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Original Article

Predictive Factors Leading to Not Living at Home in a Very Frail Community Dwelling Older Population

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SUMMARY

Background: Case management has focused on care coordination reinforcement for the very frail community-dwelling older people in order to allow them to stay at home as long as possible. However the definition of the target population eligible to have a case manager is not clear. The purpose of this study was to identify predictive factors leading to not living at home over one year in a very frail community dwelling older population.
Methods: A secondary analysis from a prospective cohort of 428 very frail older people, aged 65 years and over, living at home in Paris were set up. Patients were assessed using RAI-HC 2.0 (Resident Assessment Instrument – Home care) tool. Not living at home at one year was identified in relation with admission characteristics using logistic regressions.
Results: At baseline, a large majority of the patients lived alone with cognitive impairments and functional limitations. In one year, 48.6% (n = 208) did not live at home anymore. Among them 40.5% were dead, 36% were institutionalized and 23.5% were hospitalized and moved away. Functional disabilities for meal preparation (p = 0.04) and eating (p = 0.08), bladder incontinence (p = 0.07) and prior hospitalization (p = 0.08) increased the risk of not living at home over one year. Cognitive impairment, socio-demographic characteristics and number of home-based services were not related with the primary outcome.
Conclusion: Functional limitations and prior hospitalizations were predictive factors leading to not living at home in a very frail community dwelling older population. Results could help for identifying the population eligible to have a case manager.

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1. Introduction

Most of the very frail older people live at home and express the wish to stay in their family as long as possible in order to maintain their social network and their quality of life.[1] They receive numerous home based-services provided by care professionals and caregivers to respond to their complex needs.[2] Health care systems are defined as fragmented between social and health care services leading to unmet needs for this very frail community dwelling population.[3] Integrated care services with intensive case management have been developed to reinforce the coordination of the home-based services for this target population.[4] The case management is a well-defined process including the identification of the very frail older patients, the exhaustive needs assessment, the services planning, the follow-ups and the re-assessments in the community.[5] The case manager is responsible for the case management and he (she) is assigned for a limited number of older people allowing them to stay longer on their own.[6]

The impacts of the community-based integrated care services with intensive case management are encouraging concerning the quality of care and the resources utilization.[7] However the definition of the target population eligible to have a case manager is not clear and could limit the positive impacts of the case management.[8] This very frail older population has to be at risk of not staying at home with a combination of health, social and psychological problems.[9] Not staying at home for older people could be due to nursing home admission (NHA), death and hospitalization. Functional limitations, cognitive impairment, illness severity and previous history of hospital admission are the strongest factors of not staying at home.[10,11] However, there is an heterogeneity among studies' samples without focusing on the very frail older people with complex needs. Otherwise, there is a lack of knowledge concerning the functional activities disabled involved in staying or not to staying at home.

The objectives of the study are to identify predictive factors

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leading to not living at home in a very frail older population living in an urban district of Paris (France). This sample was followed during one year to determine which factors were associated with the change of living status. Results could be helpful to identify more precisely the target population eligible for the case management and to allow the older people to live longer at home.

2. Methods

This paper is based on secondary analyses of data from a quasi-experimental study with a comparison between an integrated care model and a usual care organization.[4] The study was conducted over a one year period in 2008 in a district of Paris. The study was approved by the Ambroise Pare Hospital research Board. Informed written consent was obtained from each patient or the family caregiver.

Older patients were recruited from the community-based health care services centers in an urban district of Paris. The eligibility criteria of the population were: being over 64 years old, living at home, having a primary care physician, and being very frail with complex health and social needs assessed with the RAI-CA (Resident Assessment Instrument Contact Assessment). We used the screener of Contact Assessment tool derived from the InterRAI set of tools.[12] This screener is composed by nine separate items with yes/no binary responses (yes = 1; no = 0): four items for supervision and any physical assistance in performing 4 activities of daily living (dressing, personal hygiene, bathing and moving around indoors), one item on presence of any cognitive impairment, one item on perceived poor health status, one item on presence of shortness of breath and two items on social characteristics (lack of caregiver, living alone). A score of up to 5 defined a person having complex needs. Exclusion factors were older people with a three months planned institutionalization and a probable life expectancy less than one month.

