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DOI: 10.1177/0269216315606010

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Abstract

Background: Many patients show deterioration in functioning and increased care needs in the last year of life. End-of-life care needs and health care utilization might differ between groups of acutely hospitalized older patients.

Aim: To investigate differences in geriatric conditions, advance care planning, and health care utilization in patients with cancer, organ failure, or frailty, who died within 1 year after acute hospitalization.

Design: Prospective cohort study conducted between 2002 and 2008, with 1-year follow-up.

Setting: University teaching hospital in the Netherlands.

Participants: Aged ≥ 65 years, acutely hospitalized for ≥ 48 h, and died within 1 year after hospitalization. At admission, all patients received a systematic comprehensive geriatric assessment. Hospital records were searched for advance care planning information and health care utilization. Differences between patient groups were calculated.

Results: In total, 306 patients died within 1 year after acute admission (35%) and were included; 151 with cancer, 98 with end-stage organ failure, and 57 frail older persons. At hospital admission, 72% of the frail group had delirium and/or severe pre-existing cognitive impairment. The frail and organ failure group had many pre-existing disabilities. Three months post-discharge, 75% of the frail and organ failure group had died, 45% of these patients had an advance care plan in their hospital records.

Conclusion: Patients with frailty and organ failure had highest rates of geriatric conditions at hospital admission and often had missing information on advance care planning in the hospital records. There is a need to better identify end-of-life needs for these groups.

Keywords

Advance care planning, hospitalization, end-of-life care, end-stage organ failure, palliative care, health care utilization

What is already known about the topic?

- In the last year of their life, patients often show deterioration in physical and cognitive functioning and an increased health care utilization.
- Patients with cancer, patients with end-stage organ failure, and frail patients show different trajectories of physical functioning in the last year of life.
- It is unknown whether there are differences in geriatric conditions at hospital admission, advance care planning, and health care utilization between patients with cancer, end-stage organ failure, or frailty.

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What this paper adds?

- Acutely hospitalized older patients with end-stage organ failure and frail older patients had poorer physical and cognitive functioning than those with cancer at the time of hospital admission and showed higher rates of delirium, cognitive impairment, and activities of daily living disabilities.
- Many frail older patients and end-stage organ failure patients were not identified during hospitalization as they were in their last stage of life.
- Older patients with cancer had higher rates of health care utilization after acute hospitalization compared to older patients with end-stage organ failure and frail patients.

Implications for practice, theory, or policy

- There seem to be a need to better identify end-of-life care needs, especially in patients with frailty or end-stage organ failure to optimize palliative care for these groups.

Introduction

An acute hospital admission in older persons is associated with high post-discharge mortality. The mortality within 3 months after hospital discharge ranges between 10% and 25%,¹ and the mortality within 1 year after discharge varies between 20% and 35%.²⁻⁴ Several factors are associated with this post-discharge mortality such as male sex;^{5,6} lower educational level;⁶ age of 80 years and older;^{2,6} presence of chronic diseases such as congestive heart failure,⁶ pulmonary disease,⁶ or cancer;⁶ a high Charlson comorbidity index (CCI);^{6,7} and the presence of geriatric conditions such as delirium, dementia, and functional impairment.^{2,3,6-9}

In the last year of their life, patients often show deterioration in physical and cognitive functioning and an increased health care utilization. This trajectory of functional decline is highly dependent on the underlying diseases. Lunney et al.¹⁰ described three different types of trajectories of functional decline during the year before dying, in patients with cancer, in patients with end-stage organ failure, and in frail patients defined as people with multiple morbidities and disabilities. Persons with cancer mainly face a rapid deterioration in the last 3 months of their life, but their starting point is often a high level of independency in activities of daily living (ADL). Persons with end-stage organ failure, such as end-stage renal disease or heart failure already have impairments in ADL in their last year and their functioning gradually decreases, with some periods of rapid decline and even sometime a temporarily recovery from these exacerbations. Frail older persons, with geriatric conditions originating from their multimorbidity, often have a low baseline ADL functioning and show a progressive decrease in physical ability in the final year of their life.¹⁰ As functional decline is often evoked by acute hospitalization, we hypothesized that these three trajectories may also be present in acutely admitted older hospital patients and there might be differences in the care needs and problems of older patients with cancer, organ failure, and frailty face during and after hospitalization.

