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Original Study

Social Services Post-discharge and Their Association With Readmission in a 2016 Swedish Geriatric Cohort

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A B S T R A C T

Objectives: To describe the social services received by a 2016 Swedish cohort after discharge from inpatient geriatric care and to analyze the association between level of social services post-discharge and 30-day readmission.
Design: Observational, closed-cohort study.
Setting and Participants: All patients admitted to 1 of 3 regionally operated inpatient geriatric care settings in Region Stockholm, Sweden, in 2016 (n = 7453).
Methods: Individual-level data from medical records and population registries were linked using unique personal identification numbers. Descriptive statistics were reported for 4 levels of municipal social services post-discharge: long-term care, 1 to 50 home help hours per month, >50 home help hours per month, and no home help. Multinomial logistic regression was performed to analyze the association between level of social services post-discharge and 3 outcomes within 30 days: readmission, death without readmission, or neither readmission nor death.
Results: Results show that almost 11% of patients were discharged to long-term care and 54% received municipal home help services. Individuals with no municipal home help or with 1 to 50 hours per month were more likely to be readmitted within 30 days compared with those in long-term care. Living with more than 50 hours of help was not associated with an increased likelihood of 30-day readmission.
Conclusions and Implications: Patients who received inpatient geriatric care are significant users of municipal social services post-discharge. Living in long-term care or with extensive home help appears to be a protective factor in preventing readmission compared with more limited or no home help services. Care transitions for this frail patient group require careful social care planning. Supporting individuals discharged with fewer social service hours may help reduce readmissions.

Older adults are a group with a high prevalence of multiple morbidities and social care needs, particularly after age 85.[1,2] Driven by citizen preferences and economic factors, many countries with aging populations have adopted policies to promote aging at home, instead of in residential facilities.[3,4] In Sweden, this prioritization has led over the past 30 years to a significant decrease in the proportion of older adults in long-term care. As a result, community-dwelling older adults today have higher care needs than previously.[5]

Transitions from hospital to home for this age group often demand complex coordination between care providers.[6] Research on geriatric cohorts shows that between 12.6% and 14.6% of patients return to hospital within 30 days.[7-9] Readmissions come with hospitalization risks like decreased function,[10] falls, delirium, and pressure ulcers.[11] Although many readmissions are medically motivated, others are

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driven by unmet personal care needs after discharge.[12] Previous geriatric studies have identified polypharmacy, frailty,[13] decreased function,[14] number of diagnoses, and male sex[15,16] as individual risk factors for readmission. Researchers emphasize, however, the need to understand readmissions within the context of community-level social services post-discharge.[17,18]

To date, there is limited research on the association between social services and geriatric readmissions after inpatient care. In Sweden, one acute care hospital study showed that individuals with home help were more likely to be readmitted vs those without help or in long-term care, but did not explore differences in degrees of help.[19] Multisite international research has reported an increased readmission risk for older adults with more extensive service levels (either receiving personal care at home or living in long-term care) after discharge from internal medicine units.[20] Analysis of geriatric readmissions from emergency wards has also found more comprehensive home help to be associated with readmission vs less support[21] and a stronger association with increasing minutes of home help.[22] No studies have been identified exploring these patterns following inpatient geriatric care. Research from this type of care environment has pointed out the importance of supporting patients' activities of daily living (ADLs) in preventing readmission.[23] Because this old and frail patient group likely relies heavily on social services, a comprehensive multisite examination of how varying help levels may predict readmission is needed.

This study had 2 objectives: (1) to describe the social services received by a 2016 cohort after discharge from inpatient geriatric care, and (2) to analyze the association between level of social services post-discharge and 30-day readmission. Our hypothesis, informed by earlier literature from other care settings,[19,20,22] is that individuals with more than 50 home help hours per month will exhibit the highest odds of 30-day readmission. Extensive services (>50 home help hours or long-term care residency)[24] can be seen as a marker for individual frailty and more complex care needs. After controlling for covariates, these characteristics may heighten readmissions odds from home but not from residential settings where continuous medical and social support is available.

Methods

Study Design, Population, and Setting

This closed-cohort study used registry data from 2016–2017. The sample included all patients admitted to 1 of 3 inpatient geriatric care settings operated by Region Stockholm, Sweden in 2016. An individual's final admission in 2016 was registered as the index admission. Individuals were excluded if they died during index admission, or did not live in Region Stockholm during index admission or in the 30 days post-discharge. This cohort has been previously described and validated in relation to a regional cohort from inpatient geriatric care in Region Stockholm.[15,25]

Geriatric care in Sweden is under joint jurisdiction with most health care services funded and managed regionally and social care (long-term care and home help) municipally. These systems are primarily publicly funded with user fees of 4% to 5% and maximum copayments. Both public and private providers deliver this subsidized care.[5,26] Social care in the form of home help (personal care and housekeeping) is universally available following a municipal needs assessment. Individuals with high care needs can be granted around-the-clock help at home, or long-term care when home help is insufficient.[27,28] Community-dwelling older adults with difficulty accessing outpatient health centers can also receive medical care and rehabilitation services at home (home health care).

