LONG-TERM CARE UTILIZATION AND MORTALITY AFTER HOSPITALIZATION IN OLDER PEOPLE WITH HIGH-VOLUME DIAGNOSES: A RETROSPECTIVE LONGITUDINAL COHORT STUDY

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ABSTRACT

Long-term care utilization and mortality after hospitalization in older people with high-volume diagnoses: a retrospective longitudinal cohort study

Background: Hospitalization in older people is associated with disability, mortality and entry to long-term care (LTC, care in care institutions or home care).
Aim and research question(s): To describe (predictors of) LTC and mortality in six months post-hospitalization in older patients with stroke, pneumonia, myocardial infarction (MI), hip fracture, chronic obstructive pulmonary disease (COPD) and chronic heart failure. 1) What percentage of patients use LTC or die in the six months post-hospitalization? 2) What percentage of patients discharged to LTC still require LTC at three and six months? 3) Which variables predict LTC and mortality?
Methods: Quantitative retrospective longitudinal observational cohort study with data from 3,154 patients >65, hospitalized because of one of six diagnoses. Dependent variables: LTC and mortality. Independent variables: age, gender, ethnicity, urbanization and diagnosis. Percentages of LTC use and mortality were calculated and multinomial logistic regression was performed.
Results: Institutionalization at one month was highest in hip fracture (31.1%) and lowest in MI (3.1%). Home care use was highest in COPD (over 12%). Between 16.7% and 26.6% died. At three months >48% discharged to a care institution were institutionalized, at six months >60% were still institutionalized. More than 55% discharged with home care still required this at three months, and 45%-72% at six months. High age and living in strongly urbanized areas predicted LTC and mortality. Pneumonia, stroke and hip fracture predicted institutionalization and COPD both home care and institutionalization. Pneumonia and stroke predicted mortality.
Conclusion: LTC utilization and mortality are high after hospitalization in older people and vary between diagnosis groups. LTC is often required for a long duration. Age, urbanization and diagnosis predict LTC and mortality.
Recommendations: Health care workers should distinguish patients with poor prognosis from those who benefit from rehabilitation. Home rehabilitation should be further explored to prevent long-term institutionalization.

Keywords: Hospitalization, aged, long-term care, institutionalization, home care services.

NEDERLANDSE SAMENVATTING

Gebruik van langdurige zorg en sterfte na ziekenhuisopname bij ouderen met zes veelvoorkomende diagnosen: een retrospectief longitudinaal cohortonderzoek

Inleiding: Ziekenhuisopname bij ouderen wordt geassocieerd met functieverlies, sterfte en gebruik van langdurige zorg (LZ, zorg in instelling of thuiszorg).

Doel en onderzoeksvraag(vragen): Beschrijven van (voorspellers van) LZ en sterfte in zes maanden na ziekenhuisopname bij ouderen met beroerte, pneumonie, hartinfarct, heupfractuur, chronische bronchitis en longemfyseem (COPD) en chronisch hartfalen. 1) Welk percentage patiënten gebruikt LZ of overlijdt in de zes maanden na ziekenhuisopname? 2) Welk percentage patiënten ontslagen met LZ gebruikt deze zorg nog na drie en zes maanden? 3) Welke variabelen voorspellen gebruik van LZ en sterfte?

Methoden: Kwantitatieve retrospectieve longitudinale cohort studie met gegevens van 3 154 patiënten >65, met ziekenhuisopname vanwege één van de diagnosen. Afhankelijke variabelen: LZ en sterfte. Onafhankelijke variabelen: leeftijd, geslacht, etniciteit, stedelijkheid en opnamediagnose. Percentages van LZ gebruik en sterfte werden berekend en multinomiale logistische regressie werd uitgevoerd.

Resultaten: Institutionalisatie na één maand was het hoogst bij heupfractuur (31,1%) en het laagst bij hartinfarct (3,1%). Thuiszorggebruik was het hoogst bij COPD patiënten (>12%). Sterfte was tussen 16,7% en 26,6%. Na drie maanden woonden >48% van patiënten ontslagen naar een instelling daar nog steeds, na zes maanden >60%. Meer dan 55% van ouderen ontslagen met thuiszorg gebruikten dit nog na drie maanden en 45%-72% na zes maanden. Hoge leeftijd en wonen in sterk stedelijke gebieden voorspelden LZ en sterfte. Pneumonie, beroerte en heupfractuur voorspelden institutionalisatie en COPD zowel thuiszorg als institutionalisatie. Pneumonie en beroerte voorspelden sterfte.