The aim of this study was to explore differences in end-of-life care in patients of age 65 years and older, with advanced stages of cancer, organ failure, or frailty who died within 1 year after acute hospitalization. The objectives were to investigate in acutely hospitalized older patients with cancer, organ failure, or frailty whether there were differences in (1) geriatric conditions present at hospital admission, (2) advance care planning, and (3) health care utilization in the last month of life.

Methods**Design and setting**

This study is a sub-analysis of a prospective cohort study of acutely hospitalized patients of age 65 years or above, conducted between 2002 and 2008. The DEFENCE study was conducted in the University Medical Centre in Utrecht, the Spaarne Hospital in Hoofddorp, and the Academic Medical Center (AMC) in Amsterdam in the Netherlands.³

This sub-analysis was only conducted with patients previously hospitalized in the AMC, a 1024-bed university teaching hospital. In total, five wards of the AMC participated in this study. The study was approved by the Medical Ethics Committee of the AMC.

Palliative care facilities in the Netherlands

The palliative care facilities in the hospital were limited during the study period; there was no dedicated palliative care team. There was a specialized pain team that could be consulted, in case a patient was in a terminal phase and suffered from unbearable pain or other symptoms. There did exist palliative care options in primary care. For patients with limited life expectancy (mostly 3 months or less), palliative care could be provided at the patients' home. The home care team (general practitioner, specialized nurse) could provide with 24-h assistance and could also offer

medical technical interventions such as intravenous therapy and parental feeding. Palliative care could also be received in a nursing home or hospice unit. A hospice is a community facility, outside a nursing home or a hospital, and completely specialized in end-of-life care. For all forms of palliative care, a patient should have a life expectancy of less than 3 months. In hospitalized patients, the medical specialist is in charge of the indication for palliative care.

Study population for this sub-analysis

Patients included in the DEFENCE study between 2002 and 2008 and subsequently died in the first year after admission were further analyzed.³ A detailed description of this cohort is described elsewhere.^{1,3} Briefly, patients were included if they were 65 years and above and acutely hospitalized for at least 48 h. All patients gave permission before inclusion and signed informed consent for participation in the study and following them until 1 year after discharge.

Data collection

Demographics and geriatric conditions

Data concerning clinical characteristics were collected within 48 h after admission. Members of the geriatric team completed an initial multidisciplinary evaluation for all study participants. Briefly, demographic variables such as age, sex, social status, and living situation were collected, as well as the presence of geriatric conditions. The geriatric team performed a comprehensive geriatric assessment including cognitive impairment (Mini-Mental State Examination (MMSE) <24), impairments in ADL (modified Katz ADL index score, with higher scores indicating more impairments), and delirium (Confusion Assessment Method).^{1,3}

Advance care planning information

A second method of data collection was by searching the medical and nursing records on advance care planning information. One of the researchers (S.H.) screened all medical records on the presence of these clues, using a pre-defined case-record scoring form. The first 20 records were screened by two researchers (S.H. and B.M.B.) to determine agreement in scoring. Information on the end-stage of life included presence of end-stage organ failure, malignancy, or frailty; treatment restrictions denoted in the medical or nursing record (no resuscitation, palliative care, not go to intensive care unit); and the time and reason for death. Information about treatment restrictions was divided into treatment restrictions formulated at time of admission, the person who initiated changes in treatment restrictions during hospitalization, and the discussion on advance care planning before hospital discharge.

End-of-life care was defined as care offered to improve the quality of life of patients and their families facing all problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial, and spiritual.¹¹

Based on the information provided in the medical record, we indicated whether the death of the patient was expected or unexpected for the attending team. An expected death was defined as an expected life span of 3 months or less or if active palliative treatment or complete treatment restrictions were described in the medical and nursing records.

If none of this information was present in the medical record, this was defined as an unexpected death.

Health care utilization

Information about the health care utilization in the last month prior to death was obtained from administrative data. This health care utilization included number of hospital readmissions, day care admissions, and/or outpatient visits.