Hospital care in Sweden includes specialized geriatric care for older adults requiring medical services for acute or chronic conditions, or rehabilitation in an inpatient setting. Patients typically have multiple morbidities or personal care needs where interdisciplinary team care is desirable. Admissions are made from more medically specialized acute care hospitals or from the emergency ward, ambulance, home (by a general practitioner), or long-term care.[29] At the time of the study, Region Stockholm had 12 inpatient geriatric care facilities with 1015 geriatric beds.[30] Three of these are publicly-operated and the focus of this research project. This region has the highest number of geriatric beds per capita with this type of care accounting for 11.5% of all somatic inpatient admissions in 2016.[31] Recent data show that almost 20% of patients 65 and older admitted to an acute care hospital are discharged to inpatient geriatric care (M. Ambjörnsson, Analyst, Region Stockholm, personal communication, 2023). All 3 geriatric care settings in this study had multiple wards targeting specific patient groups (eg, acute medicine, stroke, or orthopedic rehabilitation) and, while independently operated, were found at hospital facilities without emergency services.

Ethical approval for this study was granted by the Regional Ethical Board in Stockholm (reference numbers 2013/1620-31/2, 2018/247-32 and 2019-02837), who determined that individual informed consent was not required. The study was registered on the Open Science Framework (DOI: 10.17605/OSF.IO/8KNRU).

Data Sources and Variables

Data from several sources were linked using a pseudonymized personal identification number. Data sources and study variables are outlined in Table 1.

The Social Services Register (SSR) includes national data on home help and long-term care reported monthly by municipalities.[32] SSR data from the month of geriatric discharge determined living arrangement and service types. Home help hours granted in the 30 days post-discharge were calculated based on the 2 SSR months post-discharge. Supplementary Material 1 outlines this calculation. Individuals granted personal care or practical help but 0 home help hours were excluded from analyses, with this discrepancy interpreted as a reporting error. Those discharged to Danderyd municipality before August 1, 2016, and Täby municipality after September 30, 2016, were also excluded, because research shows that these municipalities registered extreme outliers for mean home help hours during these months.[28] Supplementary Figure 1 displays a flowchart of study participants.

Independent variable

The independent variable was the level of social services granted in the 30 days post-discharge. Individuals were classified into 1 of 4 groups: living in long-term care, at home with between 1 and 50 hours of home help per month, at home with more than 50 hours of home help per month, or at home without registered home help hours. More than 50 hours was selected as the cutoff because it has previously identified individuals with extensive care needs in Sweden.[24]

Outcome variable

Three outcomes were considered within 30 days of discharge. Individuals were classified as (1) readmitted, (2) dying without a readmission, or (3) not readmitted or dying. A readmission is defined as an admission to any inpatient department after discharge. The exception to this is direct transfer from inpatient geriatric care to another inpatient unit, which was not considered a readmission. Patients who died following readmission were analyzed in the readmission group. Death was included as an outcome because it is a significant competing event to readmission in geriatric populations.[33] As death prevents future readmission, a social service group with high 30-day mortality may have a lower likelihood of 30-day readmission.

Table 1
Sources for Data Collection and Study Variables

Data Source	Study Variables
SSR, National Board of Health and Welfare	Home help hours granted in the 30 days post-discharge, Living arrangement and service types granted in month of discharge (Personal care, Practical services, Security alarm, Meal distribution, Accompaniment services, Relief of a relative, Adult day activites, Short-term care)
Electronic Medical Records, Index Admission	Age, Sex, Number of diagnoses, Number of medications, Barthel Index, Rivermead Mobility Index, Downtown Fall Risk Index, Norton Pressure Ulcer Risk Screening, MNA, Length of index admission, Death during index admission
Stockholm Regional Healthcare Data Warehouse (VAL) Database	Readmission to inpatient care within 30 days of discharge
National Registries, Statistics Sweden	Marital status, Education, Income, Region of birth, Date of death

SSR, Social Services Register.

Covariates

Previous literature, clinical reasoning, and available data informed our choice of covariates for the multinomial model. Sociodemographic factors included age, sex, region of birth, level of education, annual disposable income, and marital status. Annual disposable income was converted from a continuous to categorical variable based on quartiles. Measures of health status were polypharmacy (defined as 5 or more continuous medications and modeled as a binary variable), length in days of index admission, number of diagnoses, and dementia diagnosis. Diagnoses were extracted from all those registered at index admission.

