Original Investigation

# Comprehensive Geriatric Assessment and Transitional Care in Acutely Hospitalized Patients
## The Transitional Care Bridge Randomized Clinical Trial

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**IMPORTANCE** Older adults acutely hospitalized are at risk of disability. Trials on comprehensive geriatric assessment (CGA) and transitional care present inconsistent results.

**OBJECTIVE** To test whether an intervention of systematic CGA, followed by the transitional care bridge program, improved activities of daily living (ADLs) compared with systematic CGA alone.

**DESIGN, SETTING, AND PARTICIPANTS** This study was a double-blind, multicenter, randomized clinical trial conducted at 3 hospitals with affiliated home care organizations in the Netherlands between September 1, 2010, and March 1, 2014. In total, 1070 consecutive patients were eligible, 674 (63.0%) of whom enrolled. They were 65 years or older, acutely hospitalized to a medical ward for at least 48 hours with an Identification of Seniors at Risk–Hospitalized Patients score of 2 or higher, and randomized using permuted blocks stratified by study site and Mini-Mental State Examination score (<24 vs ≥24). The dates of the analysis were June 1, 2014, to November 15, 2014.

**INTERVENTIONS** The transitional care bridge program intervention was started during hospitalization by a visit from a community care registered nurse (CCRN) and continued after discharge with home visits at 2 days and at 2, 6, 12, and 24 weeks. The CCRNs applied the CGA care and treatment plan.

**MAIN OUTCOMES AND MEASURES** The main outcome was the Katz Index of ADL at 6 months compared with 2 weeks before admission. Secondary outcomes were mortality, cognitive functioning, time to hospital readmission, and the time to discharge from a nursing home.

**RESULTS** The study cohort comprised 674 participants. Their mean age was 80 years, 42.1% (n = 284) were male, and 39.2% (n = 264) were cognitively impaired at admission. Intent-to-treat analysis found no differences in the mean Katz Index of ADL at 6 months between the intervention arm (mean, 2.0; 95% CI, 1.8-2.2) and the CGA-only arm (mean, 1.9; 95% CI, 1.7-2.2). For secondary outcomes, there were 85 deaths (25.2%) in the intervention arm and 104 deaths (30.9%) in the CGA-only arm, resulting in a lower risk on the time to death within 6 months after hospital admission (hazard ratio, 0.75; 95% CI, 0.56-0.99; $P$ = .045; number needed to treat to prevent 1 death, 16). No other secondary outcome was significant.

**CONCLUSIONS AND RELEVANCE** A systematic CGA, followed by the transitional care bridge program, showed no effect on ADL functioning in acutely hospitalized older patients.

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Within 6 months of acute hospitalization, 30% to 50% of older patients experience a loss of essential activities of daily living (ADLs),[1-3] while 20% to 30% are readmitted[4] and 20% to 30% die.[1,5] Two clinical care models specifically target older persons at risk for these negative outcomes during hospitalization and in the transition from hospital to home, including the comprehensive geriatric assessment (CGA) team approach[6] and transitional care.[7]

In the CGA team approach, a multidisciplinary team visits older patients during hospitalization, performs a CGA focused on illnesses and geriatric conditions, initiates interventions, and monitors each patient until hospital discharge. The effectiveness of this approach has been studied extensively, with one meta-analysis[6] demonstrating a positive effect on cognitive functioning, while another meta-analysis[8] found a reduction in mortality until 8 months after discharge. On most other outcomes, the CGA team approach has not demonstrated effectiveness.[6,8] These mixed findings may be due to nonadherence to recommendations provided in the CGA care and treatment plans, and the care initiated during hospitalization may be discontinued on discharge regardless of the presence or worsening of the geriatric conditions.

Transitional care aims to ensure safe transitions between care settings.[7] In the transition from hospital to home, many patients experience adverse drug events,[9] have inadequate follow-up,[10] and manifest difficulties with the execution of discharge instructions.[11] Transitional care is a time-limited service. After a number of visits, this care is discontinued, and the patient is handed over to primary care. Transitional care has shown beneficial effects on readmission rates.[12,13] Nurse care coordination, a home visit within 2 days after hospital discharge, and communication between the hospital and primary care providers are intervention components associated with a reduction in readmission.[12] However, the effects of transitional care on mortality are inconsistent,[14-16] and only one study[14] to date has studied the effect on ADLs.