Three patient groups for analysis based on patterns of functional decline by Lunney

For analysis, patients were hierarchically divided into three categories as suggested by Lunney et al.¹⁰ The first group, patients with cancer, contains all patients with an active malignancy. The second group consisted of patients with end-stage organ failure such as chronic obstructive pulmonary disease (COPD), end-stage liver failure, end-stage renal disease, heart failure, or severe peripheral arterial disease. This information was derived from the medical record. The remaining patients were defined as frail patients if they met the following conditions: first, we screened these patients on their living circumstances. Patients living in a nursing home or otherwise sheltered were marked as frail. Second, all remaining patients with a MMSE score of 24 points or lower, and/or a modified Katz ADL index score of 8 points or more were also classified as belonging to the frail group. Almost all patients could be classified in the group with cancer, organ failure, or frailty, except eight patients. We specified this remaining group as “other” and they were not further included in the analysis. This group had no common characteristic.

Statistical analyses

All collected data were analyzed using SPSS version 18.0. Baseline characteristics and outcomes were summarized using descriptive statistics. To determine potential differences between the groups in baseline characteristics, in

Table 1. Baseline characteristics of the complete study population.

	Alive 12 months after acute hospitalization (N=603)	Died within 12 months after acute hospitalization (N=306)	p value
Age			
Mean (SD)	78.5 (7.9)	78.7 (7.9)	0.73
Sex			
Men (%; 95% CI)	43.6 (40.7–48.6)	44.7 (39.3–50.5)	0.18
Ethnicity (%; 95% CI)			0.35
Dutch	88.4 (85.6–90.7)	91.4 (87.8–94.1)	
Surinam/Hindu	5.1 (3.6–7.2)	3.5 (2.0–6.3)	
Other	6.5 (4.8–8.7)	5.1 (3.2–8.3)	
Education years			
Mean (SD)	23.3 (32.6)	25.3 (32.5)	0.18
Living situation (%; 95% CI)			0.99
Independent	69.9 (66.0–73.4)	64.9 (59.5–70.2)	
Senior residence	16.1 (13.4–19.3)	14.1 (10.6–18.4)	
Old peoples' home	8.6 (6.6–11.1)	13.7 (10.3–18.2)	
Nursing home	3.3 (2.2–5.2)	5.4 (3.2–8.5)	
Intermediate care	2.0 (1.1–3.5)	1.9 (0.9–4.2)	
Charlson comorbidity index			
Mean (SD)	3.0 (2.1)	4.5 (2.6)	<0.001
Cognitive impairment (%; 95% CI) ^a	40.6 (36.8–44.6)	53.8 (48.3–59.4)	<0.001
Severe impairment in ADL and IADL (%; 95% CI) ^b	49.7 (45.8–53.7)	62.8 (57.2–68.0)	0.21
Delirium (%; 95% CI)	27.3 (24.0–31.1)	36.8 (31.7–42.5)	0.08

SD: standard deviation; CI: confidence interval; ADL: activities of daily living; IADL: instrumental activities of daily living.

^aCognitive impairment defined as Mini-Mental State Examination score of <24 points.

^bSevere impairment in ADL and IADL defined as score of 8 or more impairments on the modified Katz ADL index.

identifying remaining life expectancy, in advance care planning, and in health care utilization in the last month of life continuous variables were tested using analysis of variance (ANOVA) test and dichotomous variables and categorical data were tested using a chi-squared test.

Results

Baseline characteristics

Table 1 shows the baseline characteristic of the included patients in the study, both those who survived and those who died within 12 months after hospital admission. The complete study population consisted of 909 patients, 306 patients died within 1 year. Differences between groups were found with regard to the CCI ($p < 0.001$) and presence of cognitive impairment ($p < 0.001$). The group of patients who died within 1 year had a higher CCI than the patients who survived, respectively, 4.5 (standard deviation (SD)=2.6) and 3.0 (SD=2.1). A higher percentage of patients in the mortality group (53.8%) suffered from cognitive impairment compared to surviving patients (40.6%).

In this sub-analysis, we further studied the patients who died within 1 year after hospital admission. In total, 306 patients were included, of which 151 patients in the group with cancer, 98 patients in the group with end-stage organ

failure, and 57 frail older patients. In total, 80 patients died in the hospital (25.5%), 131 patients died between discharge and 3 months after discharge (41.7%), and 103 patients (32.8%) died between 3 and 12 months after discharge.