Three risk screening measures (Mini Nutritional Assessment [MNA], Norton Pressure Ulcer Risk Screening, and Downton Fall Risk Index) were also used. After conversion to binary variables, an MNA score $\leq$11 was considered at risk for malnutrition,[34] a Norton score $\leq$20 as at risk for a pressure ulcer,[35] and a Downton score $\geq$3 as high fall risk.[36] The final covariate, the Barthel Index (0–100), measures independence in personal care activities of daily living (P-ADLs), with 100 as full independence. This variable was also presented categorically in descriptive analysis ($\leq$50 as severe dependence, 51–75 as moderate dependence, and $>$75 as mild dependence/independence), similar to other geriatric research.[37]

Descriptive variables

The Rivermead Mobility Index (0–15) was analyzed descriptively, but excluded from the regression analysis because of a high correlation with the Barthel Index (Spearman correlation, $\rho = 0.81$). Variables for home help types had many missing values and were therefore only analyzed descriptively.

Statistical Analyses

Descriptive statistics were reported for the 4 social service groups. Frequency and percentage were presented for categorical variables, mean and standard deviation (SD) for normally distributed variables, or median and interquartile range (IQR) for non-normally distributed and ordinal variables. Q-Q plots determined if continuous variables were normally distributed. Comparisons between groups were completed using χ^2 tests for categorical variables, analysis of variance tests for normal distributions, and Kruskal-Wallis tests for non-normal distributions and ordinal variables. Given a statistically significant *P* value ($<$.05), post hoc tests with a Bonferroni-adjusted *P* value were conducted to determine group differences.

To analyze the association between level of social services and readmission, multinomial regression was performed. This method has previously been applied in research on geriatric care settings and 30-day readmission.[7] Correlation analyses of covariates were first conducted to avoid multicollinearity. Pearson's correlation coefficient was used for normal distributions and Spearman's correlation coefficient for non-normal and ordinal distributions. Phi tests were performed for binary variables and Cramer's V tests for categorical variables with more than 2 levels. The covariates outlined previously were entered into the model. Only individuals with no missing values for all covariates were included (n = 6458). Long-term care was assigned as the reference category to highlight comparisons between this group and other service levels. This is important given the difference in care level between long-term care and community-dwelling groups, and that this population is sometimes omitted from studies on social services and readmissions.[21,22] SAS, version 9.4 was used for statistical analyses (SAS Institute, Inc.).

Results

Descriptive Analysis of Social Services Post-discharge

Table 2 displays baseline characteristics of study participants (n = 7453) by social service group. Almost 11% lived in long-term care after discharge and 54.2% had registered home help hours. Individuals were almost equally distributed between 1 and 50 hours per month (26.6%) and more than 50 hours per month (27.6%). Thirty-five percent of the sample had no home help hours, although 18.4% of this group had a security alarm for emergency, around-the-clock help.

Statistically significant sociodemographic differences existed between the social service groups. Long-term care residents were the oldest group with the average age of each group declining as home help hours decreased. The group without home help included a lower proportion of women (56.1%), a greater proportion who were married (41.5%), and a higher median disposable income vs other groups.

Health status was poorer in groups with more comprehensive social services. The mean number of diagnoses was highest among long-term care residents and those with more than 50 hours of help. Long-term care residents also had the highest proportion with dementia (33.0%), and at risk for malnutrition (94.7%), falls (95.5%), and pressure ulcers (57.7%), with these numbers declining as social service levels decreased. Polypharmacy was high across all groups, although least common among those without help (79.4%). This group also had the highest functional status compared with the other 3 groups.

The long-term care group had a lower proportion readmitted within 30 days (13.6%) vs those with more than 50 hours (15.9%), between 1 and 50 hours (17.6%), or without help (17.8%). However, following Bonferroni post hoc tests, this difference was only statistically significant between groups in long-term care and without help. Those with more than 50 hours had a lower 30-day mortality (3.3%) compared with other groups.

Individuals with home help hours received a median of 51 hours (62.9 IQR) in the month post-discharge. A security alarm was the most common service (n = 3322), followed by personal care (n = 2126) and practical help (n = 2041) (Figure 1). Practical help (eg, cooking, cleaning), personal care (eg, dressing, hygiene), and accompaniment services, however, had missing values for more than 1500 individuals. Figure 2 shows the distribution of personal care and practical help by age and sex. Most personal care and practical help recipients were older than 80 with more women than men receiving services, particularly after age 84.