Combining the 2 clinical care models might be beneficial for older patients by assisting during hospitalization, by aiding in their transition home, and by providing home follow-up for geriatric conditions after hospital discharge. In this double-blind, multicenter, randomized clinical trial, we tested whether an intervention of an in-hospital systematic CGA by a geriatric consultation team, followed by a transitional care program, reduced ADL disabilities by 6 months after discharge in older persons who were acutely admitted to a medical ward compared with older persons who received only systematic CGA during hospitalization.

## Methods

### Design and Setting

Three hospitals with affiliated home care organizations in the Netherlands participated in the transitional care bridge program, a multicenter, double-blind (via the postponed informed consent procedure),[17] randomized clinical trial conducted between September 1, 2010, and March 1, 2014. The participating hospitals in the Netherlands included the Academic Medical Center in Amsterdam (a 1024-bed university teaching hospital), the Onze Lieve Vrouwe Gasthuis in Amsterdam (a 555-bed teaching hospital), and the Flevo Hospital in Almere (a 386-bed regional teaching hospital). All these hospitals had a geriatric consultation team. A community care registered nurse (CCRN) from Cordaan Home Care, Buurtzorg Nederland, and Zorggroep Almere provided the transitional care bridge program to participants who were randomized to the intervention group. The trial protocol has been previously described[18] and can be found in Supplement 1. The eMethods 1 in Supplement 2 describes the health care system in the Netherlands.

### Ethics

The institutional review board of the Academic Medical Center approved this study (protocol ID MEC10/082). The institutional review boards of the Onze Lieve Vrouwe Gasthuis and Flevo Hospital provided local approval.

### Participants

Consecutive patients who were 65 years or older, were acutely admitted for at least 48 hours to an internal medicine department, and were at risk for functional decline were eligible for inclusion in this study. The risk of functional decline was assessed using the Identification of Seniors at Risk-Hospitalized Patients (ISAR-HP),[19] and those with a score of 2 or higher were considered to be at increased risk for functional decline (eMethods 2 in Supplement 2).

### Recruitment of Participants and Informed Consent

Experienced trained research nurses met with all consecutive patients within 48 hours of admission. Eligible patients were invited to participate in the trial and provided written informed consent using a postponed informed consent procedure.[17] For those patients with severe cognitive impairment due to dementia or delirium (Mini-Mental State Examination [MMSE] score, <16)[20] or severe acute illness (eg, shock), their health care proxy provided written informed consent.

### Baseline Data Collection

The baseline assessment included the following: demographics, the ISAR-HP, premorbid ADL functioning 2 weeks before admission (6-item original Katz Index of ADL[21]), cognitive functioning (MMSE score[20]), geriatric conditions (eg, polypharmacy, incontinence, malnutrition,[22] delirium,[23] and fall risk), all admission diagnoses, and comorbidity measured at discharge (Charlson Comorbidity Index[24]). A complete overview of the instruments used is described elsewhere.[18]

### Randomization

Consented participants were randomly assigned to the intervention arm (systematic CGA and the transitional care bridge program) or the control arm (systematic CGA alone). The randomization list was created using an online system (TENALEA Clinical Trial Data Management System; Trans European Network for Clinical Trial Services), with a maximum permuted block size of 20 and stratification by study site and MMSE score (<24 vs ≥24). To ensure allocation concealment,