Clinical characteristics in three diagnosis groups

Table 2 presents the baseline characteristics and clinical characteristics of patients who died, subdivided into three groups. There were differences regarding age; patients in the frail group had the highest mean age of 83.0 years (SD=6.9), compared to 78.9 years (SD=8.1) in the total population ($p = < 0.001$). In the group with cancer, 82.8% of the patients lived independently before hospital admission, compared to 31.6% in the frail group ($p < 0.001$).

Geriatric conditions

Frail patients and patients with end-stage organ failure had the highest prevalence of geriatric conditions. In the frail group, 71.7% presented with delirium at hospital admission and this group had a mean MMSE score of 13 points (SD=7.0) indicating severe cognitive impairment. Patient with end-stage organ failure had a mean score on the MMSE of 19 points (SD=9.1). Table 2 shows that both the frail group and the group with end-stage organ failure had

Table 2. Baseline characteristics of participants in different diagnosis groups.

	Total (N=306)	Cancer (N=151)	End-stage organ failure (N=98)	Frailty (N=57)	p value
Age					<0.001
Mean (SD)	78.9 (8.1)	76.0 (7.2)	81.3 (8.5)	83.0 (6.9)	
Sex (%)					0.65
Men	44.7 (39.3–50.5)	45.7 (38.0–53.7)	41.8 (32.6–51.7)	54.4 (41.6–66.6)	
Ethnicity (%)					0.20
Dutch	91.4 (87.8–94.1)	91.4 (85.8–95.0)	88.8 (81.0–93.6)	87.7 (76.8–93.9)	
Surinam/Hindu	3.5 (2.0–6.3)	4.6 (2.3–9.3)	7.1 (3.5–14.0)	5.3 (1.8–14.4)	
Other	5.1 (3.2–8.3)	4.0 (1.8–8.4)	4.1 (1.6–10.0)	7.0 (2.8–16.7)	
Education years					0.23
Mean (SD)	9.7 (3.8)	10.1 (4.1)	9.33 (3.9)	8.6 (3.2)	
Living situation (%)					<0.001
Independent	64.9 (59.5–70.2)	82.8 (76.0–88.0)	56.1 (46.2–65.6)	31.6 (21.0–44.6)	
Senior residence	14.1 (10.6–18.4)	11.3 (7.2–17.3)	17.4 (11.1–26.0)	17.5 (9.8–29.4)	
Old peoples' home	13.7 (10.3–18.2)	1.3 (0.4–4.7)	21.4 (14.5–30.1)	35.1 (24.0–48.1)	
Nursing home	5.4 (3.2–8.5)	4.0 (1.8–8.4)	4.1 (1.6–10.0)	12.3 (6.1–23.3)	
Intermediate care	1.9 (0.9–4.2)	0.7 (0.0–0.4)	1.0 (0.2–5.6)	3.5 (1.0–12.0)	
Social status (%; 95% CI)					0.02
Single	30.1 (25.2–35.4)	23.8 (17.8–31.2)	29.5 (21.5–39.3)	49.1 (36.6–61.7)	
Married/living together/with child	48.7 (43.1–54.3)	55.6 (47.7–63.4)	48.0 (38.3–57.7)	31.6 (21.0–44.5)	
Widow/divorced	21.2 (17.0–26.1)	20.6 (14.9–27.7)	22.5 (15.3–31.7)	19.3 (11.1–31.3)	
Delirium (%)	36.8 (31.7–42.5)	21.6 (16–29.0)	43.9 (34.5–53.8)	71.9 (59.1–91.9)	<0.001
MMSE					<0.001
Mean (SD)	20.2 (8.4)	23.5 (6.5)	18.6 (9.1)	13.0 (7.0)	
Impairments in ADL and IADL					<0.001
Mean (SD)	6.7 (4.6)	4.7 (4.0)	8.1 (4.2)	10.1 (3.9)	

SD: standard deviation; CI: confidence interval; MMSE: Mini-Mental State Examination; ADL: activities of daily living; IADL: instrumental activities of daily living.

Table 3. Identifying limited life expectancy.

