Original Study

Long-Term Evaluation of the Ambulatory Geriatric Assessment: A Frailty Intervention Trial (AGe-FIT): Clinical Outcomes and Total Costs After 36 Months

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mortality
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A B S T R A C T

Objective: To compare the effects of care based on comprehensive geriatric assessment (CGA) as a complement to usual care in an outpatient setting with those of usual care alone. The assessment was performed 36 months after study inclusion.

Design: Randomized, controlled, assessor-blinded, single-center trial.

Setting: A geriatric ambulatory unit in a municipality in the southeast of Sweden.

Participants: Community-dwelling individuals aged \( \geq 75 \) years who had received inpatient hospital care 3 or more times in the past 12 months and had 3 or more concomitant medical diagnoses were eligible for study inclusion. Participants were randomized to the intervention group (IG) or control group (CG).

Intervention: Participants in the IG received CGA-based care for 24 to 31 months at the geriatric ambulatory unit in addition to usual care.

Outcome measures: Mortality, transfer to nursing home, days in hospital, and total costs of health and social care after 36 months.

Results: Mean age (SD) of participants was 82.5 (4.9) years. Participants in the IG (\( n = 208 \)) lived 69 days longer than those in the CG (\( n = 174 \)); 27.9\% (\( n = 58 \)) of participants in the IG and 38.5\% (\( n = 67 \)) in the CG died (hazard ratio 1.49, 95\% confidence interval 1.05–2.12, \( P = .026 \)). The mean number of inpatient days was lower in the IG (15.1 [SD 18.4]) than in the CG (21.0 [SD 25.0], \( P = .01 \)). Mean overall costs during the 36-month period did not differ between the IG and CG (USD 71,905 [SD 85,560] and USD 65,626 [SD 66,338], \( P = .43 \)).

Conclusions: CGA-based care resulted in longer survival and fewer days in hospital, without significantly higher cost, at 3 years after baseline. These findings add to the evidence of CGA’s superiority over usual care in outpatient settings. As CGA-based care leads to important positive outcomes, this method should be used more extensively in the treatment of older people to meet their needs.

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Old age is associated with the risks of health deterioration and multimorbidity, leading to increased health care consumption. This reality has implications for the planning and delivery of health care to older people. Current health care is organized to a large extent according to medical specialties focused on diseases or malfunctions in specific body systems, which limits the ability to meet the needs of older patients with multimorbidity.

Comprehensive geriatric assessment (CGA) has been proposed as a more holistic approach to meeting the needs of older patients. CGA is defined as "a multidimensional interdisciplinary diagnostic process focused on determining a frail older person’s medical, psychological, and functional capability in order to develop a coordinated and integrated plan for treatment and long-term follow-up." Previous studies have demonstrated the superiority of CGA over usual care in acute hospital settings; however, few researchers have reported on the outcomes of CGA in outpatient or ambulatory care settings.

In a previous article on the Ambulatory Geriatric Assessment—A Frailty Intervention Trial (AGe-FIT), on which the current article also reports, we reported that patients receiving CGA-based care in an ambulatory geriatric unit (AGU) had spent fewer days in hospital (P < .035) and had a better sense of security regarding care interaction (P < .001) 24 months after inclusion, compared with patients receiving usual care. Much of the intervention was preventive, including the provision of information of the importance of physical activity and proper nutrition, continuous updating of medication lists, and support to ensure good compliance with prescriptions. We thus wanted to study the intervention’s ability to prevent health decline over a period of more than 24 months. The purpose of this analysis was to evaluate clinical outcomes (mortality, transfer to nursing home, and hospitalization) and total costs of health and social care utilization associated with CGA-based care in an AGU compared with usual care 36 months after study inclusion.

Patients and Methods

Design

AGe-FIT was a randomized, controlled, assessor-blinded, single-center trial involving 2 parallel groups of elderly patients with multimorbidity. It was performed between February 2011 and December 2013, with a 36-month follow-up period. The design of the study and main results after 2 years have been published previously. The Regional Ethics Committee of Linköping approved the protocols for the primary study (Dnr. 2011/41-31) and 3-year follow-up (Dnr. 2015/6-32). The study is registered at clinicaltrials.gov (NCT01446757).