Conclusie: LZ gebruik en sterfte bij ouderen is hoog na ziekenhuisopname en varieert tussen verschillende opnamediagnose groepen. LZ wordt vaak voor lange tijd gebruikt. Leeftijd, stedelijkheid en diagnose voorspellen LZ en sterfte.

Aanbevelingen: Medewerkers in de gezondheidszorg moeten onderscheid maken tussen patiënten met een slechte prognose en ouderen die profijt hebben van revalidatie. Thuisrevalidatie dient verder geëxploreerd te worden om langdurige opname in een instelling te voorkomen.

Trefwoorden: Ziekenhuisopname, ouderen, langdurige zorg, institutionalisatie, thuiszorg.

INTRODUCTION

Hospitalization in people of 65 years and older is highly prevalent and associated with increased mortality and disability in Activities of Daily Living (ADL, like washing and dressing).[1-3] Disability occurs in approximately one third of hospitalized older people[4;5] and is often seen in vulnerable elderly with accumulating impairments like co-morbidity, cognitive impairments and psychosocial factors.[6] During hospitalization because of an acute illness, the decline in functioning is triggered by contributing factors of hospital admission like restricted mobility, under nutrition and enforced dependence.

As a result of increased disability many patients need long-term care services following hospitalization. Long-term care (LTC) is defined as care which is offered by nurses and nurse-assistants in care institutions and home care settings and mostly exists of help with daily activities such as going in and out of bed, eating, bathing and dressing.[7] Of Dutch older people who lived independent without home-care before hospitalization, 18% need LTC in the year following hospital discharge.[8]

Requirement of LTC is a feared outcome in older people and functional independency is highly valued.[9;10] Maintenance of optimal independence is also of public interest because of the unsustainable high costs associated with LTC.[7] A health care strategy that aims to achieve optimal functioning is rehabilitation.[11] A substantial part of older patients discharged from the hospital to an institution or home with home care have rehabilitation goals. Studies have shown that rehabilitation can improve function and reduce institutionalization and mortality in patients with various geriatric diagnoses.[12;13] On the contrary, a substantial part of elderly referred for rehabilitation in nursing homes following discharge will not reach their premorbid function or even remain institutionalized.[13-15]

It is essential to identify people who are at risk for LTC entrance or mortality after hospitalization in order to provide appropriate care after hospital discharge and set achievable goals for individual patients. From our perspective care utilization and mortality after hospital discharge depends greatly on the reason for hospital admission. Therefore, this cohort study is carried out to provide insight in current long-term care utilization and mortality in six high-volume diagnosis groups in six months after hospitalization and predictors of LTC and mortality in these patients. High-volume hospitalization diagnoses are cardiovascular diseases (25% of all admissions), fall related injury like hip-fracture and lung diseases.[16]

PROBLEM STATEMENT

Hospitalization is a precipitating event that can lead to disability, LTC use and mortality in older people. LTC is a feared and costly outcome and maintenance of optimal independence in older people is of both private and public interest. Rehabilitation has the potential to improve function and prevent institutionalization but is not successful in all patients. To provide appropriate care after hospital discharge it is necessary to have insight in (predictors of) current LTC use and mortality in high-volume diagnosis groups.

AIM

The aim of this study is to describe long-term care utilization and mortality and to identify predictors of LTC and mortality six months after hospitalization in patients from 65 years and older after hospitalization because of six high-volume diagnoses (stroke, pneumonia, myocardial infarction, hip fracture, Chronic Obstructive Pulmonary Disease (COPD) and chronic heart failure). The gained knowledge can be used by nurses and other health care workers to provide appropriate care after hospitalization.

RESEARCH QUESTIONS

1.
What percentage of patients of 65 years and older hospitalized because of stroke, hip-fracture, chronic heart failure, pneumonia, COPD of myocardial infarction use LTC or die in the six months following hospitalization ?

2.
What percentage of patients discharged to a care institution or home with home care still requires LTC or dies three and six months following hospitalization?

3.
Which variables predict long-term care utilization and mortality 6 months after hospitalization in patients of 65 years and older?

METHODS

Data source

For this quantitative retrospective longitudinal observational cohort study medical claims data from the Agis Health Database (AHD) was used. Agis is one of the larger insurance companies in the Netherlands and provides health care cover for approximately 1.2 million residents. The database contains data concerning demographic information of patients and provided health services. The AHD is not completely representative for the entire Dutch population, but it represents the urbanized area of the Netherlands. Because of the economic function of the database the registry is complete and accurate.[17]

Ethical considerations

This study was approved by the scientific committee linked to the AHD which assessed whether conditions for scientific and clinical relevance of our proposal were met. Usage of the AHD is subject to the Dutch Data Protection Act which describes that data used for scientific research may not be traceable to individuals. By means of the policy conditions of Agis patients are being informed about usage of their data for research purposes. Datasets were provided de-identified, were only available for two researchers and were destroyed after use.