	Total (N=306)	Cancer (N=151)	End-stage organ failure (N=98)	Frail (N=57)	p value
Mortality observed within 3 months after admission (%) ^a	67.2 (61.9–72.3)	59.6 (51.6–67.1)	72.4 (62.9–80.3)	77.2 (63.9–85.5)	0.03
Expected mortality within 3 months (%) ^b	50.3 (44.8–56.1)	62.1 (54.3–69.9)	44.8 (35.4–54.8)	40.5 (28.6–53.3)	0.08

^aThis includes both mortality during hospitalization and mortality within 3 months after discharge.

^bAn expected death was defined as an expected life span of 3 months or less or if active palliative treatment or complete treatment restrictions were described in the hospital medical or nursing records.

severe limitations in ADL, respectively, with modified Katz ADL index scores of 10.1 (SD=3.9) and 8.1 (SD=4.2) compared to a mean score of 4.7 (SD=4.0) in cancer patients.

Identifying limited life expectancy

The actual mortality rate within 3 months after discharge in the three groups is shown in Table 3. Almost 75% of the frail group and the group with end-stage organ failure died within 3 months after discharge. In 41% of the frail patients, and in 45% of the patients with end-stage organ

failure, a restricted life expectancy of less than 3 months was noted in the hospital records.

Advance care planning during hospitalization

Table 4 gives information about advance care planning focused on treatment restrictions, changes in hospital treatment restrictions, and palliative care during hospitalization. Approximately, 50% had in-hospital treatment restrictions. During hospitalization treatment, restrictions of most patients were unchanged and if any changes were made, these were mostly on request of the patient himself.

Table 4. Characteristics of advance care planning during hospitalization.

	Total (N=306)	Cancer (N=151)	End-stage organ failure (N=98)	Frail (N=57)	p value
Treatment restrictions (%)					
No treatment restrictions	28.1 (23.4–33.4)	29.1 (22.5–36.8)	27.6 (19.7–37.1)	26.3 (16.6–39.0)	0.94
Treatment restrictions	54.9 (49.3–60.4)	53.6 (45.7–61.4)	52.0 (42.3–61.7)	61.4 (48.4–72.9)	
Change of treatment restrictions during hospitalization (%)					
No	62.4 (56.9–67.7)	62.3 (54.3–70.0)	58.5 (48.3–67.4)	68.5 (55.5–79.0)	0.36
Yes, on request of family	10.1 (7.23–14.0)	6.0 (3.2–11.0)	17.6 (11.1–26.0)	9.3 (3.8–18.9)	
Yes, on request of patient	13.7 (10.3–18.0)	17.9 (12.6–24.8)	10.6 (5.6–17.8)	9.3 (3.8–18.9)	
Yes, initiated by physician	7.2 (4.8–10.7)	6.0 (3.2–11.0)	8.2 (4.2–15.3)	7.4 (2.8–16.7)	
Yes, on request of unknown	6.5 (4.3–10.0)	8.0 (4.6–13.4)	4.1 (1.6–10.0)	5.3 (1.8–14.4)	
Palliative care arranged after hospital discharge (%)	30.7 (25.8–36.1)	35.8 (28.6–43.7)	28.6 (20.6–38.2)	24.6 (15.2–37.1)	0.27

Table 5. Health care utilization in the last month prior to death.

	Total (N=306)	Cancer (N=151)	End-stage organ failure (N=98)	Frail (N=57)	p value
Hospitalization (%)	24.2 (19.7–29.3)	30.5 (23.7–38.2)	17.3 (11.1–26.0)	17.5 (9.8–29.4)	0.03
Day care in hospital (%)	4.1 (2.5–7.1)	6.6 (3.6–11.8)	2.0 (0.6–7.1)	0.0 (0.0–0.0)	0.05
Outpatient visits (%)	38.2 (33.0–43.8)	49.0 (41.2–56.9)	27.6 (19.7–37.1)	28.1 (18.1–40.8)	<0.001
Total (%)	41.7 (36.4–47.4)	53.0 (45.0–60.8)	29.6 (21.5–39.3)	31.6 (21.0–45.4)	<0.001

Percent of people who went to the hospital for hospitalization, one-day cares or outpatients visits at least one time in the last month before death. Actual number of patients visited the hospital in their end-stage of life is higher than reported in this table, because of mortality during hospitalization is included in this table.