Study Setting

This study was conducted in a municipality in the Region of Östergötland (Sweden), which includes rural and urban areas. Residents older than 75 years comprise 8.3% of the population. Medical care is provided by an acute care hospital (or a university hospital, when needed) and 10 community primary care centers managed by the regional health care authority, and social care is provided by the municipality. The hospital has no inpatient ward specializing in geriatric medicine.

Participants and Randomization

Participants were identified through an administrative health care registry. Eligible individuals were community dwelling and aged 75 years or older, had received inpatient hospital care 3 or more times in the previous 12 months, and had 3 or more concomitant medical diagnoses. All individuals who fulfilled the inclusion criteria were randomized to an intervention group (IG) and a control group (CG) using a random list generated by SPSS software (version 18.0; SPSS, Inc, Chicago, IL). Participants who provided written informed consent before baseline interviews and assessments were included in this analysis (Figure 1).

Intervention Group

Participants randomized to the IG received CGA-based care and follow-up in an AGU designed specifically for the intervention and opened when the study was initiated. After baseline assessment by research personnel, participants in the intervention group were invited to receive individually tailored care and attend follow-up visits at the ambulatory geriatric unit during the study period. Initial CGA was performed based on a standardized procedure and after the initial CGA, the intervention was characterized by home visits, participants’ visits to the AGU, and/or telephone calls, according to each participant’s needs and preferences.

Control Group

Participants allocated randomly to the CG received usual social and health care, delivered at home, in primary care centers, and in the hospital. This usual care was provided most often after patients or family members contacted social and health care workers, rather than at the initiative of health care professionals.

Baseline Assessment, Costs, and Outcome Measures

Baseline assessments were conducted at consenting participants’ homes by registered nurses or an occupational therapist not involved in the intervention or other aspects of participants’ care. Assessments were part of the study protocol and had no therapeutic purpose.

Clinical outcomes (mortality, transfer to nursing home, and hospitalization) and costs of social and health care resource utilization were assessed for all participants 36 months after baseline. Dates of death were collected from electronic medical records linked to the MASTER Swedish total population register. Survival time (days) was calculated from the date of baseline assessment to the date of death. Data on health care consumption, including inpatient care, ambulatory visits, and prescribed drugs, were obtained from patient registries. Data were collected from the Östergötland Region data warehouse, which contains administrative information about patients’ characteristics, visits to health care providers, and hospitalizations (including number of inpatient days), in February 2015. Individual costs per patient for each contact were recorded in a separate database and linked to the data warehouse. Data on prescribed drugs and costs were extracted from a national pharmaceutical data registry. Information on participants’ use of home help services, transfer to nursing homes, and days spent at nursing homes was obtained from municipal social care managers’ records for the calculation of social care costs.
Statistical Analyses

Student t test was used to compare continuous data between the IG and CG, and the $\chi^2$ test was used to compare categorical data. Mean costs of health and social care were calculated for the 2 groups, and mean differences between groups ($D$) were determined after 36 months. All cost estimates are presented as mean 2014 US dollar values. For mortality and cost of care analyses, all recruited participants were analyzed (intention-to-treat sample); for mortality, an analysis of patients who followed the protocol (ie, those who actually received care at the AGU compared with the CG) was also performed. The number needed to treat (NNT) to avoid 1 death under the 36 months was calculated as the inverse of absolute risk reduction (ARR) of death by the risk in the CG minus the risk in the IG with confidence intervals. The number of months to mortality is also presented using a Kaplan–Meier curve. The significance level was set to $P < .05$ for all analyses.

Results

A total of 837 eligible participants were randomized to the IG and CG. Of these, 46% gave written informed consent, resulting in a final sample of 208 participants in the IG and 174 in the CG. Mean age was 82.5 years and 52% of participants were men. No significant difference in any of the baseline characteristics (age, sex, education, living situation, hearing and vision problems, cognition, health-related quality of life [HRQoL], activities of daily living, or diagnoses) was observed between groups (Table 1).

Eleven participants randomized to the IG did not accept invitations for initial CGA visits and never contacted the AGU; thus,
they consumed only usual care (Figure 1). Mean intervention periods were 25.3 months for all participants in the IG and 28.5 months for participants alive at the time of AGU closure (November 2013).

