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ORIGINAL RESEARCH

Is the acute care of frail elderly patients in a comprehensive geriatric assessment unit superior to conventional acute medical care?

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Objective: The aim of this study was to investigate whether the acute care of frail elderly patients in a comprehensive geriatric assessment (CGA) unit is superior to the care in a conventional acute medical care unit.

Design: This is a clinical, prospective, randomized, controlled, one-center intervention study.

Setting: This study was conducted in a large county hospital in western Sweden.

Participants: The study included 408 frail elderly patients, aged ≥75 years, in need of acute in-hospital treatment. The patients were allocated to the intervention group (n=206) or control group (n=202). Mean age of the patients was 85.7 years, and 56% were female.

Intervention: This organizational form of care is characterized by a structured, systematic interdisciplinary CGA-based care at an acute elderly care unit.

Measurements: The primary outcome was the change in health-related quality of life (HRQoL) 3 months after discharge from hospital, measured by the Health Utilities Index-3 (HUI-3). Secondary outcomes were all-cause mortality, rehospitalizations, and hospital care costs.

Results: After adjustment by regression analysis, patients in the intervention group were less likely to present with decline in HRQoL after 3 months for the following dimensions: vision (odds ratio [OR] =0.33, 95% confidence interval [CI] =0.14–0.79), ambulation (OR =0.19, 95% CI =0.1–0.37), dexterity (OR =0.38, 95% CI =0.19–0.75), emotion (OR =0.43, 95% CI =0.22–0.84), cognition (OR = 0.076, 95% CI =0.033–0.18) and pain (OR =0.28, 95% CI =0.15–0.50). Treatment in a CGA unit was independently associated with lower 3-month mortality adjusted by Cox regression analysis (hazard ratio [HR] =0.55, 95% CI =0.32–0.96), and the two groups did not differ significantly in terms of hospital care costs ($P>0.05$).

Conclusion: Patients in an acute CGA unit were less likely to present with decline in HRQoL after 3 months, and the care in a CGA unit was also independently associated with lower mortality, at no higher cost.

Keywords: frailty, elderly, acute care, intervention, comprehensive geriatric assessment

Introduction

Background

Frail elderly individuals constitute a high percentage of emergency patients. The current organization of acute care is often poorly adapted to the specific needs of these patients.

Frailty is a biological syndrome reflecting vulnerability to stressors and reduced physiological reserves.[1] For the individual, frailty is strongly associated with functional decline, activity limitations, prolonged recovery and a high risk of being institutionalized and dying within a short period of time.[2–6]

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Among community-dwelling older adults, the prevalence of frailty is estimated to be at least 10%.[7,8] Several frailty instruments reflect different aspects of the clinical phenotype of frailty, most of them focusing on one or more of the following core domains: slowness, weakness, low physical activity, exhaustion and unintentional weight loss.[2,8,9] Other instruments reflect the accumulation of deficits, including a simplified bedside version.[3,10,11] Most frail elderly patients have multiple chronic conditions, and recurring acute illness is frequent. A high percentage of health care consumption among these individuals is related to specialized inpatient care.

Frail elderly patients in acute care have complex needs. They would therefore be likely to benefit from a complex intervention including a biopsychosocial approach. A comprehensive geriatric assessment (CGA) aims to meet the needs of these frail patients through an interdisciplinary assessment and intervention with a broad focus on physiological, psychological, and social factors. This includes a person-centered approach focusing on the individual's needs by validated instruments (Table 1). A few clinical studies have indicated that frail elderly patients could benefit from a CGA, in a general elderly care context, as well as under more specific conditions, eg, ortho-geriatric care.[12–17] Two meta-analyses showed no differences in mortality between patients treated in CGA units and in conventional care units.[15,17] However, in a recent study, caring for elderly patients in a CGA unit was associated with trends of lower 24-month mortality compared with conventional care units.[13] These meta-analyses did not show any difference in rehospitalizations between the types of care. However, they reported that care in a CGA unit is associated with a potential cost reduction and so did a recent study on acute care of elders unit.[18]

Importance

In acute care settings, there is a great need to find appropriate organizational forms of CGA. There is also a lack of knowledge regarding the effects of CGA on health-related quality of life (HRQoL) and cost-effectiveness,[16,17] particularly for the severely frail patients with poor prognosis who often have not been included in previous acute studies.