Study population

Subjects for the current study were extracted from a dataset from the AHD containing all people of 65 years and older who experienced at least one inpatient hospitalization between July and December 2011. From these patients various separate datasets were provided containing data on demographics, hospitalization, long-term care utilization and mortality. Six high-volume specific diagnoses were identified, two chronic conditions (COPD and chronic heart failure) and four acute conditions (myocardial infarction, stroke, hip-fracture, pneumonia and stroke). Only patients with one of these hospitalization diagnoses (as registered through the diagnostic/treatment code) were included. For patients with more than one hospitalization claim with the defined diagnoses the first claim was used as the index hospitalization. Patients who switched from health care insurer between 2011 and 2012 were excluded because a six months continuous insurance period was needed to provide follow-up data. For all subjects the date of hospital admission was determined with data from the index hospitalization. The follow-up period was calculated through adding six months to the date of hospital admission because data on length of hospital stay and discharge date was lacking.

Dependent variables

The dependent variables were the four possible outcomes in the six months following hospitalization 1) living at home without care, 2) living at home with home care, 3) living in a care institution or in the worst case being 4) deceased. Institutionalized care and home care were defined as having a care indication (as extracted from the dataset containing all LTC indications) for this care. Mortality was extracted from a dataset containing dates of death. Patients who were not deceased and did not have a care indication were considered to be living at home without care.

Independent variables

Various independent variables were used. The variables were chosen because of availability of the information in the AHD. The age at hospital admission was calculated and three age categories were defined; 65-74, 75-84 and 85 years and older. Gender, ethnicity and urbanization were extracted from the database with demographic variables. The categories for ethnicity in the AHD were Dutch, Turkish, Moroccan and Surinamese, based on the patient's surname (for married women the maiden name). Urbanization was a categorical variable expressing the degree of urbanization of the zip code area of the patient. The measure classifies areas according to the address density of the surroundings. The measure has five categories, ranging from very strongly urbanized (mean address density of 2500 or more addresses per square kilometer) until rural (mean address density of 500 or less addresses per square kilometer).[18] For research question three the six diagnosis groups were used as possible predictors by means of a categorical variable.

Data analysis

For continuous variables means and standard deviations were calculated. Frequencies and percentages were calculated for the categorical and dichotomous variables.

Research question 1.

For every diagnosis group it was determined what percentage of patients lived in a care institution, used home care or was deceased in each month of the six months following hospitalization. The remaining patients were considered to be living at home without care.

Research question 2

To answer this question only the patients who received institutionalized care or home care in the first month after hospital discharge were selected. For these patients it was defined what percentage of patients used LTC three and six months after discharge or died in this period.

Research question 3

Since the studied outcome was categorical with four levels a multinomial logistic regression model was used to explore the associations between the independent variables and the dependent variable six months after hospital discharge. In this model the group living at home without home care was chosen as the reference group.

Before performing the regression analysis the variable ethnicity was dichotomized to 'Dutch' and 'Other' because of the low prevalence of other ethnicities. The independent variables male gender, having the Dutch ethnicity, living in a very strongly urbanized area and being diagnosed with a myocardial infarction were chosen as reference categories. First all independent variables were tested in univariate analyses on associations with the dependent variable. Since all variables were significant at $P<.10$ in one or more outcome categories all were included in the final backward model. In the first stage of this backward model all variables were significant in one or more categories at $P<.10$ which meant that no factors could be removed.

To produce a valid logistic regression model, the number of events per variable needed to be at least ten.[19] All analysis were conducted with IBM SPSS statistics, version 20.0 (IBM corp., Armonk, NY).

RESULTS

(table 1)

Demographics

Baseline characteristics of the included subgroups are displayed in table 1. In total 18,788 subjects of 65 years and older were hospitalized between July and December 2011 of which 3,154 (16.8%) met the inclusion criteria and were included in this cohort study. Of the included subjects 744 (23.6%) were admitted to the hospital with stroke, 685 (21.7%) with pneumonia, 511 (16.2%) with a myocardial infarction, 495 (15.7%) with hip fracture, 395 (12.5%) with COPD and 324 (10.3%) with chronic heart failure. The mean age at hospitalization was 76 to 79 years, except for the subgroup hip fracture who had a substantially higher mean age (83). The proportion of males in each subgroup differed, the heart failure group contained the most males (57%) and the hip fracture group contained the smallest percentage of males (23%). The pneumonia group had the highest percentage of immigrants (8.2%). Over 50% of all subjects in each subgroup lived in a strongly to very strongly urbanized area and up to 8% in a rural area.