The one year non-living at home was the primary outcome. The data were recorded in a central database by assessors. Patients were assessed using RAI-HC 2.0 (Resident Assessment Instrument-Home Care) which is a comprehensive assessment with 280 items including the following categories of variables at baseline: demographics items, cognitive performance, physical functioning, communication, mood and behavior, continence, health conditions, nutritional status, locomotion, psychosocial well-being, medications (number of drugs), number of diagnostics (limited list of diagnosis), services utilization (number and type of services), and environment. Type of services included home health aides, home nurses, homemaking services, physical therapy, and occupational therapy. A person lived alone when he/she was alone at home more than 12 hours a day. The caregiver was a child, a spouse, the partner, a friend or a neighbor, could live with the person and provided informal care. The assessment was carried out during 24 hour periods over the last three days. We used also the 6 validated scales in the RAI-HC 2.0: the Cognitive Performance Scale (CPS),[13] the Depression Rating Scale (DRS),[14] the Aggressive Behavior Scale (ABS),[15] the Pain Scale,[16] the Instrumental Activity of Daily Living (IADL) Capacity Scale and the Activity of Daily Living (ADL) Capacity Hierarchical Scale.[17] The IADL scale includes 8 items: meal preparation, ordinary housework, shopping, managing finances, managing medications, phone use, stairs and transportation. The ADL Scale was constructed using 4 items: personal hygiene, toileting, locomotion and eating. Functional scales were dichotomized by being independent and having ADL and IADL disabilities (difficulties up to dependency). The dichotomization of the scales was used in the scientific literature.

An analysis of the very frail older people characteristics at baseline was done. Not remaining at home was defined by the fact that the patient was not living at home at the one year of follow-up. Baseline characteristics were compared with those living at home and those not living at home one year. In a first step, we used a univariate logistic regression with a materiality threshold of 5%. In a second step we used a global multivariate model including the variables associated with not-living at home with a $p \leq 0.05$. Age and gender were forced into the multivariate models as adjustment variables. Statistical analyses were conducted using SPSS (version 12.0) and SAS (version 9.2) software.

3. Results

A sample of 544 very frail community-dwelling older people was eligible to participate in the study. Among them, 81 (69.8%) refused to participate, 20 (17.2%) had passed away and 15 (13%) had moved away. At the end, a total of 428 (78.6%) participated in the one year follow-up study. The incidence of not living at home was 48.6% at one year. Among this group more than 40% died, 36% were institutionalized and 23.5% were hospitalized or moved away at one year (Fig. 1). No older people hospitalized will be coming back home.

At baseline, the mean age was 86 years, 73.1% were women, 70.2% lived alone, and 76% had an identified informal caregiver represented mainly by a child (for 55.9% of them). Cognitive impairment was present in 62% of the sample with an average CPS score of 2.3 (0–6). IADL disabilities represented 97.9% of the sample with a mean score of 16.7 (out of 0–42) for the 8 activities. ADL disabilities represented 31% of the sample with a mean score of 2.35 (0–6) for the 4 activities. Nearly 59% were not bladder continent, 56% had pain but no pain control, 36.6% had fallen down in the last 3 months and 17.3% had pressures sores. Depressive symptoms were present in 44% of the sample and 19% had