In 2008, the NU (NÄL-Uddevalla) hospital group, a large county hospital in the Västra Götaland Region of Sweden, introduced two acute elderly care units (MÄVAs).[19] This organizational form of care is characterized by a structured, systematic interdisciplinary CGA and intervention performed on the ward, including an early rehabilitation strategy. To individualize the assessment and treatment, the team has a person-centered approach including care guidance, focusing on the needs of frail elderly patients, including HRQoL. The differences between MÄVA and a conventional care unit are given in Table 1.

Goals of this investigation

The aim was to study whether the acute care of frail elderly patients in a CGA unit is superior to the care in a conventional acute medical care unit when it comes to HRQoL, mortality, rehospitalizations, and hospital care costs. We hypothesized

Table 1 Comparison of the management in the intervention group (CGA) and the control group (conventional acute medical care)

Characteristics	CGA and care	Conventional acute medical care
Department and facilities	Two MÄVA (acute elderly care CGA units) wards with a total of 48 beds: one, two, or four bedrooms; Division of Internal Medicine and Emergency Care	Wards of internal and emergency medicine: one, two, or four bedrooms; Division of Internal Medicine and Emergency Care
Team members		
Physicians	Yes. Specialists in internal medicine, family medicine and/or geriatrics	Yes. Specialists in internal medicine
Licensed practicing nurses	Yes. Including specialized admission and discharge nurses	Yes
Occupational therapists	Yes	No. Only counseling
Physiotherapists	Yes	No. Only counseling
Nutritionists	No. Only counseling	No. Only counseling
Treatment	Systematic, structured interdisciplinary CGA and care by validated instruments focusing on the following: somatic and mental health, medication review, functional and activity ability including early rehabilitation, social situation, and early discharge planning	Following routines at departments of internal medicine and emergency care according to guidelines
Admission route	Directly to the MÄVA ward via ambulance or primary care	Via the emergency ward

Notes: For both groups, standard management procedures according to national and international guidelines were followed.
Abbreviation: CGA, comprehensive geriatric assessment.

that patients cared for in a CGA unit would be less likely to present with decline in HRQoL dimensions at 3 months after discharge compared with patients treated in a conventional care unit.

Patients and methods

Study design and setting

This is a clinical, prospective, randomized, controlled intervention study with two parallel groups performed at the NU county hospital between March 2013 and July 2015. The total primary population of the NU health care system is 280,000 inhabitants. The study was approved by the independent ethics committee at the Sahlgrenska University Hospital in Gothenburg (8883-12, 20121212) and registered at the Swedish National Database of Research and Development; identifier 113021 (http://www.researchweb.org/is/vgr/project/113021; November 4, 2012).

Selection of participants

The study included patients, aged ≥75 years, being in need of in-hospital treatment and who fulfilled the foundation of frailty according to the recently validated FRESH (FRail Elderly Support research group) screening instrument,[12,20,21] ie, two or more of the following criteria: tiredness from a short walk, general fatigue, frequent falls/anticipation of falls, dependence in shopping and three or more visits to the emergency ward during the last 12 months. Patients were excluded if they declined participation in the study, were unable to give informed consent (and it was impossible to obtain informed consent from a relative), were previously defined MÄVA patients (when a patient already had a MÄVA file implying direct access to the MÄVA facilities), or were clearly suited for care at a conventional acute medical care unit due to the severity of his/her acute condition (acute myocardial infarction, acute stroke, sepsis, or other acute life-threatening conditions).

When the staff at a primary care clinic, or the ambulance staff, had identified a patient who fulfilled the inclusion criteria, a MÄVA doctor was contacted via telephone. If he/she agreed, and there was a bed available at MÄVA, the patient was included in the intervention group and admitted directly to MÄVA. If no bed was available on the MÄVA wards, the patient was included in the control group and admitted to a conventional acute medical care unit through the emergency room. This method was considered likely to create a random distribution of patients.