(figure 1)

Long-term care utilization and mortality after hospitalization

Long-term care utilization and mortality in the six months following hospitalization is described in figure 1. For each hospitalization diagnosis it is displayed what percentage of patients died, received care in a care institution, received home care or did not receive care in every month following hospitalization. Cumulative mortality varied from 16.7% for patients with COPD, up to 26.6% for patients with pneumonia. Most people died within the first month after hospital admission. Institutionalization was mostly seen in patients with stroke and hip fracture (respectively 21.5% and 31.1% one month after hospitalization). Six months after hospitalization 11.7% of patients with stroke and 19% of patients admitted with a hip-fracture were institutionalized. In patients with COPD the percentage of admitted patients increased over time from 5.6% until 8.6%. Institutionalization was limited in patients with myocardial infarction (3.1 at both one and six months) chronic heart failure and pneumonia.

Patients with COPD were most likely to use home care services after hospital discharge, varying from 12.9% one month after hospitalization until 13.9% five months later. In patients with stroke, hip fracture and myocardial infarction the proportion of patients using home care services increased in the studied period. In pneumonia and chronic heart failure home care use remained quite stable over time.

(table 2)

Long-term care utilization and mortality in patients discharged with long-term care

Table 2 shows the outcomes concerning care use and mortality in patients discharged to a care institution or to their homes with home care. It is displayed whether the patients from the six studied subgroups were deceased, institutionalized, received home care or received no LTC three and six months after hospitalization.

In all subgroups three months after hospital discharge more than 48% of all people admitted to a care institution were still institutionalized. In the COPD group the most people remained institutionalized (70%) and of those discharged from the care institution 15% required home care. In patients with stroke, pneumonia, myocardial infarction and hip-fracture >30% lived at home without home care three months after discharge. In patients with heart failure and COPD this was only 6.3% and 15%. A substantial part had returned to a care institution three months later (e.g. 13.3% in the hip-fracture group). At six months, more than 60% off those still institutionalized at three months lived in a care institution.

Mortality was especially high in patients who were discharged to a care facility after hospitalization because of chronic heart failure; 37.5% were deceased at three months. Hip fracture patients discharged to a care institution were most unlikely to be deceased three months after hospitalization (3.9%).

Of patients discharged to their homes with home care >55% still required home care at three months and 45%-72% at six months. Home care use directly after discharge was temporary in >21% of those hospitalized because of stroke, pneumonia, myocardial infarction and hip-fracture. Mortality at three months for patients discharged with home care was lower than in those discharged to an institution, and was highest in the chronic heart failure group (25%). After six months still a large proportion of those using home care at three months still required help at their homes and around 10% were deceased.

(table 3)

Predictors for long-term care and mortality

Six months after hospitalization 1886 (59.8%) patients were alive and did not use long-term care, 724 (23%) were deceased, 291 (9.2%) received care in an institution and 253 (8%) required home care. Since the smallest group contained 253 subjects, we were able to include a maximum of 25 variables in the regression model. Table 3 shows the odds ratios (OR) for using home care, living in an institution or mortality compared to living at home without home care.

Age, hospitalization diagnosis and urbanization were found to be predictors for all negative outcomes (home care, institutionalization and mortality). Older patients were more likely to receive home care, be institutionalized or be deceased six months after hospitalization. Patients suffering from COPD had the highest odds of receiving home care (odds ratio 2.29, 95% confidence interval = 1.46-3.59; *P*=<.001). Pneumonia, stroke, hip fracture and COPD predicted institutionalization, with particularly strong effects observed for hip fracture (odds ratio 6.00, 95% confidence interval 3.47-10.37; *P*=<.001) and stroke (odds ratio 4.15, 95% confidence interval 2.43-7.07; *P*=<.001). Patients with pneumonia or stroke were significantly more likely to be deceased. Living in a less urbanized area was protective for all negative outcomes with especially strong protective effects for patients living in rural areas on receiving home care (odds ratio 0.08, 95% confidence interval 0.02-0.34; *P*=.001) or being institutionalized (odds ratio 0.05, 95% confidence interval 0.01-0.21; *P*=<.001) six months after hospitalization.

DISCUSSION

This study with medical claims data of 3,154 older people after hospitalization because of six high-volume diagnoses shows that long-term care utilization and mortality after hospitalization is high. This study identified different LTC and mortality rates in the studied diagnosis groups which are evidenced by the results presented in figure 1. Of patients discharged with LTC more than half still used LTC three months after hospitalization and a substantial part still required LTC at six months, here also were differences observed between different diagnosis groups. Age, urbanization and diagnosis were identified as predictors for long-term care use and mortality six months after discharge.

