [a]
Walking problems	427 (33.8)	145 (19.1)	271 (56.2)	**<0.001** [a]	253 (28.9)	105 (51.0)	**<0.001** [a]
Sleeping problems	414 (32.5)	218 (28.5)	189 (39.0)	**=0.003** [a]	240 (27.2)	111 (54.7)	**<0.001** [a]
Breathlessness	339 (26.9)	158 (20.8)	173 (35.9)	**<0.001** [a]	216 (24.8)	81 (39.7)	**<0.001** [a]
Cough	322 (25.5)	172 (22.7)	142 (29.4)	=0.501 [a]	193 (22.0)	70 (34.5)	**<0.001** [a]
Diagnosis codes							
The six most common registered diagnosis groups, with the top three diagnoses, according to the ICD-10 classification, for the baseline year (n=1402), n (%)							
Diseases of the circulatory system (I00-I99)	88 (6.3)	34 (4.3)	53 (9.1)	**<0.001** [a]	50 (5.4)	18 (7.9)	=0.143 [a]
Heart failure (I50)	22 (1.6)	5 (0.6)	17 (2.9)	**=0.001** [a]	12 (1.3)	7 (3.1)	=0.076 [c]
Acute myocardial infarction (I21)	18 (1.3)	6 (0.8)	12 (2.1)	**=0.036** [a]	11 (1.2)	4 (1.8)	=0.511 [c]
Angina pectoris (I20)	16 (1.1)	11 (1.4)	5 (0.9)	=0.366 [a]	9 (1.0)	2 (0.9)	=1.000 [c]
Injury, poisoning and certain other consequences of external causes (S00-T98)	44 (3.1)	7 (0.9)	36 (6.2)	**<0.001** [a]	22 (2.4)	11 (4.8)	**=0.044** [a]
Fracture of femur (S72)	19 (1.4)	4 (0.5)	15 (2.6)	**=0.001** [a]	10 (1.1)	5 (2.2)	=0.190 [c]
Fracture of lumbar spine and pelvis (S32)	6 (0.4)	1 (0.1)	5 (0.9)	=0.089 [c]	3 (0.3)	1 (0.4)	=0.583 [c]
Fracture of rib(s), sternum and thoracic spine (S22)	5 (0.4)	1 (0.1)	4 (0.7)	=0.169 [c]	2 (0.2)	1 (0.4)	=0.481 [c]
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	42 (3.0)	16 (2.0)	26 (4.5)	**=0.009** [a]	25 (2.7)	10 (4.4)	=0.176 [a]

Pain in throat and chest (R07)	18	(1.3)	7	(0.9)	11	(1.9)	=0.105 [a]	11	(1.2)	4	(1.8)	=0.511 [c]
Abdominal and pelvic pain (R10)	7	(0.5)	2	(0.3)	5	(0.9)	=0.141 [c]	3	(0.3)	2	(0.9)	=0.255 [c]
Dizziness and giddiness (R42)	6	(0.4)	3	(0.4)	3	(0.5)	=0.702 [c]	6	(0.6)	-		=0.604 [c]
Diseases of the digestive system (K00-K93)	32	(2.3)	12	(1.5)	19	(3.3)	**=0.031 [a]**	16	(1.7)	7	(3.1)	=0.187 [a]
Other functional intestinal disorders (K59)	6	(0.4)	3	(0.4)	3	(0.5)	=0.702 [c]	4	(0.4)	-		=1.000 [c]
Cholelithiasis (K80)	5	(0.4)	2	(0.3)	2	(0.3)	=1.000 [c]	3	(0.3)	1	(0.4)	=0.583 [c]
Other diseases of the digestive system (K92)	4	(0.3)	2	(0.3)	2	(0.3)	=1.000 [c]	2	(0.2)	1	(0.4)	=0.481 [c]
Diseases of the respiratory system (J00-J99)	28	(2.0)	5	(0.6)	23	(4.0)	**<0.001 [a]**	15	(1.6)	6	(2.6)	=0.297 [a]
Bacterial pneumonia, not elsewhere classified (J15)	11	(0.8)	1	(0.1)	10	(1.7)	**=0.001 [c]**	6	(0.6)	1	(0.4)	=1.000 [c]
Other chronic obstructive pulmonary disease (J44)	5	(0.4)	1	(0.1)	4	(0.7)	=0.169 [c]	5	(0.4)	-		=0.590 [c]
Pneumonia, organism unspecified (J18)	5	(0.4)	1	(0.1)	4	(0.7)	=0.169 [c]	3	(0.3)	2	(0.9)	=0.255 [c]
Diseases of the musculoskeletal system and connective tissue (M00-M99)	28	(2.0)	9	(1.1)	19	(3.3)	**=0.006 [a]**	18	(1.9)	8	(3.5)	=0.148 [a]
Gonarthrosis (M17)	6	(0.4)	2	(0.3)	4	(0.7)	=0.249 [c]	3	(0.3)	3	(1.3)	=0.094 [c]
Coxarthrosis (M16)	4	(0.3)	2	(0.3)	2	(0.3)	=1.000 [c]	4	(0.4)	-		=1.000 [c]
Other spondylopathies (M48)	3	(0.2)	-		3	(0.5)	=0.076 [c]	3	(0.3)	-		=1.000 [c]
Other soft tissue disorders, not elsewhere classified (M79)	3	(0.2)	-		3	(0.5)	=0.076 [c]	-		3	(1.3)	**=0.007 [c]**