Table 1. Components of the Transitional Care Bridge Program Intervention Arm and the Systematic CGA-Only Control Arm

| Time Frame | Intervention Component | Professional Involved | Intervention | CGA Only |
|---|---|---|---|---|
| ≤48 h After hospital admission | CGA[a] | Geriatric-trained RN with geriatrician | X | X |
| | Care and treatment plan, with prioritization by patient and geriatric team | Geriatric consultation team | X | X |
| During hospital stay | Multidisciplinary care provided by geriatric team | RN and geriatrician; as-needed physical therapist, dietician, and team on the ward | X | X |
| Before hospital discharge | In-person handover of CGA and care and treatment plan by geriatric team to CCRN | Geriatric consultation team, team on the ward, CCRN | X | |
| Before hospital discharge | Visit of CCRN to participant | CCRN | X | |
| ≤2 d After hospital discharge | Home visit or visit to the NH, with medication reconciliation; initiate home care; check for activities of daily living and availability of adequate help; target geriatric conditions; contact GP or NH physician | CCRN | X | |
| 2 wk | Home visit or visit to the NH, evaluation of hospital-based care and treatment plan, goal setting by participant, protocol adherence for incident and prevalent geriatric conditions | CCRN | X | |
| 6 wk | Home visit or visit to the NH, focusing on the proxy and caregiver burden; further actions on geriatric conditions | CCRN | X | |
| 12 wk | Home visit or visit to the NH, focusing on care needs for incident and prevalent geriatric conditions | CCRN | X | |
| 24 wk | Home visit or visit to the NH, focusing on care needs; evaluation of geriatric conditions; handover to GP | CCRN | X | |

Abbreviations: CCRN, community care registered nurse; CGA, comprehensive geriatric assessment; GP, general practitioner; NH, nursing home; RN, registered nurse.

[a] The CGA was conducted by a geriatric-trained RN, who assessed participants on 18 geriatric conditions using a standardized geriatric assessment form. After this, participants were asked whether they recognized the detected geriatric conditions, if they needed any (additional) care or treatment, and which conditions should have priority in the care and treatment plan. The geriatric RN presented these findings to the team's geriatrician. If a psychological problem was present (eg, delirium, cognitive impairment [Mini-Mental State Examination score <24]), or depression) or if the participant had 5 or more geriatric conditions, the geriatrician visited the participant. A personalized care and treatment plan was initiated, and participants were followed up throughout hospitalization. The geriatric consultation team consisted of at least a geriatrician, geriatric RN, physical therapist, and dietician. After discharge, the medical responsibility was handed over to the GP. In the intervention group, the CCRN contacted the GP in case of problems with medications or geriatric conditions. There was no predefined contact moment between the CCRN and GP. All GPs of patients in the intervention arm received the CGA results and a letter informing them about the transitional care bridge, including the name and telephone number of the CCRN who was coordinating the transitional care bridge program for the patient.

the research nurse used a secure randomization website to receive the treatment allocation when submitting patient information.

## Treatment Arms

Components of the systematic CGA and the transitional care bridge program are listed in **Table 1**. The CCRNs who conducted the transitional care bridge program received additional training before the start of the intervention (eMethods 3 in Supplement 2). All randomized participants received a systematic CGA within 48 hours of admission (Table 1).

## Transitional Care Bridge Program Intervention

After the geriatric-trained registered nurse conducted the CGA, the CCRN was contacted to visit the hospital to receive a personal handover of the CGA, to initiate the personalized care and treatment plan (CTP), and to meet with the participant and informal caregiver to discuss their needs. This visit was performed as soon as possible, occurring a median of 4 days after admission.

After discharge, the CCRN at a home visit 2 days later performed medication reconciliation, answered the participant's questions, and completed a needs assessment. If a participant was discharged to a nursing home, the CCRN also visited the nursing home within 2 days after discharge.

At weeks 2, 6, 12, and 24 after discharge, the CCRN performed home visits or visits to the nursing home, with the CTP providing the guidance for these home visits. Geriatric conditions were monitored, and interventions were continued or newly initiated. For geriatric conditions, evidence-based intervention protocols were provided (eMethods 4 in Supplement 2).

## Outcomes

The original Katz Index of ADL[21] at 6 months was the primary end point. The participants were asked whether they needed help to perform each ADL activity 2 weeks before admission and at the time of the follow-up assessments. The Katz Index of ADL ranges from 0 to 6, with higher scores indicating more dependence. Secondary outcomes included mortality at 1 month and 6 months after admission. Complete data on dates of death were verified using electronic medical records or the municipal registry. Cognitive functioning was measured at baseline and at 6 months with the MMSE. Other secondary outcomes were the time to the first unplanned hospital readmission (within 6 months) and, among those discharged to a nursing home, the time to discharge from the nursing home to the community.