Written informed consent was obtained from the patient or from a member of his/her next of kin when appropriate, as soon as possible after admission, by a study nurse or doctor after oral and written information (repeatedly if necessary). A screening log book, in which all patients identified as being eligible for inclusion were registered, was kept continuously. Data including study instruments were registered by a qualified member of the study team on computerized case record forms. All data were handled according to legislation and good clinical practice.

Interventions

The intervention in this study was the type of hospital unit the patients were treated in. In the intervention group, patients were allocated to MÄVA, characterized by a structured, systematic interdisciplinary CGA and intervention with standardized procedures and validated instruments focusing on somatic and mental health, medication review, social situation, early discharge planning, and functional and activity ability including an early rehabilitation strategy involving physicians, occupational therapists, physiotherapists, and nurses as active team members. The team has a person-centered approach focusing on the individual needs of frail elderly patients (Table 1).

In the control group, patients were allocated to a conventional acute medical care unit, where standard procedures according to national and international guidelines were followed.

Methods and measurements

Clinical characteristics, hospital care consumption, and mortality

The following data were collected mainly from medical records and registers: age, gender, housing, diabetes mellitus, renal function, heart failure, other comorbidities, numbers of in-hospital care days, rehospitalizations, and all-cause mortality.

Health Utilities Index-3 (HUI-3)

HRQoL was measured using the HUI-3 instrument.[22] The HUI-3 is a generic HRQoL instrument that includes eight dimensions: vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain. Each dimension has two to eight questions. From the answers to these questions, an attribute level and a single-attribute utility score can be assigned to each of the dimensions. The HUI version used in the current study was the interview-based, 41-question, 1-week recall version. We used the patient self-assessment version or the proxy-assessment version, when self-assessment was not possible. The HRQoL measurement also included the

EuroQoL-visual analog scale (EQ-VAS),[23] which is a Visual Analog Scale ranging from 0 (worst imaginable health) to 100 (best imaginable health). Both the HUI-3 and EQ-VAS have been validated and are commonly used for elderly patients. The HUI version used in the current study was not available in Swedish, and a translation–back translation procedure was carried out in collaboration with the HUI Service Centre in Canada.[22] As other versions were available in Swedish, the translation for the current study included only minor portions of the instrument, such as recall time.

Charlson Comorbidity Index

The patient's total burden of morbidity was measured by the Charlson Comorbidity Index.[24,25] It contains 19 categories of comorbidity and predicts the 10-year mortality for a patient. Each comorbidity is assigned with a score of 1, 2, 3, or 6 depending on the risk of dying that is associated with this condition.

Costs

The costs of in-hospital and outpatient health care and nursing, including health care staff costs, were extracted at the 3-month follow-up by administrative staff from the hospital database system and the national database on cost per patient,[26] and from medical records after due approval by the relevant authorities. Cost per patient is a method used to calculate the cost of each patient and episode of hospital care.

Data concerning clinical and demographic characteristics and HRQoL were collected before discharge from the index hospital care episode when the patient was included in the study. Most patients were assessed by an occupational therapist or a physiotherapist (physical capacity), a dietician (nutritional state), and a nurse (eg, housing). In a few cases, a trained physician made the assessments. Follow-up assessments were made 3 months after discharge, by a physician's examination, registers, and medical records. These assessments were made at the hospital or in the patient's home. Patients were the primary informants. Proxy informants were used when patients were unable to participate.

Outcomes

The primary outcome was the change in HRQoL assessed before discharge from the index hospital care episode and at 3 months after discharge from hospital, measured by the HUI-3 instrument, which is given in the following sections. For each of the eight HUI dimensions, a clinically relevant change was defined as a patient-reported decrease to a lower attribute level at the 3-month follow-up compared with the index in-hospital episode.

Secondary outcomes were all-cause mortality, rehospitalizations, and hospital care costs.