[a] Chi 2-test , [b] Mann-Whitney U-test , [c] Fisher's exact test, [d] 9-item version of MADRS.
Missing/not known: [e] 9.2-10.0%, [f] 17.1-25.8%

Table 4: Comparison of formal and informal care, hospital stays and length of stay between independent (ADL=0) and dependent (ADL>0) and between those not at risk of depression (MADRS≤6) and those who are at risk (MADRS>6).

	Total	Physically Independent (ADL=0)	Physically dependent (ADL>0)	p-value	MADRS≤6 [d]	MADRS>6 [d]	p-value
Formal and informal care (n=1402)							
"*Do you get any help with home care, other activities of daily life, nursing or medical home care from the municipality or county?*" (n=1367)[e], n (%)							
Proportion of "yes"	231 (16.9)	6 (0.8)	216 (38.5)	**<0.001 [a]**	103 (11.1)	52 (22.9)	**<0.001 [a]**
"*Do you get any help with personal care from the municipality?*" (n=1281)f, n (%)							
Proportion of "yes"	181 (14.1)	3 (0.4)	172 (32.4)	**<0.001 [a]**	80 (8.7)	39 (17.2)	**<0.001 [a]**
"*Do you get help with home care, other activities of daily life, nursing or personal care from relatives or friends, due to reduced health?*" (n=1347)[g], n (%)							
Proportion of "yes"	236 (17.5)	18 (2.3)	214 (36.8)	**<0.001 [a]**	135 (14.7)	57 (25.4)	**<0.001 [a]**
"*Have you, during the last month received help from relatives or friends with home care or other activities of daily life, due to reduced health?*" (n=1021)[h] (%)							
Proportion of "yes"	188 (18.4)	17 (2.9)	169 (29.1)	**<0.001 [a]**	105 (13.9)	51 (26.4)	**<0.001 [a]**
Total number with at least one hospital stay, n (%)							
First year after baseline, n=1373	332 (24.2)	143 (18.2)	182 (32.5)	**<0.001 [a]**	207 22.4	73 32.9	**=0.001 [a]**
Second year after baseline, n=1301	316 (24.3)	124 (16.2)	185 (36.4)	**<0.001 [a]**	211 23.5	57 27.1	=0.274 [a]
Third year after baseline, n=1225	278 (22.7)	125 (16.7)	148 (32.7)	**<0.001 [a]**	186 21.7	58 29.3	**=0.022 [a]**
Fourth year after baseline, n=1148	257 (22.4)	122 (16.9)	133 (33.0)	**<0.001 [a]**	180 22.2	44 23.7	=0.667 [a]
Fifth year after baseline, n=1059	221 (20.9)	117 (16.9)	101 (29.2)	**<0.001 [a]**	157 20.8	43 25.3	=0.204 [a]
Sixth year after baseline, n=998	238 (23.8)	123 (18.1)	112 (37.2)	**<0.001 [a]**	158 21.9	48 32.4	**=0.006 [a]**
Hospital stays							
First year after baseline, n=1373							
Mean (SD)	0.43 (1.06)	0.31 (0.85)	0.59 (1.30)	**<0.001 [b]**	0.40 (1.02)	0.55 (1.08)	**=0.002 [b]**
Range	0-14	0-9	0-14		0-14	0-7	
Second year after baseline, n=1301							
Mean (SD)	0.45 (1.20)	0.31 (1.20)	0.66 (1.19)	**<0.001 [b]**	0.44 (1.28)	0.49 (1.01)	=0.259 [b]
Range	0-24	0-24	0-11		0-24	0-5	
Third year after baseline, n=1225							
Mean (SD)	0.36 (0.85)	0.27 (0.74)	0.52 (0.99)	**<0.001 [b]**	0.36 (0.86)	0.41 (0.81)	**=0.049 [b]**
Range	0-9	0-6	0-9		0-9	0-6	
Fourth year after baseline, n=1148							
Mean (SD)	0.39 (0.92)	0.29 (0.80)	0.59 (1.08)	**<0.001 [b]**	0.36 (0.82)	0.45 (1.10)	=0.609 [b]
Range	0-10	0-10	0-9		0-6	0-10	
Fifth year after baseline, n=1059							
Mean (SD)	0.42 (1.01)	0.35 (0.93)	0.59 (1.14)	**<0.001 [b]**	0.42 (1.00)	0.54 (1.13)	=0.168 [b]
Range	0-7	0-6	0-7		0-6	0-7	
Sixth year after baseline, n=998							
Mean (SD)	0.60 (1.30)	0.44 (1.07)	0.99 (1.68)	**<0.001 [b]**	0.54 (1.21)	0.94 (1.67)	**=0.003 [b]**
Range	0-10	0-9	0-10		0-8	0-9	