Table 2
Characteristics of Study Cohort by Social Service Level Post-discharge

	Long-Term Care (1)	>50 Hours of Home Help/Mo (2)	1–50 Hours of Home Help/Mo (3)	No Home Help (4)	*P* Value	Post hoc Comparisons*
All, n (%)	795 (10.7)	2060 (27.6)	1985 (26.6)	2613 (35.1)		
Age, mean (SD)	87.4 (7.4)	84.9 (7.7)	83.6 (8.1)	80.7 (8.0)	<.001†	1≠2≠3≠4
Sex, female, n (%)	533 (67.0)	1421 (69.0)	1295 (65.2)	1466 (56.1)	<.001‡	1≠4; 2≠4; 3≠4
Region of birth, n (%)					<.001‡	1≠2; 2≠4
Sweden	669 (84.2)	1702 (82.7)	1658 (83.6)	2115 (81.0)		
Other Nordic country	50 (6.3)	137 (6.7)	152 (7.7)	222 (8.5)		
Other European country	62 (7.8)	128 (6.2)	116 (5.8)	190 (7.3)		
Outside Europe	14 (1.8)	92 (4.5)	58 (2.9)	84 (3.2)		
Annual disposable income category, n (%)					<.001‡	1≠4; 2≠4; 3≠4
0–25th percentile	200 (25.2)	528 (25.6)	514 (25.9)	620 (23.7)		
26–50th percentile	232 (29.2)	533 (25.9)	527 (26.6)	570 (21.8)		
51–75th percentile	176 (22.1)	525 (25.5)	508 (25.6)	654 (25.0)		
76–100th percentile	187 (23.5)	474 (23.0)	435 (21.9)	767 (29.4)		
Level of education, n (%)					<.001‡	1≠2; 1≠3; 1≠4
Primary	220 (28.8)	441 (22.3)	420 (21.6)	525 (20.6)		
Lower secondary	97 (12.7)	249 (12.6)	260 (13.4)	320 (12.6)		
Upper secondary	285 (37.3)	715 (36.2)	717 (36.9)	907 (35.6)		
Post secondary	105 (13.7)	359 (18.2)	377 (19.4)	540 (21.2)		
Higher post-secondary	57 (7.5)	210 (10.6)	167 (8.6)	257 (10.1)		
Marital status, n (%)					<.001‡	1≠3; 1≠4; 2≠3≠4
Married	149 (18.7)	366 (17.8)	508 (25.6)	1084 (41.5)		
Widowed	423 (53.2)	1014 (49.2)	847 (42.7)	701 (26.8)		
Never married	68 (8.6)	225 (10.9)	215 (10.8)	275 (10.5)		
Divorced	155 (19.5)	455 (22.1)	414 (20.9)	551 (21.1)		
Medical history						
Number of diagnoses, mean (SD)	4.8 (1.7)	4.9 (1.8)	4.6 (1.8)	4.4 (1.8)	<.001	1≠3; 1≠4; 2≠3≠4
Polypharmacy (≥5), n (%)	707 (88.9)	1786 (86.7)	1675 (84.4)	2076 (79.4)	<.001‡	1≠3; 1≠4; 2≠4; 3≠4
Dementia diagnosis, n (%)	262 (33.0)	354 (17.2)	190 (9.6)	193 (7.4)	<.001‡	1≠2≠3≠4
Index admission length in days, median (IQR)	8.0 (6.0)	9.0 (7.0)	8.0 (5.0)	7.0 (6.0)	<.001§	1≠2≠3≠4
Functional status						
Barthel ADL Index (0–100)					<.001§	1≠2≠3≠4
Median (IQR)	25 (35.0)	45 (35.0)	65.0 (35.0)	65 (40.0)		
Mild dependence/independence, n (%)	27 (3.8)	147 (7.8)	479 (26.7)	827 (35.6)		
Moderate dependence, n (%)	92 (13.1)	555 (29.5)	691 (38.6)	705 (30.3)		
Severe dependence, n (%)	585 (83.1)	1177 (62.6)	621 (34.7)	792 (34.1)		
Rivermead Mobility Index (RMI) (0–15), median (IQR)	2.0 (4.0)	3.0 (4.0)	6.0 (5.0)	7.0 (6.0)	<.001§	1≠2≠3≠4
Risk screenings						
Pressure ulcer risk, Norton ≤ 20, n (%)	459 (57.7)	750 (36.4)	370 (18.6)	484 (18.5)	<.001‡	1≠2≠3; 1≠4; 2≠4
Malnutrition risk, MNA ≤ 11, n (%)	753 (94.7)	1821 (88.4)	1615 (81.4)	1986 (76.0)	<.001‡	1≠2≠3≠4
Fall risk, Downton≥3, n (%)	744 (95.5)	1868 (91.9)	1688 (85.9)	2035 (78.6)	<.001‡	1≠2≠3≠4
Outcomes						
Readmission within 30 days, n (%)	108 (13.6)	328 (15.9)	349 (17.6)	465 (17.8)	.021‡	1≠4
Death within 30 days, n (%)	67 (8.4)	69 (3.3)	120 (6.0)	200 (7.7)	<.001‡	1≠2; 2≠3; 2≠4

*The symbol ≠ is used to indicate which groups are significantly different from one another following post hoc analysis.
†Analysis of variance test.
‡Chi-square test.
§Kruskal-Wallis test.