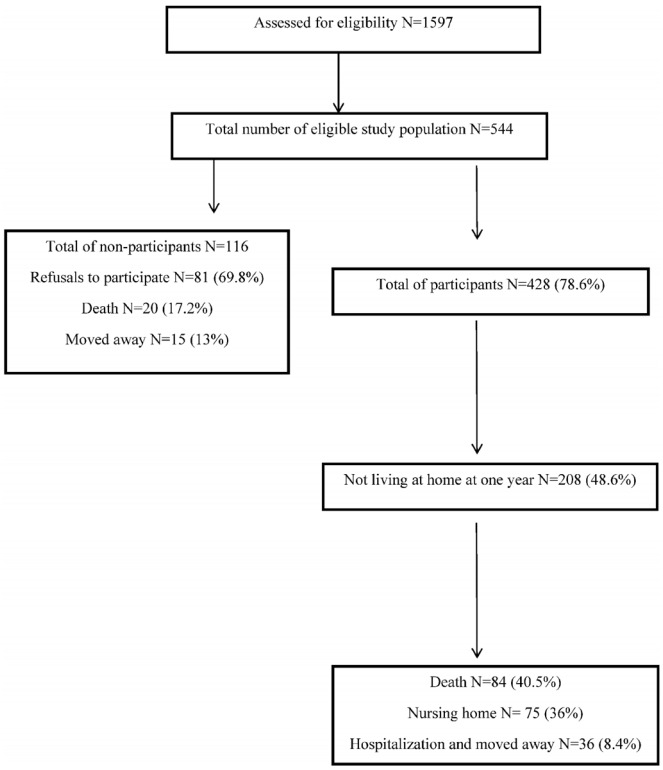

Figure 1. Patient selection flow chart.

behavioral disturbances. The number of diagnosis was 3.6 and the number of drugs per day was 7.6. The number of home based-services was 2.6 per week. More than 47% of the sample had a previous hospitalization in the last three months (Table 1).

Predictive factors of non-living at home for socio-demographic and health parameters identified three variables with a p value ≤ 0.05 in univariate analysis. Cognitive impairment and bladder incontinence were associated with not living at home with a ORs of 1.6 (95% CI 1.1–3.2) and 1.8 (95% CI 1.2–4.5) respectively. Previous hospitalization was related to no living at home with ORs 1.7 (95% CI 1.1–2.0). In the multivariate analysis, bladder incontinence (p = 0.07) and prior hospitalization (p = 0.08) were related on not living at home at one year. No significant interaction was noted between forced variables and predictive variables (Table 2).

Predictive factors of non-living at home for functional disabilities identified eight variables with a p value ≤ 0.05 in univariate analysis. IADL disabilities in meal preparation (OR = 2.5 CI 1.4–5.0), managing finances (OR = 2.1 CI 1.25–3.3), managing medication (OR = 2.0 CI 1.3–3.3), phone use (OR = 1.9 CI 1.4–2.5) and using stairs (2.1 CI 1.1–4.0) increased significantly the risk of not staying at home at one year. ADL disabilities for personal hygiene, toileting use, and eating were associated with a higher risk of not staying at home respectively with ORs of 1.4 (95% CI 1.1–2.5), ORs of 1.7 (95% CI 1.1–2.9) and ORs of 2.5 (95% CI 1.4–5.0). In multivariate analysis, disabilities for meal preparation (p = 0.04) and eating (p = 0.08) were related on not living at home at one year. No significant interaction was noted between forced variables and predictive variables (Table 3).

4. Discussion

The risk of not remaining at home was high over one year in the sample of community dwelling older people characterized by a large proportion of disabled women living alone. Risks factors leading to not living at home were related to ADL and IADL disabilities as well as prior hospitalizations. Socio-demographic data, health parameters, type of home based services were not related to the primary outcome.

The functional disabilities have an impact on not remaining at home at one year. The functional status referred to an individual's capacity to perform the current activities of daily living, carried out normally by an individual of the same age and sex.[18] The international classification of functioning insisted on the strong relations between personal factors, diseases, environment and functional parameters.[19] In our study, the prevalence of functional limitations was higher for IADL items compared to ADL items. This result was explained by the fact that IADL items were more elaborated and the loss occurred before the ADL items.[20] Among IADL items, the study has shown that meal preparation, managing medication and finances, phone use and stairs increased the risk of not living at home. It had been shown that the ability to use the phone, the management of medication and finances were a predictive of one-year incidence of dementia among older population.[21] Our study has identified that the meal preparation was the strongest risk factor of not living at home. This is a daily and repetitive activity which

Table 1
Characteristics of the study population at baseline (N = 428).