## Data Collection and Masking

The geriatric-trained registered nurse performed the screening and baseline data collection, which was conducted before the randomization because all participants received CGA. Research assistants masked to the treatment allocation con-

ducted all outcome assessments, including an in-home assessment at 6 months. If a participant was still in a nursing home, the assessment was performed there.

### Adherence to the Intervention Protocol

The CCRNs registered each visit for the participants in the intervention arm. Based on these logs and predefined quality indicators (eMethods 5 in Supplement 2), we calculated adherence to the intervention protocol (eTable 1 in Supplement 2).

### Sample Size Calculation

The trial was powered for the primary end point of the difference in the Katz Index of ADL between the control and intervention arms at 6 months compared with that at 2 weeks before hospital admission, assuming an effect size of 0.25 to represent a clinically important change of 0.5 point on the original Katz Index of ADL. In total, 256 participants were needed for each treatment arm to achieve 80% power with a 2-sided type I error of 5% and standard deviation of the Katz Index of ADL change of 2.0. The expected attrition due to mortality was 25%. Therefore, 674 participants were enrolled.

### Statistical Analysis

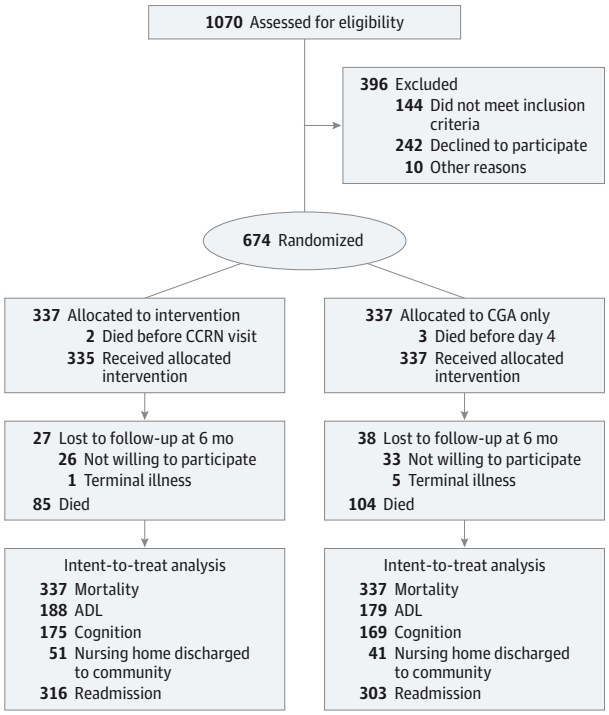
All primary analyses were performed on an intent-to-treat basis. Descriptive characteristics of each arm were calculated using proportions or means and SDs, as appropriate. The ADLs 2 weeks before baseline were compared between survivors and decedents with Wilcoxon median tests. All outcome models were adjusted for the randomization strata of study site and the MMSE score (<24 vs ≥24). The primary outcome of ADL functioning was analyzed using a linear mixed-effects model with participant-specific random intercepts, time (baseline or 6 months), treatment arm, and their interaction. Sensitivity analyses using the above approach were performed to assess the number of ADL disabilities, for which decedents were assigned a disability score of 7.

For the secondary outcome of mortality from the time of hospital admission to 1 month and 5 months was analyzed by Cox proportional hazards regression analysis. The number needed to treat was estimated.[25] Sensitivity analyses were performed for those who survived past hospital day 4 (the median day when the CCRN started in-hospital visits) to 6 months. For the secondary outcomes of predefined subgroups based on the ISAR-HP risk assessment score (2-3 vs 4-5) and Charlson Comorbidity Index (0-3 vs ≥4), a Cox proportional hazards regression for the time to death tested whether the intervention effect differed by the respective subgroups.