Results from Multinomial Regression Analysis

Adjusted results from the multinomial model (Table 3) revealed an increased odds of 30-day readmission for the groups with 1 to 50 hours of help (odds ratio [OR], 1.62; 95% CI, 1.22–2.16) and no home help (OR, 1.61; 95% CI, 1.21–2.15) vs the long-term care group. Having more than 50 home help hours was associated with a decreased odds of death without readmission (OR, 0.49; 95% CI, 0.28–0.85) compared with long-term care, whereas the group with no home help had an increased odds of death without readmission (OR, 2.79; 95% CI, 1.70–4.59). Supplementary Table 1 shows adjusted results for all covariates.

Discussion

Patterns of Social Services Post-discharge

Individuals recently discharged from inpatient geriatric care receive high levels of social services. More than half of our sample lived in long-term care (10.7%) or received home help (54.2%). The proportion in long-term care reflects the larger Swedish population age 80 and older (11.9%), but home help levels are greater than those nationally (22%).[38] Home help users in our cohort received a median of 51 hours per month, which also exceeds the national mean of 23 hours per month for adults older than 65.[39] These findings point to higher care needs among individuals after inpatient geriatric care vs the general older adult population, and even home help users nationally.

The groups with home help were older with a greater number of diagnoses than those without help, both findings aligned with a Swedish national survey.[40] Our results also show a higher proportion with dementia and increased dependence in P-ADLs in groups with higher service levels. This finding matches research in Stockholm where cognitive impairment and personal care needs were identified as predictors of long-term care or more home help.[41]

The Association Between Social Services and 30-Day Readmission

Our results showed that receiving more limited home help (1–50 hours/month) or no home help was significantly associated with hospital readmission, vs living in long-term care. There was no

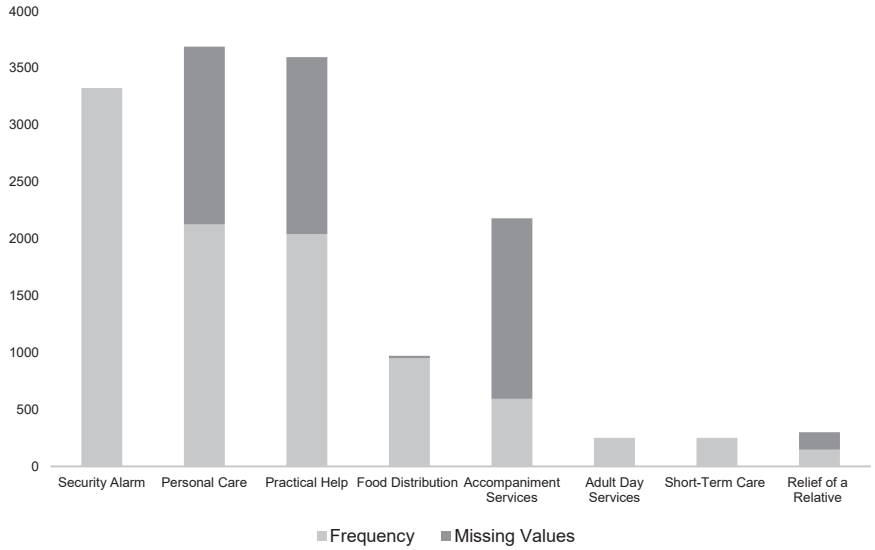

Fig. 1. Types of services received in the month of geriatric discharge.

statistically significant association between receiving more than 50 hours of help and readmission.

These findings suggest that living in long-term care or receiving more extensive home help is protective against readmission compared with more limited or no home help following inpatient geriatric care. Previous Swedish studies have reported a lower odds of 30-day readmission for long-term care residents vs those with home help after inpatient care at an acute care hospital[19] or an emergency ward visit.[42] International results from inpatient settings have found long-term care as either protective[43] or comparable[20] to receiving personal care services at home in terms of readmission risk. Researchers in Sweden have argued that home help may not meet certain older adults' care needs compared with greater support in long-term care, thus prompting readmission.[42] Our results add to previous work from other care settings, suggesting that in this old and frail Swedish cohort, not just long-term residents but also those with more than 50 home help hours may receive sufficient care to prevent readmission.

Our findings differ from most previous readmissions research comparing groups receiving home help with ones living independently after discharge from inpatient units and the emergency ward. Results from these studies have largely found home help to be associated with 30-day readmission.[19,22,42,44] with a stronger association among groups with more extensive help. Research in a similar health care system has noted a greater readmission risk for older adults receiving personal care but not practical services after inpatient care,[20] and a higher risk in groups with more weekly home help minutes after emergency department discharge.[22] Naseer et al[21] found that receiving both practical help and personal care, but not just one or the other, was associated with emergency department readmission in the Swedish region of Dalarna. We similarly hypothesized that groups with more home help would be more likely to return to hospital because these service levels suggest greater frailty and more complex care profiles that could be difficult to support at home. This association, however, was not seen in our analysis. This contrast with previous studies may be explained by our adjustment for physical function and dementia, both risk factors for readmission,[14,45] or variation in different geriatric care systems.