There were no differences in changes of treatment restrictions between the three patient groups. Patients who died within 3 months after acute hospital admission received more changes in treatment restrictions during hospitalization compared to patients who died between 3 months and 1 year after admission ($p < 0.001$). One-third of all patients received palliative care after hospital discharge.

Health care utilization in the last month before death

Table 5 contains the percentage of patients who used health care services in the last month prior to their death. In general, patients with cancer had the highest rate of health care consumption. This table also shows similar health care consumption in patients with end-stage organ failure and frail older in the last month prior to death regarding hospitalizations and outpatient visits, 17% and 28%, respectively. In contrast, patients with cancer had higher percentages of hospitalizations and outpatient visits, 30.5% and 49.0%, respectively.

Discussion

In this study, in acutely hospitalized medical patients, who died within 1 year after hospitalization, we investigated the

differences in geriatric conditions, advance care planning, and health care utilization, using three distinct subgroups. Frail patients and patients with end-stage organ failure had the highest rates of geriatric conditions at hospital admission, and also died most frequently within 3 months post-discharge compared to cancer patients. Identifying the end-life care needs was, however, more difficult in frail older patients and those with end-stage organ failure; less than 50% had advance care planning information in their records. Cancer patients had the highest rates of health care utilization in the month before death.

We were able to demonstrate that acutely hospitalized cancer patients, compared to patients with end-stage organ failure or frailty, had a better pre-admission level of ADL functioning.¹⁰ All three patient groups showed a high prevalence of geriatric conditions. The percentage of delirium varied between 21% in cancer patients and 72% in frail patients, and the number of ADL and instrumental activities of daily living (IADL) impairments varied between 5 impairments in cancer patients and 10 impairments in frail patients. Geriatric conditions cover an important part of end-of-life care for all three patient groups and are known to be associated with institutionalization, quality of life, and mortality.^{1,12}

Three-fourth of the patients with end-stage organ failure and frailty died within 3 months after discharge, yet

end-of-life care was often not arranged at time of hospital discharge. Presumably for physicians identification of the terminal phase in non-cancer patients is more difficult to determine.¹³ As earlier noticed by Christakis and colleagues,^{14,15} physicians feel poorly prepared for (end-of-life) prognostication.

Advance care planning and customizing this planning at different times during the disease trajectory might assist professionals in discussing approaching end-of-life care needs with their patients. Needs of the older patient can change over time in terms of desired intensity of treatment, acceptance, and outcome measurements, especially after experiencing an acute hospitalization.¹⁶ Therefore, discharge planning during an acute hospital admission can serve as a moment of reconsideration, for both the patients as the physician. Most of older persons do not choose intensive therapy, instead they prefer comforting interventions.¹⁷ In a previous study, in hospitalized patients of age 80 years and older, advance care planning helped older patients to formulate their wishes regarding the end-of-life.¹⁸ This approach showed that more patients died at their preferred location and planning also reduced the burden of caregivers.

Advance care planning might also reduce health care utilization in the last month of life. For instance, we demonstrated a high percentage of patients who were (re)hospitalized in their last month of life. Gozalo et al.¹⁹ reported that older patients with cognitive impairment had an increased risk of transitions, especially when no advance directives were described. Our study also showed that over one-third of the deceased frail patients together with patients suffering from end-stage organ failure were hospitalized in the last month before death. Timely advance care planning might be important to discuss desired care options, preferred outcomes, and decrease undesired care transitions.

This study has some limitations. All information on whether mortality expected was derived from the medical record and not by interviewing the physicians directly during the hospital stay. Interviewing physicians might have given more precise information on why decisions were made and what expectations physicians had. On the other hand, important information such as the expected time to death should be noted in the medical record. We were also not able to reveal whether the hospital admissions were avoidable or undesirable in advance.

Strength of our study is that we used different resources and also had prospective data regarding the clinical condition of patients. This enabled us to include different perspectives: from the patient, his carer, nurses, and physicians.

Conclusion

Patients with end-stage organ failure and frail patients had a poorer physical and cognitive functioning than those

with cancer at the time of hospital admission; they had higher rates of delirium, cognitive impairment, and ADL disabilities. Patients with frailty and end-stage organ failure were not identified as approaching the end-of-life. In general, patients with cancer had the highest rates of health care utilization. Older patients with end-stage organ failure and frail patients had similar patterns of health consumption in the last month prior to death. Early recognition and understanding end-of-life care needs during and after acute hospitalization might improve palliative care in the last phase of life.