Although earlier studies described LTC and mortality in more heterogeneous groups of patients various findings of this study are in line with previous work. High rates of long-term care utilization after hospitalization in adults were previously reported in another Dutch database study[8] and in a large retrospective case-cohort study in America.[20] A prospective cohort study in the Netherlands showed that 35% of older patients acutely admitted to the hospital die within one year after hospitalization.[2] High rates of continued requirement of LTC after hospitalization were also previously described[13;20] and may be well explained by poor functional outcomes after hospitalization in patients with cardiac diseases and COPD,[21;22] hip fracture,[23] stroke[24] and various medical diagnoses.[3] Different studies reported higher age and specific diagnosis groups (e.g. stroke and femoral fractures) as predictors for poor outcomes six months after hospitalization.[8;20]

In this study a strongly protective effect for care utilization and mortality was observed for patients living in less urbanized areas. Multiple other studies identified different social en economic predictors of home care services.[25-27] An earlier cited American study also showed geographic variation in risk of nursing home admission after hospitalization. This was hypothesized to depend on different reasons for referral to nursing homes in varying regions.[20] The mechanism of this protective factor in our study is unknown and should be further investigated.

We were able to present unique data on care use by using medical claims data from the AHD. Usage of this database made it possible to include a large population of patients living throughout the whole country treated in different hospitals and care institutions. Loss to follow-up and missing data was not present which improved validity of this study. Working with this large dataset also introduced some limitations which need to be addressed. At first, the dataset lacked information about important influencing factors on care utilization like living arrangements, length of hospital stay and presence of dementia.[28-30] Also data on comorbidity was lacking and unfortunately we did not have data on long-term care use before

hospitalization. Because of the retrospective design it was not possible to collect additional information.

RECOMMENDATIONS

The final aim of this study was to help nurses and other health care workers to provide appropriate care after hospital discharge in older patients that they deal with on a day-to-day basis. From our opinion this study addresses some important concerns.

At first, a large proportion of patients in this study, up to 26%, died in the six months following hospitalization. This points out that many patients who present in the hospital because of an acute or chronic condition have a poor prognosis. Identification of this group is important. This study identified high age, hospitalized with stroke or pneumonia and living in a very strongly urbanized area as predictors for mortality at six months. In patients with poor prognosis patients and health care workers need to discuss wishes for living arrangements and needs for professional help at the end-of-life. Although several studies pointed out that most people wish to die at home,[31;32] in the past decades the number of patients dying in the hospital or care institutions increased sharply.[33]

Patients who do have the potential to rehabilitate on the other hand also need to be identified and offered rehabilitation. Results of an ongoing American cohort study show that in patients referred for rehabilitation after acute hospitalization performance on physical tests, absence of cognitive impairments and significant weight loss predict recovery.[34] This can be taken into account when considering rehabilitation.

This study showed that a substantial part of patients are referred to a care institution after hospitalization and a large proportion of patients remain institutionalized. This continued institutionalization was especially high in patients with chronic diseases (COPD/chronic heart failure), but also in patients with acute conditions around 50% still lived in a care institution at three months. Predictors of institutionalization at six months were high age, living in strongly urbanized areas and diagnosis of COPD, hip-fracture and stroke. Institutionalization is, as discussed previously, an undesirable outcome. An alternative for rehabilitation in an institute that gained attention is home-rehabilitation. Although there is insufficient evidence to compare the efficiency of home rehabilitation in older people to rehabilitation in an institution[35] studies in cardiac rehabilitation and stroke showed that rehabilitation in the home is less expensive and has promising results.[36;37] When possible, health care workers should consider this type of rehabilitation and more research should be performed to the effectiveness of this care.

CONCLUSION

Long-term care utilization and mortality after hospitalization in older people is high and differs between the studied six high-volume diagnoses. More than half of patients discharged to LTC still require LTC three months after hospitalization and a substantial part still use LTC at six months. Age, urbanization and diagnosis were identified as predictors for long-term care use and mortality six months after discharge. Several recommendations for both clinical practice and research were made to provide appropriate care after hospitalization in older people.

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GRAPHICS

Table 1.