Alternatively, our population in inpatient geriatric care may account for divergent findings. This cohort represents an older, frailer sub-group of older adults compared with studies from other inpatient and emergency department settings. In this population, in which care needs are overall high, receiving lower home help levels may instead reflect insufficient support. Geriatric research has identified unmet care needs after hospitalization as a risk factor for readmission.[12] In our cohort, 73.3% with 1 to 50 help hours and 64.4% without help had moderate to severe dependence in P-ADLs during index admission. Although many in these groups likely experienced functional improvements, or received home health care or informal care post-discharge, social care gaps may have led others to return to hospital. In contrast, the regular care and supervision in long-term care or through extensive home help may help mitigate readmissions in frail geriatric populations with high care needs.

Greater understanding of social care patterns after discharge may help prevent readmissions. In Sweden, municipalities currently prioritize supporting older adults with home help instead of in long-term care.[46] However, recent reductions in long-term care have not been accompanied by comparable expansions in home help[5,47] and qualifying for help has become more difficult.[48] Service levels have increased for those with high care needs, while coverage has declined for those requiring more limited help.[5] Patterns in our cohort reflecting extensive home help for some and limited help for others should be understood in this context. Beyond system resources, the level of function, individual choice, informal care available,[41] and effective discharge planning also determine an older adult's social service levels. The challenge of coordinating regional inpatient care with municipal social care[49] may also affect home help post-discharge. Differences can also exist between individuals with home help prior to index admission vs new home help users post-discharge for whom finding the right number of hours may take time. Whether geriatric patients receive appropriate social services is therefore a complex interplay of individual and system factors[41] before, during, and after index admission.

The Association Between Social Services and 30-Day Mortality Without Readmission

Compared with long-term care, the group with no help was more likely to die without readmission and the group with 1 to 50 help hours had the same likelihood of dying without readmission. These findings suggest that the increased odds of readmission among those with no help or 1 to 50 hours was not because these individuals were

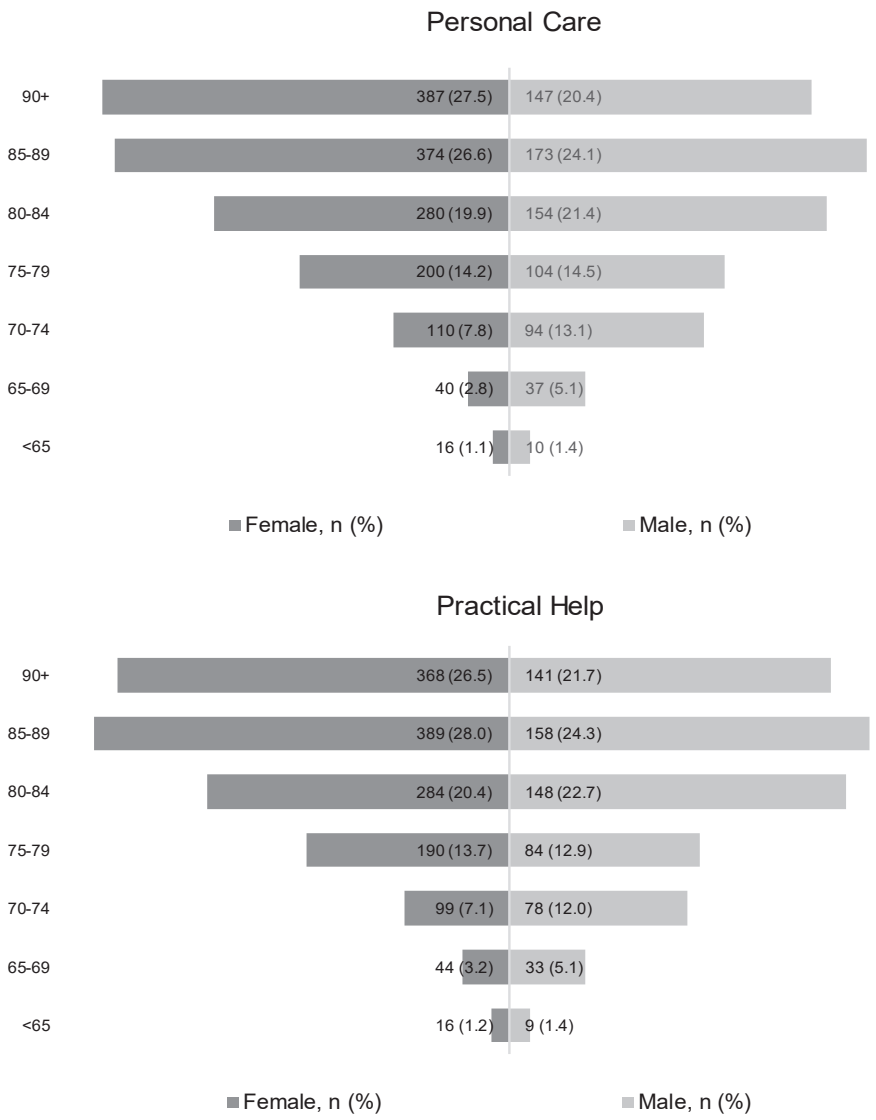

Fig. 2. Age and sex distribution of personal care and practical help recipients: 2126 personal care recipients (1407 female and 719 male) and 2041 practical help recipients (1390 female and 651 male).