Next, the time to unplanned readmission within 6 months and the time to discharge home (among those discharged to a nursing home) were analyzed using the competing risk models by Fine and Gray,[26] accounting for death. Last, cognitive functioning was analyzed by a linear mixed-effects model as described above. All secondary outcomes were adjusted for multiplicity using the method by Hochberg.[27]

All analyses were performed using statistical software (SAS, version 9.4; SAS Institute Inc). Two-tailed $P < .05$ denoted statistical significance.

Figure 1. CONSORT Diagram of Participant Inclusion




For ADL and cognition, all participants had baseline data and were included in the analyses of these outcomes. The numbers specified are those with 6-month assessment data on ADL and cognition. Nursing home discharged to community applies only for those who went directly from the hospital to a nursing home. Readmission data were only available for those who were discharged alive. ADL indicates activities of daily living; CCRN, community care registered nurse; CGA, comprehensive geriatric assessment; and CONSORT, Consolidated Standards of Reporting Trials.

## Results

### Patient Inclusion

From October 1, 2010, to January 31, 2013, a total of 1070 consecutive patients were determined to be eligible for the study, and 674 (63.0%) were enrolled (**Figure 1**). The health care proxies provided informed consent for 55 participants (16.3%) in the intervention arm and for 58 participants (17.2%) in the CGA-only arm. The 2 arms were well balanced on baseline characteristics (**Table 2**). Overall, the participants had a mean age of 80 years and a mean of 1.8 preexisting ADL disabilities. eTable 2 in Supplement 2 lists additional information on the baseline characteristics for both arms. The median (interquartile range [IQR]) lengths of stay were 8 days (IQR, 5-12 days) in the intervention arm and 8 days (IQR, 5-14 days) in the CGA-only arm. There were 21 hospital deaths (6.2%) in the intervention arm and 34 hospital deaths (10.1%) in the control arm.

### Adherence to the Intervention Protocol

Adherence to the intervention protocol is summarized in eTable 1 in Supplement 2. The CGA was conducted for all participants, and a CTP was provided to 95.0% (320 of 337)

Table 2. Baseline Characteristics of the Study Population[a]

| Variable | Intervention (n = 337) | CGA Only (n = 337) |
|---|---|---|
| Study site, No. (%) | | |
| Academic Medical Center | 173 (51.3) | 173 (51.3) |
| Onze Lieve Vrouwe Gasthuis | 69 (20.5) | 70 (20.8) |
| Flevo Hospital | 95 (28.2) | 94 (27.9) |
| Demographics | | |
| Age, mean (SD), y | 79.7 (7.3) | 80.0 (7.8) |
| Male sex, No. (%) | 142 (42.1) | 142 (42.1) |
| Living situation before admission, No./total No. (%) | | |
| Independent | 228/336 (67.9) | 224/334 (67.1) |
| Senior residence | 68/336 (20.2) | 74/334 (22.2) |
| Assisted living | 26/336 (7.7) | 31/334 (9.3) |
| Other | 14/336 (4.2) | 5/334 (1.5) |
| Married, No./total No. (%) | 128/334 (38.3) | 96/335 (28.7) |
| Born in the Netherlands, No. (%) | 286 (84.9) | 289 (85.8) |
| Health care proxy provided informed consent, No. (%) | 55 (16.3) | 58 (17.2) |
| ISAR-HP score, mean (SD)[b] | 3.8 (0.9) | 3.8 (1.0) |
| Katz Index of ADL baseline, mean (SD)[c] | 1.7 (1.8) | 1.8 (1.7) |
| Charlson Comorbidity Index, mean (SD)[d] | 3.11 (2.17) | 3.36 (2.40) |
| Admission diagnosis, No./total No. (%) | | |
| Infection | 102 (30.3) | 94 (27.9) |
| Gastrointestinal | 49 (14.5) | 47 (13.9) |
| Cardiac | 31 (9.2) | 41 (12.2) |
| Respiratory | 38 (11.3) | 40 (11.9) |
| Cancer, including hematology | 9 (2.7) | 22 (6.5) |
| Electrolyte disturbances | 23 (6.8) | 16 (4.7) |
| Renal | 11 (3.3) | 12 (3.6) |
| Other[e] | 74 (22.0) | 65 (19.3) |
| **CGA at admission, No./total No. (%)** | | |
| Somatic domain | | |
| Polypharmacy[f] | 222/277 (80.1) | 212/269 (78.8) |
| Incontinence[g] | 96/277 (34.7) | 99/279 (35.5) |
| Indwelling urinary catheter[h] | 69/279 (24.7) | 68/279 (24.4) |
| Dizziness[i] | 129/283 (45.6) | 137/281 (48.8) |
| Malnutrition[j] | 179/336 (53.3) | 172/337 (51.1) |
| Pain[k] | 175/336 (52.1) | 146/316 (46.2) |
| Psychological domain | | |
| Cognitively impaired[l] | 136/337 (40.4) | 128/337 (38.0) |
| Sad or depressive symptoms in the past month[m] | 96/279 (34.3) | 106/280 (37.9) |
| Less interest in activities[m] | 88/279 (31.5) | 110/280 (39.2) |
| Functional domain | | |
| Fall in the past 6 mo[n] | 149/329 (45.3) | 174/332 (52.4) |
| Sleep disturbances[o] | 164/283 (58.0) | 143/280 (51.1) |
| Hearing impairment[p] | 66/261 (25.3) | 65/267 (24.3) |
| Visual impairment[q] | 53/270 (19.6) | 68/271 (25.1) |