Acknowledgements

Study design was made by B.M.B. and S.E.R. Acquisition of the data was made by S.H., B.M.B., and S.E.R. Data were analyzed by S.H. and B.M.B. Interpretation of the analysis was done by S.H., B.M.B., and S.E.R. The article was drafted by S.H. Critical revision was done by B.M.B. and S.E.R. All authors had full access to the data and approved the manuscript before submitting it.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This study was sponsored by an unrestricted Grant of the Netherlands Organization for Health Research and Development (ZonMw no 13550004).

References

1. Buurman BM, Hoogerduijn JG, de Haan RJ, et al. Geriatric conditions in acutely hospitalized older patients: prevalence and one-year survival and functional decline. *PLoS One* 2011; 6: e26951.
2. Baztan JJ, Galvez CP and Socorro A. Recovery of functional impairment after acute illness and mortality: one-year follow-up study. *Gerontology* 2009; 55: 269–274.
3. Buurman BM, Hoogerduijn J, Gemert EA, et al. Clinical characteristics and outcomes of acutely hospitalized older patients with distinct risk profiles for functional decline: a prospective cohort study, 2011.
4. Wong RY and Miller WC. Adverse outcomes following hospitalization in acutely ill older patients. *BMC Geriatr* 2008; 8: 10.
5. Hoogerduijn JG, Schuurmans MJ, Duijnste MS, et al. A systematic review of predictors and screening instruments to identify older hospitalized patients at risk for functional decline. *J Clin Nurs* 2007; 16: 46–57.
6. Rozzini R, Sabatini T, Cassinadri A, et al. Relationship between functional loss before hospital admission and mortality in elderly persons with medical illness. *J Gerontol A Biol Sci Med Sci* 2005; 60: 1180–1183.
7. Marengoni A, von Strauss E, Rizzuto D, et al. The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. *J Intern Med* 2008; 265: 288–295.

8. Sullivan DH, Liu L, Roberson PK, et al. Body weight change and mortality in a cohort of elderly patients recently discharged from the hospital. *J Am Geriatr Soc* 2004; 52: 1696–1701.
9. Walston J, Hadley EC, Ferrucci L, et al. Research agenda for frailty in older adults: toward a better understanding of physiology and etiology: summary from the American Geriatrics Society/National Institute on Aging Research Conference on Frailty in Older Adults. *J Am Geriatr Soc* 2006; 54: 991–1001.
10. Lunney JR, Lynn J, Foley DJ, et al. Patterns of functional decline at the end of life. *JAMA* 2003; 289: 2387–2392.
11. http://www.euro.who.int/__data/assets/pdf_file/0017/143153/e95052.pdf (2012).
12. Boyd CM, Landefeld CS, Counsell SR, et al. Recovery of activities of daily living in older adults after hospitalization for acute medical illness. *J Am Geriatr Soc* 2008; 56: 2171–2179.
13. Buurman BM, van Munster BC, Korevaar JC, et al. Prognostication in acutely admitted older patients by nurses and physicians. *J Gen Intern Med* 2008; 23: 1883–1889.
14. Christakis NA and Iwashyna TJ. Attitude and self-reported practice regarding prognostication in a national sample of internists. *Arch Intern Med* 1998; 158: 2389–2395.
15. Christakis NA and Lamont EB. Extent and determinants of error in doctors' prognoses in terminally ill patients: prospective cohort study. *BMJ* 2000; 320: 469–472.
16. Fried TR and Bradley EH. What matters to seriously ill older persons making end-of-life treatment decisions?: a qualitative study. *J Palliat Med* 2003; 6: 237–244.
17. Agren BI. End-of-life care for old people: a review of the literature. *Am J Hosp Palliat Care* 2008; 25: 328–338.
18. Detering KM, Hancock AD, Reade MC, et al. The impact of advance care planning on end of life care in elderly patients: randomised controlled trial. *BMJ* 2010; 340: c1345.
19. Gozalo P, Teno JM, Mitchell SL, et al. End-of-life transitions among nursing home residents with cognitive issues. *N Engl J Med* 2011; 365: 1212–1221.