Length of hospital stay (days)							
First year after baseline, n=332							
Mean (SD)	13.95 (14.71)	13.36 (13.95)	14.63 (15.51)	=0.332 [b]	13.59 (13.83)	14.26 (13.31)	=0.454 [b]
Range	1-103	2-72	1-103		1-78	1-60	
Second year after baseline, n=316							
Mean (SD)	14.17 (17.09)	13.47 (16.90)	14.96 (17.46)	**=0.030 [b]**	13.56 (17.17)	14.98 (16.12)	=0.341 [b]
Range	1-141	1-84	2-141		1-141	2-92	
Third year after baseline, n=278							
Mean (SD)	13.67 (17.01)	14.64 (20.27)	12.68 (13.92)	=0.948 [b]	15.08 (19.06)	11.16 (13.08)	=0.083 [b]
Range	1-159	1-159	1-75		1-159	2-66	
Fourth year after baseline, n=257							
Mean (SD)	14.83 (15.87)	14.59 (16.23)	15.24 (15.63)	=0.265 [b]	14.11 (14.44)	16.48 (20.07)	=0.509 [b]
Range	1-104	1-104	1-88		1-80	2-104	
Fifth year after baseline, n=221							
Mean (SD)	15.96 (15.28)	15.51 (16.14)	16.81 (14.38)	=0.098 [b]	15.02 (14.80)	19.42 (16.08)	=0.051 [b]
Range	1-87	1-87	1-81		1-87	3-68	
Sixth year after baseline, n=238							
Mean (SD)	18.28 (16.79)	15.00 (11.92)	22.26 (20.30)	**=0.004 [b]**	16.84 (13.71)	23.06 (17.20)	**=0.024 [b]**
Range	1-150	1-49	1-150		1-73	1-61	

[a] Chi 2-test, [b] Mann-Whitney U-test, [c] Fisher's exact test, [d] 9-item version of MADRS.
Missing/not known: [e] 2.5%, [f] 8.6%, [g] 3.9%, [h] 27.2%,

Table 5: Friedman's Test of hospital stays and length of hospital stay (days) 1-6 years after baseline.