Abbreviations: ADL, activities of daily living; CGA, comprehensive geriatric assessment; ISAR-HP, Identification of Seniors at Risk–Hospitalized Patients.

[a] Some denominators vary because of missing data. In patients with cognitive impairment, informed consent was obtained from the health care proxy, and the CGA was administered with the health care proxy. Therefore, denominators are less than the 337 patients who were randomized in each group. Health care proxies were not always able to indicate whether patients had a certain geriatric condition.

[b] Score range of 0 to 5, with increased risk of functional impairment at a score of 2 or higher.[19]

[c] Range of 0 to 6, with a higher score indicating more disabilities.[21]

[d] Range of 0 to 31, with a higher score indicating more or more severe comorbidity.[24]

[e] Vascular, neurodegenerative, musculoskeletal, or endocrine diagnosis at admission.

[f] Use of 5 or more different medications.

[g] One question to the patient: "Do you experience incontinence for urine or stool?"

[h] One question to the patient: "Do you have an indwelling urinary catheter?"

[i] One question to the patient: "Do you experience dizziness?"

[j] Score of 2 or higher on the Short Nutritional Assessment Questionnaire (range, 0-7).[22]

[k] Score of 4 or higher on the Visual Analogue Pain Intensity Scale (range, 0-10).[28]

[l] Cognitively impaired if a score of less than 24 on the Mini-Mental State Examination (range, 0-30).[20]

[m] Both questions on the 2-item Geriatric Depression Scale.[29]

[n] One question to the patient: "Did you experience a fall during the past 6 months?"

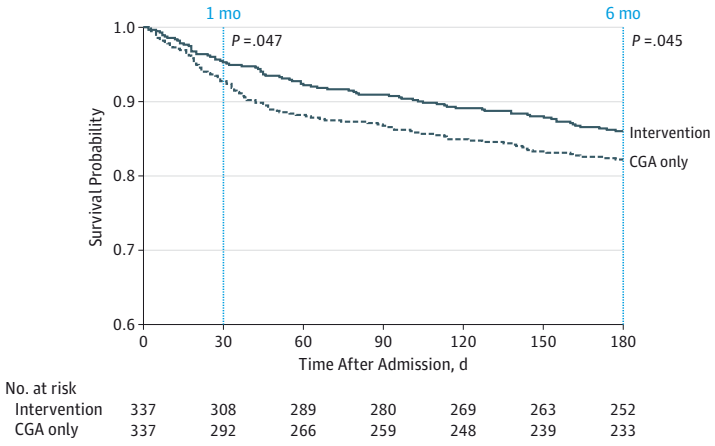
[o] One question to the patient: "Do you have trouble falling asleep or sleeping through the night?"