**Mortality**

Mean survival time was 69 days longer in the IG than in the CG; 27.9% (n = 58) of participants in the IG and 38.5% (n = 67) of those in the CG had died within 3 years after study inclusion (HR 1.49, 95% CI 1.05–2.12, \( P = .026 \)). Cumulative mortality is shown in Figure 2. Kaplan–Meier analysis including only participants who followed the protocol showed a greater difference; 25.9% (n = 51) of participants in the IG and 38.5% (n = 67) in the CG had died (HR 1.62, 95% CI 1.13–2.34, \( P = .009 \)).

The NNT to avoid 1 death in the 36-month follow-up period was \( \frac{0.385 – 0.279}{0.279} = 10 \) participants (CI 5–85).

**Nursing Home and Hospital Admission**

Thirty (14.4%) participants in the IG and 32 (18.4%) participants in the CG moved to nursing homes during the 3-year follow-up period (HR 1.36, 95% CI 0.83–2.24, \( P = .23 \)). The mean number of hospitalizations during follow-up did not differ significantly between groups (IG: 2.8, SD 3.0; CG: 3.4, SD 3.3; \( P = .06 \)); however, the mean number of inpatient days was significantly lower in the IG than in the CG (15.1, SD 18.4, vs 21.0, SD 25.0, \( P = .01 \)).

**Costs**

Mean costs during the 36-month period after baseline assessment were USD 71,905 (SD 85,560) in the IG and USD 65,626 (SD 66,338) in the CG (\( P = .43 \)). The mean difference per patient per year was USD 7193. Patients in the IG had more visits to physicians and other staff and less cost for hospital care compared with patients in the CG (Table 2).

**Table 1**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>208</td>
<td>174</td>
</tr>
<tr>
<td>Age, y, mean (SD)</td>
<td>82.3 (4.6)</td>
<td>82.7 (5.1)</td>
</tr>
<tr>
<td>Women, n (%)</td>
<td>108 (47)</td>
<td>81 (50)</td>
</tr>
<tr>
<td>Living alone, n (%)</td>
<td>102 (49)</td>
<td>93 (54)</td>
</tr>
<tr>
<td>Primary school only, n (%)</td>
<td>127 (62)</td>
<td>109 (63)</td>
</tr>
<tr>
<td>Hearing impairment with hearing aid, n (%)</td>
<td>75 (36)</td>
<td>59 (34)</td>
</tr>
<tr>
<td>Vision impairment with glasses, n (%)</td>
<td>49 (24)</td>
<td>56 (32)</td>
</tr>
<tr>
<td>Mini-Mental State Examination score, mean (SD)</td>
<td>26.2 (3.3)</td>
<td>26.6 (3.0)</td>
</tr>
<tr>
<td>Barthel index score, mean (SD)</td>
<td>89.6 (14.8)</td>
<td>92.0 (9.9)</td>
</tr>
<tr>
<td>HRQOL, mean (SD)</td>
<td>0.62 (0.31)</td>
<td>0.63 (0.28)</td>
</tr>
</tbody>
</table>

Previous diagnoses:* n (%)                          
- Certain infectious and parasitic diseases (A00–B99) 97 (47) 71 (41)
- Neoplasms (C00–D48)     89 (43) 70 (40)
- Diseases of the blood and blood-forming organs 60 (30) 56 (32)
- and certain disorders involving the immune mechanism (D50–D89) 102 (49) 87 (50)
- Endocrine, nutritional, and metabolic diseases 102 (49) 87 (50)
- (E00–E90) 78 (38) 53 (31)
- Mental and behavioural disorders (F00–F99) 78 (38) 53 (30)
- Diseases of the nervous system (G00–G99) 197 (95) 169 (97)
- Diseases of the circulatory system (I00–I99) 112 (54) 100 (56)
- Diseases of the respiratory system (J00–J99) 117 (56) 91 (52)
- Diseases of the digestive system (K00–K93) 167 (80) 132 (76)
- Diseases of the musculoskeletal system/connective tissue (M00–M99) 207 (100) 174 (99)

*Codes are taken from the International Classification of Diseases, 10th edition.