Analysis

A sample size calculation was made based on the change in HRQoL after 3 months according to the HUI-3 instrument (significance level, 0.05; power, 80%). As previous studies mostly included patients who were less frail, it was difficult to estimate strict clinically relevant differences. For this purpose, HUI-3 scores from individuals, $\geq$75 years, were obtained from a previously established database at the Division of Health Care Analysis, Linköping University, Sweden.[27] An overall average score of 0.44 (range 0–1) and an SD of 0.25 were calculated for this patient group. A 5% difference between the groups was considered clinically relevant. When using a two-sided test, it was necessary to include 150 patients in each study group. To compensate for the uncertainty, it was estimated that 200 evaluable patients should be included in each study group, ie, 400 patients in total.

The data analysis was based on the intention-to-treat principle, ie, the included patients remained in the study group to which they were allocated. Patients in both groups could, after discharge from the index care episode, be readmitted to the CGA unit or conventional care.

The statistical analyses were performed using SAS 9.3. Categorical data were analyzed using Fisher's exact test or the χ^2 test, and continuous data were compared using Student's *t*-test. The association of the intervention with the primary and secondary outcomes was examined by either Cox regression or a multiple logistic regression model adjusted for relevant prognostic variables (age, gender, and relevant comorbidities, ie, the Charlson Comorbidity Index score). All independent variables included in the models were analyzed for possible collinearity with a variance inflation factor test. Variance inflation factor values of $>$2.5 were considered to indicate collinearity.

Results

Characteristics of study subjects

Between March 2013 and July 2015, 822 eligible patients were identified by primary care or the ambulance. Of these, 408 evaluable patients were included. The mean age was 85.7 years, and 56% were female. A total of 63 patients (15.4%) died during the 3-month follow-up study period (Figure 1).

Baseline characteristics are presented in Table 2. The two groups did not differ significantly in terms of age, gender, percentage living alone, and scores of frailty. Patients in