Baseline characteristics of subgroups by hospitalization diagnosis

	Total group n=3154	**Stroke** n=744	**Pneumonia** n=685	**Myocardial infarction** n=511	**Hip fracture** n=495	**COPD** n=395	**Chronic heart failure** n=324
Age, mean(sd)	78.9 (7.9)	78.8 (7.6)	78.8 (7.4)	77.3 (7.9)	83.3 (7.7)	76.1 (6.7)	78.9 (8.3)
65-74 (%)	31.4	30.4	30.8	40.7	15.2	42.3	32.1
75-84 (%)	41.3	44	45.5	36.8	34.7	46.1	37.3
85+ (%)	27.3	25.7	23.6	22.5	50.1	11.6	30.6
Gender (% male)	44.3	41.7	54.3	50.7	22.8	51.1	56.5
Ethnicity							
Dutch (%)	94.2	94.1	91.8	93.9	98.2	94.7	93.2
Turkish (%)	2.0	1.6	3.6	1.6	0.4	2.3	2.2
Moroccan (%)	2.3	1.9	3.6	2.9	0.4	2.8	2.2
Surinamese (%)	1.5	2.4	0.9	1.6	1	0.3	2.5
Urbanization							
Very strongly urban (%)	30.6	30.5	28.3	33.9	29.5	37.7	30.2
Strongly urban (%)	28.1	25.4	26.4	30.9	27.9	26.6	28.4
Moderately urban (%)	16.2	20.8	23.4	17.0	19	15.7	21.0
Little urban (%)	19.5	16.7	17.8	13.3	16.8	15.7	12.3
Rural (%)	5.7	6.6	4.1	4.9	6.9	4.3	8.0

Figure 1.

Mortality and long-term care utilization in six months following hospitalization by hospitalization diagnosis