	Years after baseline	1	2	3	4	5	6	p-value	Post Hoc [a, b]
Hospital stays, Mean (SD)	Total (n=998)	0.25 (0.68)	0.28 (0.74)	0.24 (0.63)	0.29 (0.79)	0.38 (0.96)	0.60 (1.30)	**<0.001**	A, B, C, D, E, F, G, H, I
	Physically independent (ADL=0) (n=679)	0.22 (0.64)	0.21 (0.69)	0.19 (0.58)	0.23 (0.74)	0.33 (0.91)	0.44 (1.07)	**=0.001**	A, B, C, D, E, F, G, H
	Physically dependent (ADL>0) (n=301)	0.33 (0.74)	0.43 (0.83)	0.34 (0.70)	0.42 (0.89)	0.50 (1.06)	0.99 (1.68)	**<0.001**	A, B, C, D, E, F, H
	MADRS≤6 [c] (n=721)	0.25 (0.66)	0.26 (0.71)	0.23 (0.62)	0.27 (0.71)	0.38 (0.95)	0.54 (1.21)	**=0.001**	A, B, C, D, E, F, G, H, I
	MADRS>6 [c] (n=148)	0.33 (0.75)	0.32 (0.81)	0.34 (0.74)	0.34 (1.07)	0.48 (1.09)	0.94 (1.67)	**<0.001**	A, B, C, D, E
Length of stay (days), Mean (SD)	Total (n=574)	3.18 (8.10)	3.43 (8.88)	3.30 (10.02)	3.82 (10.06)	5.04 (11.07)	7.58 (14.07)	**<0.001**	A, B, C, D, E, F, G, H
	Physically independent (ADL=0) (n=335)	3.22 (8.24)	2.89 (8.12)	3.22 (11.07)	3.47 (9.97)	4.96 (11.47)	5.51 (10.21)	**=0.009**	A, B, C, D
	Physically dependent (ADL>0) (n=229)	3.14 (8.06)	4.25 (9.98)	3.34 (8.33)	4.48 (10.37)	5.34 (10.69)	10.89 (18.03)	**<0.001**	A, B, C, D, E, F, H
	MADRS≤6 [c] (n=400)	3.02 (7.41)	3.01 (7.05)	3.32 (10.86)	3.64 (8.84)	4.99 (10.85)	6.65 (11.91)	**<0.001**	A, B, C, D, F, G, H
	MADRS>6 [c] (n=104)	4.05 (10.51)	3.94 (12.01)	3.92 (9.02)	4.35 (14.32)	5.90 (11.91)	10.64 (16.38)	**=0.002**	A, B, C, D

[a] Correction with the Bonferroni method was used in the post hoc tests.
[b] Significant differences between: (A) Years 6 and 1, (B) Years 6 and 2, (C) Years 6 and 3, (D) Years 6 and 4, (E) Years 6 and 5, (F) Years 5 and 1, (G) Years 5 and 2, (H) Years 5 and 3, (I) Years 5 and 4.
[c] 9-item version of MADRS.

Table 6: Variables associated with the total number of hospital stays and length of hospital stays (days) six, four and two years after baseline.