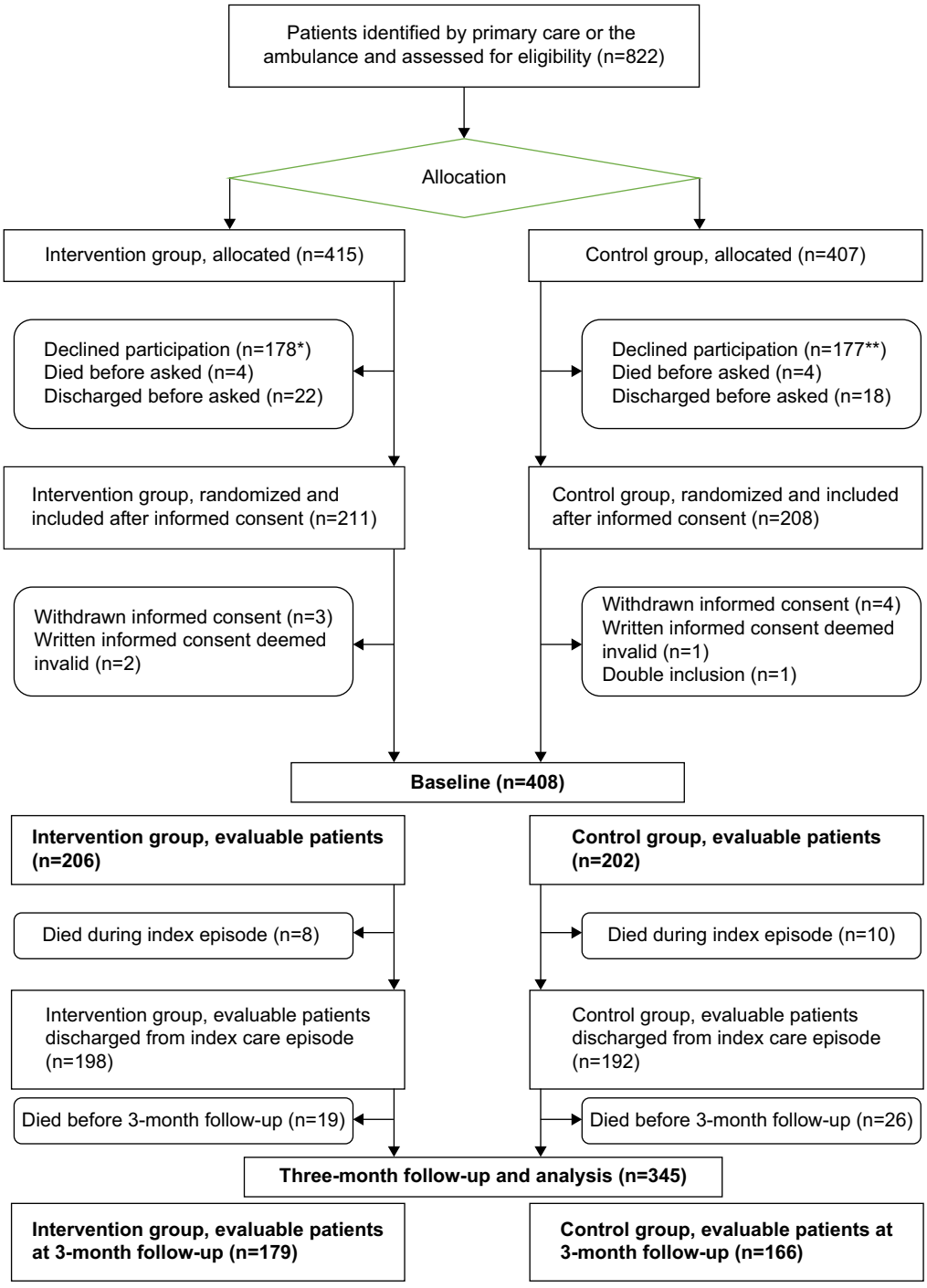

Figure 1 Flowchart of participant selection and assessment.
Notes: *Including 10 patients unable to give informed consent. **Including six patients unable to give informed consent.

both groups were heavily affected by diseases, particularly cardiovascular disease. The participants in the intervention group presented with a significantly higher burden of comorbidity compared with the control group, ie, Charlson Comorbidity Index score was 7.4 versus 6.2 ($P<0.001$). When it came to the percentage of participants living without home-help services, there was a trend toward a significant difference (intervention group, n=60 [29%]; control group, n=78 [38%]; $P=0.054$).

Main results

For each HUI-3 dimension, the average self-rated single-attribute utility scores at index and follow-up are reported (Table 3). By unadjusted analysis, a significantly lower

Table 2 Baseline characteristics of the intervention and control groups

Characteristics	Intervention group (CGA unit)	Control group (conventional care)	*P*-value
n	206	202	
Age (years), mean (SD)	85.7 (5.3)	85.6 (5.4)	0.850
Gender, female, n (%)	122 (59)	108 (53)	0.241
Living alone, n (%)	139 (67)	132 (65)	0.649
Own living without home-help services, n (%)	60 (29)	77 (38)	0.055
Frailty screening score, mean (SD)	3.5 (0.9)	3.4 (0.9)	0.149
Charlson Comorbidity Index score, mean (SD)	7.4 (2.1)	6.2 (1.5)	<0.001
Diabetes mellitus, n (%)	35 (17)	37 (18)	0.725
Ischemic heart disease, n (%)	57 (28)	67 (33)	0.227
Chronic heart failure, n (%)	90 (44)	74 (37)	0.146
Peripheral arterial disease, n (%)	18 (9)	8 (4)	0.048
Dementia, n (%)	20 (10)	27 (13)	0.247
Malignant disease, n (%)	40 (19)	27 (13)	0.099
Malignant disease with metastases, n (%)	8 (4)	2 (1)	0.059
Chronic obstructive pulmonary disease, n (%)	37 (18)	40 (20)	0.635
Renal impairment,* n (%)	193 (94)	163 (81)	<0.001
Anemia, n (%)	104 (50)	108 (53)	0.547
Reported reasons for admission, n (%)			
Dyspnea	67 (32)	65 (32)	
Worsened general condition/tiredness	48 (23)	43 (21)	
Pain	29 (14)	24 (12)	
Fever/infection	28 (14)	40 (20)	
Vertigo/falling	27 (13)	30 (15)	
Others	52 (25)	35 (17)	