more likely to survive within 30 days vs long-term care residents. Interestingly, individuals without home help were almost 3 times more likely to die without readmission than in long-term care. Further research should consider the association between social services and 30-day mortality with all deaths as a single outcome.

Strengths and Limitations

This study uses a large, inclusive cohort. To our knowledge, it is the first study in Sweden to consider the association between social services and readmission after inpatient geriatric care. Analysis of social

Table 3
Results From Adjusted* Multinomial Model, n = 6458

Level of Social Services	Readmission Within 30 Days		Death Within 30 Days Without Readmission	
	OR	95% CI	OR	95% CI
Long-term care (1)	REF		REF	
>50 hours of home help/mo (2)	1.29	0.99–1.70	0.49†	0.28–0.85
1–50 hours of home help/mo (3)	1.62†	1.22–2.16	1.67	0.99–2.82
Ordinary home without home help (4)	1.61†	1.21–2.15	2.79†	1.70–4.59

*The following factors were adjusted for in the multinomial model: age, sex, polypharmacy, number of diagnoses, dementia, annual disposable income quartile, level of education, marital status, region of birth, length of stay, Downton Fall Risk Index, MNA, Norton Pressure Ulcer Risk Screening, Barthel Index.
†Denotes significant association with outcome on a 5% significance level.

service levels captures the heterogeneity in readmission patterns among older adults receiving municipal help. Linking registry data with medical records allows for the adjustment of health and sociodemographic factors. A final strength is the inclusion of death as a competing event, an aspect overlooked in several studies on geriatric readmissions.[16,19,21]

This study has certain limitations. This sample represents only 3 geriatric inpatient settings in Region Stockholm, thus affecting generalizability of results. This cohort shows good validity to regional cohorts for hospital care,[25] but validity for social care has not been examined. Data on informal care and home health care services were also not included and may influence differences in readmission and mortality between groups at home. Furthermore, social services before index admission were not considered. Research has found a lower likelihood for readmission among individuals who are newly admitted vs returning to long-term care after hospital discharge,[7] which motivates including previous social services in future work. Missing values in the SSR made it impossible to analyze the association between home help types and readmission. The SSR also does not specify if care is only partially delivered that month,[28] meaning some individuals may not have received all hours registered. Monthly reporting without exact dates for new services meant that help may not have been in place directly post-discharge and, in a few cases, new decisions following an early readmission may have affected the total hours. Although a longer follow-up might have reduced this problem, we see social services levels as most plausibly contributing to readmission within the first 30 days when many individuals are adjusting to functional changes post-discharge.

Finally, study data are from 2016 and 2017 and more recent data are needed to confirm these associations today and investigate trends over time. Our results remain relevant, however, as coordination of health and social care for older adults with hospital discharge, and readmissions are ongoing challenges in Sweden.[49]

Implications and Conclusions

Our study shows that patients at 3 Stockholm inpatient geriatric care settings are significant social services users in the month post-discharge. Groups with no home help or 1 to 50 hours per month displayed an increased likelihood of 30-day readmission. Further research is needed to determine whether this association can be explained by unmet care needs post-discharge or other factors unaccounted for in this study. High social service levels suggest that transitions from inpatient geriatric care to home require careful social care planning. Discharge and community interventions targeting individuals with fewer social services may help reduce readmissions.

Disclosure

The authors declare no conflicts of interest.