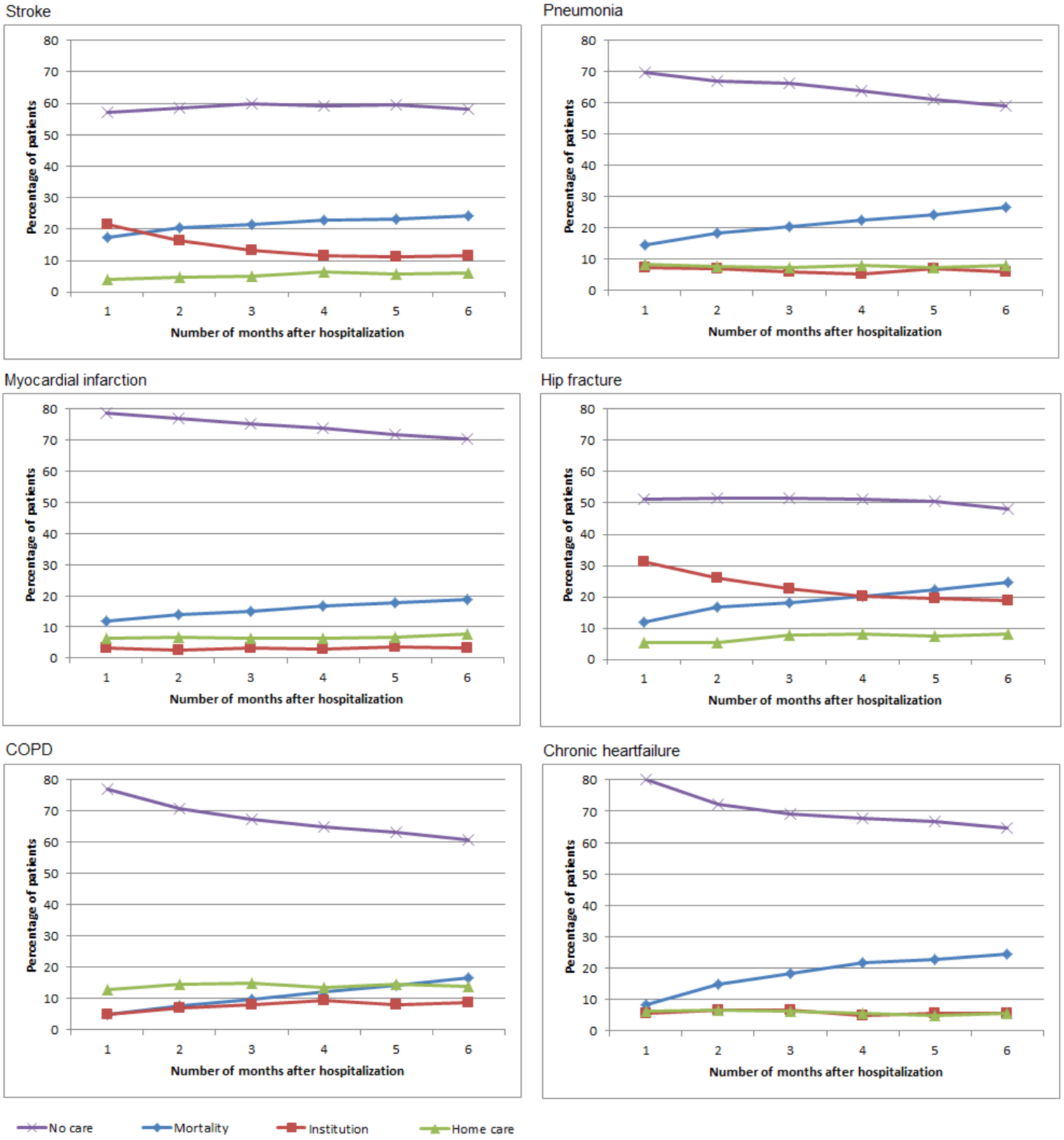

Table 2.

Mortality and long-term care utilization at three and six months for patients institutionalized or receiving home care one month after hospitalization

		Institutionalized one month after hospitalization				Home care one month after hospitalization			
		3 months		6 months		3 months		6 months	
		n (%)		n (%)		n (%)		n (%)	
Stroke	n=160	Deceased	18 (11.3)			Deceased	1 (3.7)		
		Institution	81 (50.6)	Deceased	8 (9.9)	Institution	1 (3.7)	Deceased	0 (0)
				Institution	53 (65.4)			Institution	0 (0)
				Home care	5 (6.2)			Home care	0 (0)
				No care	15 (18.5)			No care	1 (100)
		Home care	6 (3.8)	Deceased	0 (0)	Home care	18 (66.7)	Deceased	2 (11.1)
				Institution	0 (0)			Institution	1 (5.6)
				Home care	5 (83.3)			Home care	12 (66.7)
				No care	1 (16.7)			No care	3 (16.7)
		No care	55 (34.4)	Deceased	0 (0)	No care	7 (25.9)	Deceased	1 (14.3)
				Institution	6 (10.9)			Institution	1 (14.3)
				Home care	6 (10.9)			Home care	0 (0)
				No care	43 (78.2)			No care	5 (71.4)
Pneumonia	n=50	Deceased	7 (14)			Deceased	4 (7.1)		
		Institution	26 (52)	Deceased	2 (7.7)	Institution	1 (1.8)	Deceased	0 (0)
				Institution	16 (61.5)			Institution	0 (0)
				Home care	1 (3.8)			Home care	1 (100)
				No care	7 (26.9)			No care	0 (0)
		Home care	2 (4)	Deceased	0 (0)	Home care	38 (67.9)	Deceased	5 (13.2)
				Institution	0 (0)			Institution	0 (0)
				Home care	1 (50)			Home care	27 (71.1)
				No care	1 (50)			No care	6 (15.8)
		No care	15 (30)	Deceased	3 (20)	No care	13 (23.3)	Deceased	0 (0)
				Institution	3 (20)			Institution	0 (0)
				Home care	3 (20)			Home care	2 (15.4)
				No care	6 (40)			No care	11 (84.6)
Myocardial infarction	n=18	Deceased	2 (11.1)			Deceased	2 (6.3)		
		Institution	9 (50)	Deceased	0 (0)	Institution	1 (3.1)	Deceased	0 (0)
				Institution	(77.9)			Institution	1 (100)
				Home care	0 (0)			Home care	0 (0)
				No care	2 (22.1)			No care	0 (0)
		Home care	1 (5.6)	Deceased	0 (0)	Home care	22 (68.8)	Deceased	2 (9.1)
				Institution	0 (0)			Institution	1 (4.5)
				Home care	1 (100)			Home care	16 (72.7)
				No care	0 (0)			No care	3 (13.6)
		No care	6 (33.3)	Deceased	1 (16.7)	No care	7 (21.9)	Deceased	1 (14.3)
				Institution	0 (0)			Institution	0 (0)
				Home care	1 (16.7)			Home care	0 (0)
				No care	4 (66.7)			No care	6 85.7)