Notes: *Defined as glomerular filtration rate <90. In both groups, the five most frequently reported reasons for admission were dyspnea, worsened general condition/tiredness, pain, fever/infection, and vertigo/falling. For some of the patients, more than one reason for admission was reported. No statistical comparisons were performed.
Abbreviation: CGA, comprehensive geriatric assessment.

proportion of patients in the intervention group than in the control group presented with decline in HRQoL from baseline in the following dimensions: vision, ambulation, dexterity, emotions, cognition, and pain (all $P<0.05$). For hearing and speech, we found no significant difference between the groups.

The two groups did not differ significantly in terms of unadjusted mortality, numbers of in-hospital days and costs of in-hospital and outpatient health care and nursing (all $P>0.05$).

There was no difference with regard to rehospitalizations within 3 months, but, at 1 month, rehospitalizations were

Table 3 Unadjusted outcomes

Outcomes	Index			Follow-up (3 months)		
	Intervention group	Control group	*P*-value	Intervention group	Control group	*P*-value
Mortality, n (%)	8 (4%)	10 (5%)	0.600	27 (13%)	36 (18%)	0.188
No of hospital days, mean	11.2	9.2	0.002	16.2	16.9	0.648
Rehospitalizations, n (%)				73 (37%)	88 (46%)	0.072
Hospital care costs (SEK), mean	55,215	48,927	0.097	83,989	96,315	0.131
EQ-VAS score, mean	51.1 (n=173)	48.9 (n=177)	0.298	56.8 (n=156)	51.2 (n=133)	0.003
HUI-3 dimensions, mean						
Vision	0.886 (n=167)	0.884 (n=170)	0.937	0.873 (n=146)	0.862 (n=127)	0.664
Hearing	0.815 (n=143)	0.881 (n=137)	0.013	0.818 (n=133)	0.817 (n=91)	0.976
Speech	0.999 (n=170)	0.975 (n=177)	0.003	0.995 (n=154)	0.985 (n=131)	0.036
Ambulation	0.540 (n=170)	0.569 (n=173)	0.388	0.584 (n=153)	0.458 (n=130)	0.001
Dexterity	0.871 (n=171)	0.882 (n=175)	0.692	0.856 (n=152)	0.804 (n=133)	0.122
Emotion	0.823 (n=160)	0.865 (n=157)	0.077	0.896 (n=149)	0.896 (n=128)	0.963
Cognition	0.896 (n=171)	0.877 (n=175)	0.363	0.933 (n=155)	0.834 (n=132)	<0.001
Pain	0.621 (n=171)	0.631 (n=175)	0.830	0.766 (n=156)	0.594 (n=133)	<0.001

Notes: Intervention group denotes care in a CGA unit; control group denotes conventional care. For each HUI-3 dimension, the average self-rated single-attribute utility scores at index and 3-month follow-up are reported. Similarly, the average self-rated EQ-VAS scores at index and follow-up are reported. At follow-up, the total mortality, number of hospital days and in-hospital care costs are reported. The analyses excluded missing observations for the hearing dimension. *P*-values were calculated from means by Student's *t*-test, except for mortality and rehospitalizations, for which χ^2-test was used. For rehospitalizations, percentages were calculated by the use of 198 (intervention group) and 192 (control group) as denominators.
Abbreviations: CGA, comprehensive geriatric assessment; EQ, EuroQoL; HUI-3, Health Utilities Index-3; VAS, Visual Analog Scale; SEK, Swedish Crowns.