Dependent variable	Final model	B	Adjusted R2 for model	95% CI for regression coefficient	p-value
	Regression 1, final model [a, b, c]		0.140		
Total number of hospital stays, for years 5 and 6 after baseline, n = 690	Age	0.031		0.020 to 0.041	<**0.001**
	Hospital stays for years 3 & 4	0.316		0.221 to 0.410	<**0.001**
	Walking problems	0.362		0.138 to 0.586	=**0.002**
	Regression 2, final model [a, b]		0.110		
Total number of hospital stays, for years 3 and 4 after baseline, n = 767	Age	0.018		0.011 to 0.025	<**0.001**
	Hospital stays for years 1 & 2	0.217		0.163 to 0.272	<**0.001**
	Diseases of the genitourinary system (N00-N99)	0.612		0.048 to 1.177	=**0.034**
	Back pain	0.181		0.052 to 0.311	=**0.006**
	Regression 3, final model [a]		0.110		
Total number of hospital stays, for years 1 and 2 after baseline, n = 847	Age	0.019		0.010 to 0.027	<**0.001**
	Gender	0.166		0.009 to 0.323	=**0.036**
	Diseases of the respiratory system (J00-J99)	0.828		0.244 to 1.412	=**0.006**
	SF-12 PCS	-0.014		-0.022 to -0.007	<**0.001**
	Total IADL Sum	0.159		0.073 to 0.246	<**0.001**
	Total PADL Sum	-0.186		-0.277 to -0.095	<**0.001**
	Regression 4, final model [a, d, e]		0.146		
Total length of stay (days), for years 5 and 6 after baseline, n = 688	Age	0.345		0.254 to 0.436	<**0.001**
	Widow/widower	-1.929		-3.802 to -0.057	=**0.043**
	LOS for years 1 & 2	0.091		0.010 to 0.173	=**0.028**
	LOS for years 3 & 4	0.126		0.058 to 0.193	<**0.001**
	Back pain	2.549		0.953 to 4.145	=**0.002**
	Pain in the legs	-2.302		-4.086 to -0.517	=**0.012**
	Walking problems	3.427		1.458 to 5.396	=**0.001**
	Regression 5, final model [a, d]		0.114		
Total length of stay (days), for years 3 and 4 after baseline, n = 764	Age	0.172		0.112 to 0.231	<**0.001**
	LOS for years 1 & 2	0.147		0.092 to 0.202	<**0.001**
	Diseases of the genitourinary system (N00-N99)	6.269		1.529 to 11.009	=**0.010**
	Breathlessness	1.658		0.326 to 2.990	=**0.015**
	Regression 6, final model [a]		0.131		

Total length of stay (days), for years 1 and 2 after baseline, n = 843	Age	0.131	0.067 to 0.195	<**0.001**
	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism (D50-D89)	26.067	12.473 to 39.661	<**0.001**
	Diseases of the respiratory system (J00-J99)	6.833	2.676 to 10.990	=**0.001**
	SF-12 PCS	-0.110	-0.163 to -0.057	<**0.001**
	Total PADL Sum	-1.182	-1.822 to -0.543	<**0.001**
	MMSE Sum	-0.190	-0.347 to -0.032	=**0.019**
	Informal help	2.463	0.787 to 4.140	=**0.004**

Variables entered into the regression analysis:

[a] gender, age, living condition, marital status, total SOC-sum, total IADL sum, total PADL sum, SF-12 MCS, SF-12 PCS, total MMSE sum, total MADRS sum (9-item version), fatigue, pain in the legs, back pain, joint pain, impaired hearing, impaired vision, walking problems, sleeping problems, breathlessness, cough, “Can you obtain SEK 14 000 (approx. 1500 €) within a week to cover any unforeseen expenditure?”, “Do you get help with home care, other activities of daily life, nursing or personal care from relatives or friends, due to reduced health?” (informal help) & diagnosis groups (Certain infectious and parasitic diseases (A00-B99), Neoplasms (C00-D48), Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism (D50-D89), Endocrine, nutritional and metabolic diseases (E00-E90), Mental and behavioural disorders (F00-F99), Diseases of the nervous system (G00-G99), Diseases of the eye and adnexa (H00-H59), Diseases of the circulatory system (I00-I99), Diseases of the respiratory system (J00-J99), Diseases of the digestive system (K00-K93), Diseases of the skin and subcutaneous tissue (L00-L99), Diseases of the musculoskeletal system and connective tissue (M00-M99), Diseases of the genitourinary system (N00-N99), Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99), Injury, poisoning and certain other consequences of external causes (S00-T98) & Factors influencing health status and contact with health services (Z00-Z99)).

[b] Hospital stays for years 1 & 2 after baseline

[c] Hospital stays for years 3 & 4 after baseline

[d] LOS for years 1 & 2 after baseline

[e] LOS for years 3 & 4 after baseline