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Formal and informal care costs of hospitalized older people at risk of poor functioning: A prospective cohort study

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ABSTRACT

Hospitalized older people are at risk of poor functioning after hospital discharge. We aimed to relate formal and informal care costs to level of risk for low functioning of hospitalized older people up to one year after admission. We studied 460 patients 65 years or older who were admitted to a 450-bed hospital in the Netherlands between June 2010 and October 2010. Participants were classified into five risk groups at hospital admission using the Identification Seniors At Risk-Hospitalized Patients (ISAR-HP). Patients were interviewed at hospital admission and at three and twelve months after admission using validated questionnaires to measure health care utilization. Informal caregivers were interviewed by mailed paper questionnaires at the same time as patients. We estimated costs per unit from hospital information systems and nationally representative research. Mean healthcare costs were €30k euro per person per year, with one third for initial hospital stay (€9,8k), one third for formal healthcare costs between hospital discharge and twelve month follow up (€10,3k), and one third for informal healthcare costs between hospital discharge and twelve month follow up (€9,5k). Informal and formal healthcare costs were almost double for people with the highest risk score compared to people not at risk ($p < 0.001$). Older patients with high risk scores at hospital admission have substantially higher formal and informal care costs in the year after initial hospital admission than people with low risk scores. This implies that substantial investments may be made in preventive interventions for at-risk hospitalized older people.

1. Introduction

Older hospitalized patients are at risk of poor functioning after discharge from the hospital compared to functioning before hospital admission (Covinsky et al., 2003). Problems in functioning after hospital discharge are only partly explained by the patient's medical condition at hospital admission, implying that a hospital stay may in itself cause functional problems, for example due to social isolation or inactivity as a result of bed rest (Volpato et al., 2007). Poor functioning may lead to renewed hospital admission, nursing home admission, early death, high dependence on informal and formal care, and higher societal healthcare costs (Boyd et al., 2008; Covinsky, Justice, Rosenthal, Palmer, & Landefeld, 1997; Covinsky et al., 1999, 2003; de Rooij et al., 2006; Inouye et al., 1998; Practical Guide on Frail Elderly, 2009). Risk of poor functioning is closely linked to frailty as shown by an integral framework that links frailty to problems in physical functioning, cognitive functioning as well as social and psychological functioning (Bergman et al., 2007; Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). Classifying risk of problems in daily functioning is possible with instruments such as the ISAR-HP (Buurman, Parlevliet, van Deelen, de Haan, & de Rooij, 2010; Hoogerduijn et al., 2012). Insights in formal and informal healthcare costs are largely lacking for older people with different levels of risk of poor functioning, while such knowledge is relevant to the implementation of future preventive programs (Liu, Tian, & Yao, 2012; McNamee et al., 1999). In this prospective cohort study, we aimed to compare formal and informal care costs from hospital

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admission to one year after admission for hospitalized older people with different levels of risk of poor functioning as identified by the ISAR-HP.

2. Methods

2.1. Patients

A total of 2671 patients of 65 years or older were admitted to a 450-bed general hospital in the Netherlands between June and October 2010. Out of the 985 patients assessed for eligibility, 525 (53%) were excluded, either because they were not eligible (336 patients of which 152 were too ill, 20 were not able to speak Dutch, 114 were re admitted, 34 had length of stay <48 h, and 16 excluded for other reasons) or because they refused (189, 19%). Reasons for refusal were numerous but main reasons for refusing were 'not in the mood'; 'no privacy'; 'caregiver did not want patient to participate'; 'feeling too sick'; or 'not applicable to me since I feel healthy''. This left 460 patients in the study who signed an informed consent form.

2.2. Data collection

At hospital admission, participants were assessed for risk of low functioning using the ISAR-HP. The ISAR-HP consists of four yes/no questions regarding educational level, (in)dependence in traveling and housekeeping, and walking ability before admission. Scores range from 0 to 5, including two points for walking inability, with higher scores corresponding to higher risk. Trained research assistants interviewed patients within 48 h of hospital admission (baseline, T0) using validated questionnaires. Follow up interviews were held at three and twelve months after admission (T3 and T12 respectively) at the participant's home environment. When patient burden became too high during the interview, the interview was postponed and continued at another time.

Patient interviews at baseline included questions on demographics (e.g. age, gender) and healthcare utilization before admission (e.g. general practitioner contacts). Cognitive functioning was measured using the Mini Mental State Examination (MMSE), with higher scores corresponding to better cognitive functioning (Folstein, Folstein, & McHugh, 1975). Physical functioning was measured using the Katz 6-item Index of independence in basic activities of daily living (ADL) (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963), and the Lawton scale (Lawton & Brody EM, 1969) which measures instrumental activities of daily living (IADL) such as the ability to use the telephone or handle finances. Higher scores on both scales reflect higher independence in ADL and IADL. Health related quality of life (HRQoL) was measured with the EQ5D (EuroQol Group., 1990). The Caregiver Strain Index (CSI) (van Exel, 2004) measured subjective burden of care of the informal caregiver in the period before hospital admission.