		Institutionalized one month after hospitalization				Home care one month after hospitalization			
		3 months		6 months		3 months		6 months	
		n (%)		n (%)		n (%)		n (%)	
Hip fracture	n=154	Deceased	6 (3.9)			Deceased	0 (0)		
		Institution	75 (48.7)	Deceased	7 (9.3)	Institution	0 (0)	Deceased	0 (0)
				Institution	47 (62.7)			Institution	0 (0)
				Home care	7 (9.3)			Home care	0 (0)
				No care	14 (18.7)			No care	0 (0)
		Home care	13 (8.4)	Deceased	1 (7.7)	Home care	20 (74.1)	Deceased	1 (5)
				Institution	0 (0)			Institution	0 (0)
				Home care	7 (53.8)			Home care	9 (45)
				No care	5 (38.5)			No care	10 (50)
		No care	60 (39)	Deceased	2 (3.3)	No care	7 (25.9)	Deceased	0 (0)
				Institution	8 (13.3)			Institution	0 (0)
				Home care	9 (15)			Home care	1 (14.3)
				No care	41 (68.3)			No care	6 (85.7)
COPD	n=20	Deceased	0 (0)			Deceased	6 (12)		
		Institution	14 (70)	Deceased	2 (14.3)	Institution	3 (6)	Deceased	1 (33.3)
				Institution	11 (78.6)			Institution	2 (66.7)
				Home care	0 (0)			Home care	0 (0)
				No care	1 (7.1)			No care	0 (0)
		Home care	3 (15)	Deceased	1 (33.3)	Home care	36 (72)	Deceased	6 (16.7)
				Institution	0 (0)			Institution	1 (2.8)
				Home care	1 (33.3)			Home care	25 (69.4)
				No care	1 (33.3)			No care	4 (11.1)
		No care	3 (15)	Deceased	0 (0)	No care	5 (10)	Deceased	2 (40)
				Institution	2 (66.7)			Institution	1 (20)
				Home care	0 (0)			Home care	0 (0)
				No care	1 (33.3)			No care	2 (40)
Heart failure	n=16	Deceased	6 (37.5)			Deceased	5 (25)		
		Institution	9 (56.3)	Deceased	0 (0)	Institution	2 (10)	Deceased	2 (100)
				Institution	8 (88.9)			Institution	0 (0)
				Home care	0 (0)			Home care	0 (0)
				No care	1 (11.1)			No care	0 (0)
		Home care	0 (0)	Deceased	0 (0)	Home care	11 (55)	Deceased	1 (9.1)
				Institution	0 (0)			Institution	1 (9.1)
				Home care	0 (0)			Home care	6 (54.5)
				No care	0 (0)			No care	3 (27.3)
		No care	1 (6.3)	Deceased	0 (0)	No care	2 (10)	Deceased	0 (0)
				Institution	0 (0)			Institution	0 (0)
				Home care	0 (0)			Home care	0 (0)
				No care	1 (100)			No care	2 (100)

Table 3.

Multinomial logistic regression model comparing the group who lived at home without home care six months after hospitalization with the groups who received home care, care in an institution or were deceased

	Home with care (n=253)		Institution (n=291)		Deceased (n=724)	
Factor	***P*-value**	**Odds ratio (95% confidence interval)**	***P*-value**	**Odds ratio (95% confidence interval)**	***P*-value**	**Odds ratio (95% confidence interval)**
Age	<.001	1.05 (1.03-1.07)	<.001	1.06 (1.04-1.08)	<.001	1.09 (1.07-1.10)
Gender						
Male		1.00		1.00		1.00
Female	.176	1.21 (0.92-1.60)	.09	1.27 (0.96-1.68)	.464	0.93 (0.78-1.12)
Diagnosis						
Myocardial infarction		1.00		1.00		1.00
Pneumonia	.317	1.25 (0.80-1.95)	.008	2.18 (1.23-3.89)	.002	1.59 (1.18-2.14)
Stroke	.884	0.97 (0.61-1.53)	<.001	4.15 (2.43-7.07)	.009	1.49 (1.10-2.00)
Hip fracture	.299	1.30 (0.80-2.11)	<.001	6.00 (3.47-10.37)	.103	1.32 (0.95-1.84)
Heart failure	.358	0.76 (0.42-1.37)	.278	1.48 (0.73-2.99)	.185	1.27 (0.89-1.82)
COPD	<.001	2.29 (1.46-3.59)	<.001	3.16 (1.73-5.77)	.419	1.16 (0.81-1.67)
Ethnicity						
Dutch		1.00		1.00		1.00
Other	.205	1.39 (0.84-2.31)	.051	0.47 (0.22-1.00)	.438	0.85 (0.56-1.29)
Urbanization						
Very strongly urban		1.00		1.00		1.00
Strongly urban	.578	0.91 (0.66-1.26)	.252	0.84 (0.61-1.14)	.006	0.72 (0.56-0.91)
Moderatly urban	.009	0.58 (0.38-0.87)	<.001	0.44 (0.29-0.66)	.001	0.63 (0.48-0.83)
Little urban	.001	0.47 (0.31-0.72)	<.001	0.35 (0.23-0.53)	.003	0.68 (0.53-0.88)
Rural	.001	0.08 (0.02-0.34)	<.001	0.05 (0.01-0.21)	.002	0.52 (0.35-0.79)