Table 4 Reduction in HRQoL (HUI dimensions)

Variables	Vision		Hearing		Speech		Ambulation		Dexterity		Emotion		Cognition		Pain	
	OR	*P*-value	OR	*P*-value	OR	*P*-value	OR	*P*-value	OR	*P*-value	OR	*P*-value	OR	*P*-value	OR	*P*-value
Clinic																
CGA unit	0.33	0.013	0.45	0.057	0.45	0.274	0.20	<0.001	0.39	0.007	0.43	0.014	0.08	<0.001	0.27	<0.001
Conventional care	REF		REF		REF		REF		REF		REF		REF		REF	
Gender																
Female	1.21	0.655	1.23	0.620	0.17	0.035	0.80	0.467	1.84	0.087	1.43	0.307	1.79	0.095	0.62	0.102
Male	REF		REF		REF		REF		REF		REF		REF		REF	
Age	1.08	0.052	1.05	0.161	0.94	0.343	1.07	0.019	0.98	0.553	1.02	0.598	1.01	0.772	0.99	0.572
Charlson Comorbidity Index score	1.17	0.213	1.12	0.324	0.86	0.514	1.04	0.700	1.05	0.647	1.12	0.271	1.12	0.343	1.06	0.539

Notes: Comparison of the proportions of the patients in each group presenting with a reduction in terms of HUI-3 dimensions from baseline to 3-month follow-up, adjusted analyses. Patients who died before follow-up were excluded from the analysis. Gender, age and Charlson Comorbidity Index score are control variables. The independent variables were tested for collinearity with the use of the variance inflation factor. All variables had a variance inflation factor value of <2.5, which does not indicate collinearity.

Abbreviations: CGA, comprehensive geriatric assessment; HRQoL, health-related quality of life; HUI-3, Health Utilities Index-3; OR, odds ratio; REF, reference.

more frequent in the control group (56 [28%]) than in the intervention group (40 [19%]; *P*=0.048).

After adjustment by regression analysis, patients in the intervention group were less likely to present with decline in HUI single scores at 3 months after discharge for the following dimensions: vision (odds ratio [OR] =0.33, 95% confidence interval [CI] =0.14–0.79), ambulation (OR =0.19, 95% CI =0.1–0.37), dexterity (OR =0.38, 95% CI =0.19–0.75), emotion (OR =0.43, 95% CI =0.22–0.84), cognition (OR =0.076, 95% CI =0.033–0.18), and pain (OR =0.28, 95% CI =0.15–0.50). For hearing (OR =0.50, 95% CI =0.22–1.1) and speech (OR =0.45, 95% CI =0.11–1.9), we found no significant difference between the groups (Table 4).

Treatment in the CGA unit was also independently associated with lower mortality than conventional care adjusted for age, gender, and Charlson Comorbidity Index score by Cox regression analysis (hazard ratio [HR] =0.55, 95% CI =0.32–0.96).

The total number of in-hospital days including the index care episode until the follow-up was found to be significantly higher in the control group after adjustment by multiple regression analysis (*P*=0.0023).

Discussion

The results show that acute care of frail elderly patients in a CGA unit is superior to the care in a conventional acute medical care unit when it comes to several clinical outcomes at 3 months of follow-up. Patients in the CGA unit were less likely to present with decline in HRQoL, and the acute care in a CGA unit was also independently associated with lower mortality and fewer rehospitalizations. There was no significant difference between the study groups regarding the cost of hospital care.

We studied very frail elderly patients with acute illness and a high total morbidity burden. Former studies focusing on the CGA concept have not included such old patients with such a high morbidity burden and poor prognosis. The study adds knowledge relating to a potentially appropriate acute care organization that meets the needs of very frail elderly patients. We have used well-established instruments to evaluate the effects of the intervention in multiple dimensions. This study was integrated in the standard daily clinical context and included a wide spectrum of diagnoses, which enhances the generalizability of the study results.

It might be possible to argue that elderly patients so severely affected by frailty and multi-morbidity as the study patients have a very poor prognosis regardless of the treatment offered. However, patients with similar characteristics generate a large part of everyday hospital care consumption in most western countries, and there is no foreseeable trend in the opposite direction. There is, therefore, a particular need to build evidence relating to the treatment and care of this important patient group.

In the current study, patients treated in a CGA unit were less likely to present with decline in HRQoL dimensions of vision, speech, ambulation, dexterity, cognition, and pain at the 3-month follow-up compared with patients treated in a conventional acute care unit. As far as we know, this is the first study to demonstrate such an advantage in terms of HRQoL from a CGA unit for frail elderly patients. Participants who died before follow-up were excluded. Since a covariation between mortality and low HUI scores can be assumed, the group with higher mortality rate, ie, the control group, is likely to gain from the chosen analysis strategy, which thus favors the control group.