Baseline characteristics	%	Mean (SD)
Age		86.9 (7.1)
65–75	5.5	
75–85	32	
> 85 years old	62.5	
Gender, women	72.9	
Living alone	70.1	
Having a caregiver	76.4	
Spouse	22.4	
Children	53.9	
Others	23.7	
Cognitive Performance Scale [0-6]		2.3 (1.9)
Without or light (0,1)	38	
Minimum to severe (2-6)	62	
IADL Scale [0-42]		16.7 (4.5)
Independent	2.1	
Disabilities (difficulty up to dependency)	97.9	
ADL Scale [0-6]		2.3 (1.9)
Independent	31	
Disabilities (difficulty up to dependency)	69	
Bladder incontinence, yes	58.4	
Pain Scale, yes	56.1	
Falls (last 3 months), yes	36.6	
Pressure scores threshold, yes	17.3	
Depression Rating Scale, yes	43.9	
Aggressive Behavioural Scale, yes	18.9	
Number of diagnosis		3.6 (1.9)
Number of drugs		7.6 (2.8)
Number services per week		2.6 (1.3)
Prior hospitalisation	47.7	

Table 2
Predictors factors of non-living at home at 12 months for socio-demographic and health parameters, univariate and multivariate.

Predictive factors	Univariate		Multivariate
	OR 95% CI	p	p
Age	1.2 (0.6–2.0)	0.3	0.4
Gender (male)	0.8 (0.6–1.3)	0.4	0.7
Living alone	0.8 (0.55–1.3)	0.4	0.4
Having a caregiver	1.4 (0.8–2.5)	0.6	0.5
Cognitive Performance Scale	1.6 (1.1–3.2)	0.04	0.1
Bladder incontinence, yes	1.8 (1.2–4.5)	0.04	0.07
Pain Scale, yes	1.2 (0.9–1.6)	0.1	0.2
Falls, yes	1.3 (0.9–1.5)	0.09	0.1
Pressure sores, yes	1.4 (0.8–2.5)	0.6	0.7
Depression Rating Scale, yes	1.2 (0.8–2.0)	0.3	0.3
Agressive Behavioural Scale, yes	0.9 (0.5–2.0)	0.4	0.5
Number of diagnosis	1.2 (0.7–1.6)	0.3	0.2
Number of drugs	1.1 (0.8–1.5)	0.4	0.5
Number services per week	1.1 (0.6–2.1)	0.5	0.7
Prior hospitalisation	1.7 (1.1–2.0)	0.05	0.08

Table 3
Predictors factors of non-living at home at 12 months for functional disabilities, univariate and multivariate.

Predictive factors	Univariate		Multivariate
	OR 95% CI	p	p
IADL disabilities			
Meal preparation	2.5 (1.4–5.0)	0.01	0.04
Ordinary house work	1.4 (0.5–4.0)	0.7	0.7
Shopping	1.25 (0.5–3.3)	0.4	0.6
Managing finances	2.1 (1.25–3.3)	0.01	0.2
Managing medications	2.0 (1.3–3.3)	0.01	0.1
Phone use	1.9 (1.4–2.5)	0.02	0.2
Stairs use	2.1 (1.1–4.0)	0.01	0.1
Transportation	1.6 (0.7–4.0)	0.6	0.6
ADL disabilities			
Personal hygiene	1.4 (1.1–2.5)	0.04	0.2
Toileting use	1.7 (1.1–2.9)	0.03	0.1
Locomotion in home	1.4 (0.9–2.05)	0.5	0.4
Eating	2.5 (1.4–5.0)	0.02	0.04