This long-term study of CGA in an ambulatory setting is the first to document that the intervention prolonged survival and reduced hospitalization time. These results confirm the superiority of CGA compared with usual care for community-dwelling older people with multimorbidity. This study adds to the previously limited evidence that CGA is also valid in an outpatient care setting.

The improvement in survival may be explained in part by the intervention’s goal of empowering patients through continuous advice provision and active follow-up, not least in terms of pharmacological issues. The general health advice provided by AGU staff, including advice on exercise and nutritional complements, is also known to affect frailty, and thereby mortality.16,17

After 24 months of follow-up, the intervention resulted in fewer days in hospital, but had an insignificant effect on mortality.18 The
current data from 36 months of follow-up confirm our previous finding for hospital days and strengthens the findings for mortality. As many intervention actions were preventive and aimed to empower patients, the effects of the intervention probably lasted long after participants left the comprehensive care setting. This factor could explain the positive results of this study, even after AGU closure. However, a longer intervention may have achieved even better outcomes, given the condition of most study participants.

A limitation of our study was our way of randomization, where all patients were randomized as soon as we received the lists from the administrative health care registry and before collecting informed consent. This procedure created a delay between the randomization procedure and baseline assessment, which in the IG was 58 days (SD 46) and in the CG 53 days (SD 45). The number of days did not differ significantly between the groups ($P = .23$). This delay was due to a severe shortage of baseline assessors the first year. Because of this delay, some patients became noneligible for the study, as they died or moved to a nursing home before we were able to ask for informed consent and conduct the baseline assessment; see the flowchart (Figure 1). This could potentially lead to a possible difference between the groups. We could not, however, show differences between the groups at baseline in any of our analyses.

There have been other studies of CGA in outpatient care that have not with long as with a follow-up time as in this study: the longest with a follow-up of 1.5 years. The overall costs of care have not in any study differed between CGA-based care and usual care despite less inpatient hospital care. The higher cost of more home care in the intervention group has been one of the explanations. There has been a tendency of lower mortality and less inpatient care in several studies but the shorter follow-up time could explain the lack of significant results as found in our study.

One strength of Age-FIT is the comprehensive description of our way of working that enables confirmation of the findings in future studies. The manner of care delivery and assessment, however, is individualized, depending on each patient’s personality and needs, as well as the health care professionals’ qualifications and interests. Given this complexity, we lack a gold standard for CGA, which would make the concept easier to understand and transfer to nongeriatric health care, and communicate to national and local organizations conducting health care planning. A strength of the present study is the comprehensive evaluation, with consideration of clinical outcomes, and health and social care costs. This approach enabled examination of the effects of the intervention from patient, health care, and societal perspectives.

Determination of the appropriate intervention mode and dose for a given group of patients/clients is important. Older people with less complex needs may benefit from preventive home visits by nurses, with access to physicians and other health care givers. However, if their needs become more complex, more comprehensive assessment, including medical, functional, social, existential, and psychological aspects as a base of continuing care and follow-up might be needed to achieve a significant difference. Several methods of organizing care, such as the Kaiser Permanente model and triangle concept, have been suggested. In these approaches, most people with less complex conditions receive primarily supportive care and self-care case management, whereas high-risk patients are treated by specialist disease management. Highly complex patients, such as those included in the present study, are cared for holistically with comprehensive case management. This chronic care model has received much attention in the past decade, as it is considered to improve quality of care and conserve resources.

Participants were included in the present study based only on age, multimorbidity, and number of hospitalizations; this approach may not be optimal for the identification of older people with the most comprehensive needs. A few patients in our sample were too healthy to need the comprehensive care we offered, and our inclusion criteria may have prevented us from detecting people with cognitive decline, who have more trouble seeking needed care. Participant selection could be improved by offering comprehensive care based on frailty screening, including cognitive assessment, as cognitive decline is often overlooked in this group of older patients.

This analysis further confirmed the positive results of CGA-based care, not only in acute care settings, but also in ambulatory care. The findings emphasize the need for a change in the day-to-day organization of care delivery, with a shift from care focused on a single organ/disease to a more comprehensive and preventive approach, for older patients.

References