Acute care of frail elderly patients in a CGA unit was associated with a significantly lower 3-month mortality rate than that in a conventional acute medical care unit. In a recent study, caring for elderly patients in an ambulatory CGA unit was associated with lower 36-month mortality compared with conventional care units.[13] In this study, the patients were older, in need of acute care, presented with more comorbidities and generally had a poorer prognosis. The findings in these two studies strengthen a suggested association between CGA and lower mortality.

When it comes to hospital care consumption and costs during the first 3 months, there was no significant difference between the study groups. A few previous studies have indicated that care in a CGA unit could be associated with a potential cost reduction,[15,18] but some trials have reported results in the opposite direction.[28,29]

The numbers of in-hospital days during the index care episode were significantly higher in the intervention group. However, the numbers of early rehospitalizations were lower in the CGA-treated group. Consequently, by the 3-month follow-up, there was no difference regarding the total numbers of bed days between the two groups. This explains the lack of difference regarding the total cost of hospital care. It can be hypothesized that the longer index care episode for patients in the intervention group made it possible to optimize the medical treatment, to inform the patients in more detail and to perform a more extensive care planning in cooperation with other caregivers.

There is growing evidence in favor of CGA units for frail elderly patients. The CGA and related care can be considered as a complex intervention. Consequently, there may be several critical differences compared with conventional care, which may interact and benefit frail elderly patients. However, the early rehabilitation perspective including assessment and care should be regarded as crucial.

More research is needed to identify appropriate organizational forms adapted to the different stages of needs the frail elderly patients can manifest, ie, stable chronic disease and acute illnesses. This further research should include evaluations of activities in primary and municipal care, ambulant geriatric care units, and specialized hospital care.

The MÄVA form of care can serve as one example of how acute care of frail elderly people can be organized. This example could be implemented in everyday hospital health care in Sweden and other countries. Frail elderly patients would thereby be offered a health care structure, which is more compatible with their needs and provided through cooperation between several professions and care providers.

The study has some limitations. The fact that the assessments of the patients was not carried out in an examiner-blinded fashion can be regarded as a weakness. However, for practical reasons, it would have been difficult to mask the group to which the patient had been randomized, and few of the outcomes are likely to have been influenced.

There were some practical difficulties in the randomization procedure in this study. Randomization using a lottery was carefully considered, but not deemed feasible with regard to the recurrent shortage of MÄVA beds. A lottery procedure would also have meant that, in practice, several patients would have been allocated to a unit that did not belong to the group selected by the lottery. It was also important to include patients who are representative of the frail elderly population in everyday health care; a significant proportion of them are cognitively impaired, especially in the acute stage of the illness. For these reasons, randomizing representative patients through a lottery, after obtaining informed consent in the ambulance, was considered extremely difficult to implement. Blinding of patients or staff was not possible, as two hospital care forms were evaluated. The randomization was confirmed to a satisfactory extent, as most of the baseline characteristics did not differ between the groups. In cases where any differences were identified, the intervention group patients were slightly more ill, eg, presenting with a higher Charlson Comorbidity Index score with no detectable bias in favor of the intervention group.

Conclusion

The results of the study indicate that well-structured team-based acute care of frail elderly patients in a CGA unit is superior to the care in a conventional acute medical care unit in terms of clinical outcomes after 3 months. Patients in a CGA unit were less likely to present with decline in HRQoL after 3 months, and the care in a CGA unit was also independently associated with lower mortality and fewer rehospitalizations. We identified no significant difference between the study groups regarding the cost of hospital care.

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Author contributions

NE, JA, SL, and SDI contributed to the overall conception and design of the study. NE wrote the first draft of this

manuscript. BWK and NE recruited the patients. BWK, NE, JA, MH, and EH acquired and managed the data. DA and MH did the statistical analyses. All authors contributed toward data analysis, drafting and critically revising the paper and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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