involves the participation of a human support and needs a relevant fit between needs and service. Otherwise the lack of support could have some consequences on the nutritional status and poor health conditions. We didn't identify any relation between shopping and transportation disabilities with the non-living at home over one year. There are the earliest IADL losses, at the beginning of the process when the level of functional limitations were lower and could explain this result.[22] It had been shown also that the housework activity was the task most often not done for non-health related reasons and phone use the least common left undone with a strong gender differences.[11] That is the reason why our study assessed the capacity rather than the tasks performance which shared task assignments and societal norm as who should perform a task. Activities of daily living represent the basic functional tasks necessary for self-care in everyday life.[23] In our results, personal hygiene, toileting use and eating represented the most related non-living at home predictive factors among the hierarchical ADL scale. Bladder continence could be included in this list because this parameter is strongly related with toileting use and the original version of Katz's ADL had included in the scale. Incontinence and eating represented the most risk factors leading to not living at home over one year. These results were confirmed in a recent study by Edjolo and al, in which functional losses ended with eating, transferring and incontinence in the trajectory of dependency before death.[22]

Socio-demographic characteristics such as age, gender, living alone, having a caregiver were not associated with the primary outcome. A large majority of the patients was over 85 years old and that could have decreased the impact of aging on the not-living at home. Otherwise a recent systematic review had shown that male gender, living alone and poor social network could have weak or inconclusive evidence with the nursing home admissions.[24] Even more, our study underlined that having a caregiver was an increased non-significant factor in univariate model. Contributors to poor health related quality of life among caregivers included being a spouse of the care recipient.[25] In our study, caregivers were mainly children, not living with their very frail parent and that could explain the weak relation. The number of home-based health and social services was not associated with the main outcome. This result could be explained by the fact that this variable assessed the number of different types of services but didn't include the number of weekly interventions per service. Previous studies have shown that achieving a better fit between needs and services was more relevant than the quantity of services at home.[7] Finally, previous hospitalizations were a strong factor of not living at home over one year. Numerous studies had already shown this strong association between previous hospitalization with death and nursing home admissions.[26] The main reason was that older people having previous hospitalization had worse health conditions and was more likely to be readmitted in a hospital at later time.[27] There was no relation between health parameters such as cognitive impairment, pain, falls, pressures sores, depression and behavioral disturbances and not living at home. Cognitive impairment was at risk in the univariate model but not in the multivariate one. This result didn't sustain that worse cognitive status was a significant risk factor of adverse health events such as nursing home admission due to the severity of dementia and burden of the non-professional caregivers.[28] Our results could be explained by the fact that the level of cognitive status at baseline in our sample was moderate and a large part of the population didn't live with their caregiver. The other geriatric parameters as depression, falls, pressure sores didn't enhance the risk of not-living at home over one-year period. We had a selection of a very frail community-dwelling older population with a high level of comorbidity with functional limitations. It meant that it was not the advanced-health problem-related but the incapacity-led to this problem which could be a factor of not living at home.

This study presented some limitations. The first limitation was the shortness of the follow-up. The risk of not staying at home of the sample was so high that it was difficult to continue the follow-up beyond one year. Secondly, some data on socio economic status and level of education were missing and could have been related to the primary outcome. Even there was not interaction between non-living at home and IADL and ADL disabilities by number of diagnostics, we did not have results by type of diagnostics and we could have underestimated the role of the co-morbidity and its impacts on premature aging. Fourthly, the statistical model included a large diversity of factors with dichotomy variables and could have minimized the results. The fifth limitation was related to the fact that it was a secondary study of a quasi-experimental study between an integrated model and a usual care organization. However the one year follow-up was too short for implementing the entire integrated model and the proportion of older people not-living at home at one year was not significantly different between the two groups.

The findings of this study allow us to better understand the predictive factors leading to not living at home in a very frail community dwelling older population. It suggests that once certain functional activities are disabled, the risk of not living at home increases substantially. These results could help to set up a practical screening for identifying population eligible to have a case manager. Targeting more precisely this target population could enhance the effectiveness of the case manager extending the time spent at home for the older people.

Conflicts of interest

None.

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