[p] One question to the patient: "Do you have a hearing impairment, regardless of the use of a hearing device?"

[q] One question to the patient: "Do you have a visual impairment, regardless of the use of eyeglasses?"

of the participants. Seventy-three percent (199 of 272) of participants had a CCRN transitional care bridge visit during hospitalization. The first home visit was conducted for 89.7% (244 of 272) of the participants within 48 hours after discharge. There was no difference in the total number of visits in the intervention arm between those discharged to a nursing home (mean [SD], 3.8 [1.7] visits) and those directly discharged home (mean [SD], 3.9 [1.7] visits).

Figure 2. Mortality From Admission to 6 Months After Admission




Shown are survival curves from a Cox proportional hazards regression analysis adjusted for study site and cognitive functioning (Mini-Mental State Examination Score, <24 vs ≥24), with the numbers of participants at risk for each 30-day interval for the intervention arm and the CGA-only arm. Significant protective intervention effects were observed for 1-month mortality and 6-month mortality. CGA indicates comprehensive geriatric assessment.

Table 3. Differences Between the Intervention Arm and the CGA-Only Control Arm for ADL and Cognition

| Variable | LS Mean (95% CI) | | | | *P* Value for Treatment × Time Interaction |
|---|---|---|---|---|---|
| | Intervention | | CGA Only | | |
| | Baseline | 6 Months | Baseline | 6 Months | |
| ADL[a] | 1.81 (1.63-1.99) | 2.00 (1.78-2.23) | 1.89 (1.71-2.07) | 1.92 (1.69-2.15) | .32 |
| ADL7[b] | 1.83 (1.59-2.07) | 3.66 (3.40-3.92) | 1.92 (1.68-2.16) | 3.80 (3.54-4.06) | .78 |
| MMSE[c] | 22.2 (21.3-23.0) | 24.8 (23.8-25.8) | 22.4 (21.6-23.3) | 25.1 (24.1-26.1) | .87 |

Abbreviations: ADL, activities of daily living; CGA, comprehensive geriatric assessment; LS, least squares; MMSE, Mini-Mental State Examination.

[a] As measured with the 6-item Katz Index of ADL.[21] Estimates are the adjusted LS means (95% CIs) for the number of ADL that were disabled at 2 weeks before hospitalization and at 6 months after admission (see the Statistical Analysis subsection of the Methods section) using a linear mixed-effects model with random participant-specific intercepts and center and stratification factor MMSE score (<24 vs ≥24).

[b] Represents a sensitivity analysis in which decedents were assigned a score of 7 on the Katz Index of ADL.

[c] Cognitive functioning, measured with the 11-item MMSE.[20] Estimates are the adjusted LS means (95% CIs) for the MMSE score at the time of hospital admission and at 6 months after admission (see the Statistical Analysis subsection of the Methods section) using a linear mixed-effects model with random participant-specific intercepts and center.

## Activities of Daily Living

There was no difference in the mean Katz Index of ADL at 6 months between the intervention arm (mean, 2.0; 95% CI, 1.8-2.2) and the CGA-only arm (mean, 1.9; 95% CI, 1.7-2.2). For sensitivity analysis, decedents were assigned a score of higher-than-maximum disability, yet no difference in the number of ADL disabilities was detected between the intervention arm (3.6; 95% CI, 3.4-3.92) and the control arm (3.8; 95% CI, 3.5-4.1) (*P* = .78). The ADLs at 2 weeks before hospitalization for participants who died (mean [SD], 2.2 [1.9]) and participants who survived (mean [SD], 1.6 [1.6]) to 6 months differed significantly (*P* = .002).