At T3 and T12, formal healthcare utilization data was collected in interviews with patients at their home environment. Costs per unit of healthcare consumption were retrieved from hospital information systems or estimated using nationally representative unit-costs research (Hakkaart-van Roijen, Tan, & Bouwmans, 2010). Valuation of formal healthcare such as length of stay in hospital, nursing home, rehabilitation center or elderly home were measured by applying cost per day estimates. Formal homecare services were measured in costs per hour, while visits to the general practitioner were based on average costs per contact. Costs of aids and modifications to the living environment were estimated using current retail prices (see Appendix a). Informal homecare utilization in hours per week was measured by paper questionnaires sent to the primary informal caregivers of participating

Table 1
Baseline characteristics, functioning and HRQoL for 460 hospitalized older people according to ISAR-HP score.

Variable	All N = 460	ISAR-HP 0 N = 128	ISAR-HP 1 N = 92	ISAR-HP 2 N = 59	ISAR-HP 3 N = 56	ISAR-HP 4+ N = 125	p value[a] group diff.
Age, mean (SD)	76 (7.2)	73 (5.8)	75 (6.4)	77 (6.8)	78 (6.9)	80 (7.0)	<0.001[b]
Women, n (%)	256 (56)	51 (40)	43 (47)	38 (64)	38 (68)	86 (69)	<0.001[a]
Married/livingpartner, n (%)	257 (56)	91 (71)	60 (65)	33 (56)	25 (45)	48 (38)	<0.001[a]
Living environment, n (%)							<0.001[a]
Independent alone	181 (39)	31 (24)	33 (36)	25 (42)	30 (54)	62 (50)	
Independent with others	262 (57)	97 (76)	59 (64)	31 (53)	25 (45)	50 (40)	
Multi-morbidity (≥2), n (%)	337 (73)	77 (60)	66 (72)	40 (68)	45 (80)	109 (87)	<0.001[a]
ADL[e] (Katz), mean (SD)	4.4 (1.8)	4.8 (1.6)	5.0 (1.5)	4.4(1.8)	4.5 (1.4)	3.6 (1.9)	<0.001[b]
IADL[f] (Lawton), mean (SD)	4.8 (2.1)	5.6 (2.3)	5.4 (2.1)	4.5(2.0)	4.6 (1.9)	3.9 (1.6)	<0.001[b]
Cognition (MMSE), mean (SD)	26.3 (3.8)	27.9 (2.7)	25.7 (4.0)	25.9(4.0)	26.5 (3.4)	25 (4.3)	<0.001[b]
HRQoL, EQ5D, mean (SD)	0.61 (0.3)	0.67 (0.27)	0.69 (0.26)	0.61 (0.3)	0.58 (0.29)	0.50 (0.29)	<0.001[b]
Admission in hospital in 12 months before T0, n (%)	160 (35)	31 (24)	30 (33)	17 (29)	20 (36)	62 (50)	0.001[a]
Informal Caregiver							
Presence, 1 or more, n (%)	241 (52)	80 (62)	43 (47)	34 (58)	28 (50)	56 (45)	0.026 [a]
Age[c], mean (SD)	65 (11)	65 (9.4)	67 (12)	69 (12)	65 (12)	62 (12)	0.049[b]
Women[c], n (%)	126 (70)	40 (73)	22 (71)	17 (59)	16 (70)	31 (76)	0.623[a]
Living with patient[c], n (%)	112 (63)	44 (82)	26 (79)	18 (62)	10 (44)	14 (35)	<0.001[a]
Relationship with patient[c]							0.001[a]
Husband/wife/partner, n (%)	112 (62)	44 (80)	26 (79)	18 (62)	10 (44)	14 (34)	
Other, n (%)	69 (38)	11 (20)	7 (21)	11 (38)	13 (56)	27 (66)	
CSI[d,c], mean (SD)	3.2 (3)	2.18 (2.8)	3.22 (2.7)	3.13 (3.0)	3.63 (2.9)	4.13 (3.2)	0.018[b]
Informal care in week before T0, n (%)	111 (69)	24 (49)	17 (61)	21 (81)	17 (81)	32 (89)	0.001[a]

[a] p-value measured with chi-square for categorical variables.
[b] p-value measured with t-test for continuous variables.
[c] N = smaller population than 460 (informal care, N = 160; CSI N = 147; living with patient N = 179, age informal caregiver N = 185).
[d] CSI = Caregiver Strain Index.
[e] ADL = activities of daily living.
[f] IADL = Instrumental activities of daily living.