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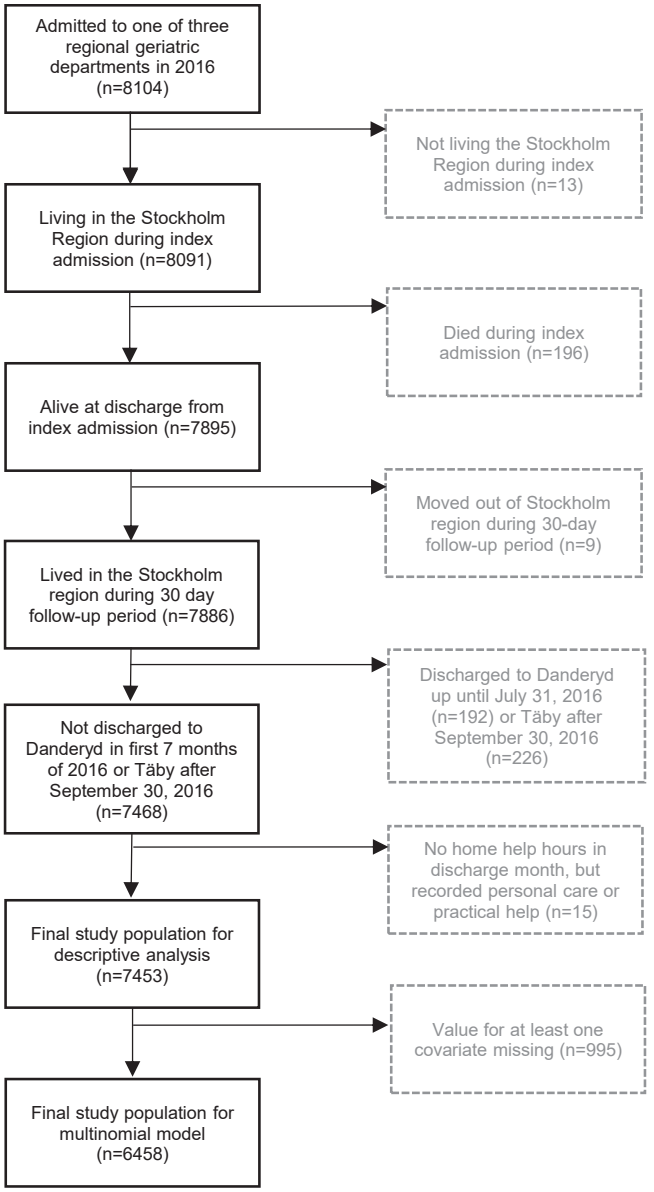
Supplementary Material 1

Calculation of home help hours granted in the 30-days after geriatric discharge

Home help hours granted in 30 days after discharge = {(Number of days remaining in month of discharge) × (home help hours granted in month of discharge) + (30 − Number of days remaining in month of discharge) × (home help hours granted in the month after discharge)}/30.



Supplementary Fig. 1. Flowchart of study participants included in analysis.

Supplementary Table 1
Adjusted Multinomial Model With ORs and 95% CIs for Independent Variable and All Covariates (N = 6458)

	Readmission Within 30 Days (Adjusted)		Death Within 30 Days Without Readmission (Adjusted)	
	OR	95% CI	OR	95% CI
Long-term care (1)	REF		REF	
>50 hours of home help/mo (2)	1.293	0.985–1.698	0.489*	0.280–0.853
1–50 hours of home help/mo (3)	1.622*	1.220–2.156	1.666	0.986–2.817
Ordinary home without home help (4)	1.613*	1.210–2.150	2.790*	1.697–4.589
Age	0.989*	0.980–0.998	1.075*	1.048–1.103
Sex				
Men	REF		REF	
Woman	0.656*	0.563–0.764	0.661*	0.447–0.977
Region of birth				
Sweden	REF		REF	
Other Nordic country	1.012	0.776–1.319	0.781	0.355–1.715
Other European country	1.064	0.804–1.409	1.420	0.770–2.616
Outside Europe	0.793	0.504–1.249	1.595	0.608–4.181
Annual disposable income category				
0–25th percentile	REF		REF	
26th–50th percentile	0.805*	0.659–0.983	0.853	0.539–1.352
51–75th percentile	0.769*	0.628–0.942	0.526*	0.314–0.883
76–100th percentile	0.828	0.672–1.021	0.770	0.468–1.265
Level of education				
Primary	REF		REF	
Lower secondary	0.983	0.770–1.256	0.964	0.532–1.747
Upper secondary	1.002	0.831–1.208	0.950	0.621–1.455
Post secondary	0.886	0.705–1.112	0.790	0.454–1.376
Higher post-secondary	1.169	0.891–1.532	1.168	0.603–2.261
Marital status				
Married	REF		REF	
Widowed	1.114	0.922–1.345	1.365	0.869–2.144
Never married	0.971	0.758–1.245	0.961	0.485–1.905
Divorced	0.921	0.750–1.130	0.752	0.422–1.340
Number of diagnoses	1.133*	1.088–1.179	1.227*	1.120–1.343
Polypharmacy	1.206	0.982–1.482	0.884	0.563–1.388
Dementia diagnosis	0.596*	0.472–0.754	0.931	0.597–1.452
Length of index admission, d	0.984*	0.971–0.998	1.000	0.973–1.027
Barthel ADL Index	0.997	0.993–1.000	0.978*	0.970–0.987
Pressure ulcer risk, Norton ≤20	1.494*	1.251–1.785	2.837*	1.863–4.320
Malnutrition risk, MNA ≤11	1.353*	1.108–1.653	1.345	0.679–2.665
Fall risk, Downtown ≥3	1.129	0.909–1.401	1.622	0.768–3.428

*Denotes significant association with outcome on a 5% significance level.