## Mortality

There were 85 deaths (25.2%) in the intervention arm and 104 deaths (30.9%) in the CGA-only arm. **Figure 2** shows the survival curve until 6 months after admission. Significant protective intervention effects were observed for 1-month mortality (hazard ratio [HR], 0.63; 95% CI, 0.39-0.99; *P* = .047) and 6-month mortality (HR, 0.75; 95% CI, 0.56-0.99; *P* = .045). The number needed to treat to prevent one death was 16. The intervention started once the CCRN visited the participant in the hospital (median, 4 days after admission); therefore, we conducted a sensitivity analysis with 2 intervention participants and 3 CGA-only participants removed because they died before the first visit. The effects of the intervention at 1 month (HR, 0.63; 95% CI, 0.39-1.01; *P* = .05) and at 6 months (HR, 0.75; 95% CI, 0.56-1.00; *P* = .05) did not reach statistical significance.

## Readmission, Institutionalization, and Cognitive Functioning

There were 106 readmissions in the intervention arm (33.5% of 316 discharged from the hospital) and 88 readmissions in the CGA-only arm (29.0% of 303 discharged from the hospital). No effect of the intervention was seen on the time to the first unplanned readmission by 6 months (HR, 1.21; 95% CI, 0.91-1.60; *P* = .76).

The numbers of discharges to a nursing home were 51 in the intervention arm (16.1% of 316 discharged alive) and 41 in the CGA-only arm (13.5% of 303 discharged alive). Among those discharged to a nursing home, the time to discharge home did not significantly differ, with a median of 63 days (IQR, 27-138 days) for the intervention arm vs a median of 38 days (IQR, 16-76 days) for the CGA-only arm (*P* = .76). Similarly, there was no effect of the intervention on cognitive functioning at 6 months after discharge (*P* = .87) (**Table 3**).

### Subgroup Analysis

For 6-month mortality, there were no significant interactions between the assigned treatment and either the prespecified subgroups (ISAR-HP score of 2-3 vs 4-5) or the Charlson Comorbidity Index (0-3 vs ≥4). These results are shown in eTable 3 in Supplement 2.

## Discussion

In this multicenter randomized clinical trial in acutely hospitalized older participants comparing systematic CGA followed by a transitional care program with systematic CGA only, we found no effect of the intervention on ADL disability at 6 months after discharge. For the secondary outcome analysis, we observed lower 1-month and 6-month mortality rates among participants in the intervention arm. The intervention had no effect on all other secondary outcomes of cognitive functioning, the time to unplanned hospital readmission, or the time to discharge from a nursing home to the community by 6 months after discharge.

While we did not observe any differences between the intervention and CGA-only arms in the change in ADLs, only a few transitional care trials have included ADL functioning as an outcome. Naylor and colleagues[14] found a short-term improvement in functioning in an intervention arm who received transitional care, but this effect was not found at 6 months. We only measured ADL functioning at 6 months after discharge; therefore, we could not have observed early improvements in functioning. Another possible explanation of the lack of an intervention effect may be that, because both arms received CGA during hospitalization, both arms' health care professionals were aware of the risk of functional decline. Furthermore, we had broad inclusion criteria, which may have increased the variability of response to the intervention, and we provided a structured exercise intervention.

Our finding of a reduction of the intervention on mortality at 1 month and 6 months after discharge should be taken with caution because the primary outcome and all other secondary outcomes of this study were negative. However, other studies of similar interventions have suggested an effect on mortality. Deschodt et al[8] showed that the systematic CGA approach by a geriatric consultation team led to a reduction in 6-month mortality. Other transitional care trials often start at the time of hospital admission but do not include a CGA or an engagement during hospitalization by a geriatric consultation team.[14,15,30] Naylor and colleagues[14] conducted a trial in patients with heart failure, including a geriatric assessment and follow-up by an advanced practice nurse, which found a reduction in the combined end point of readmission or mortality. Other transitional care trials either have not studied mortality as an end point[30-34] or have not found reductions in mortality.[15,16]

In contrast with other studies[12,35] on transitional care, we did not observe a reduction in unplanned readmissions in the intervention arm. We observed lower 6-month readmission rates compared with other trials that have been conducted.[12] We hypothesize that these lower rates may result from the high standard of primary health care in the Dutch health care system, with easily accessible general practitioner care and home care for all citizens.

There are some limitations to our study. Despite the efforts to complete the follow-up assessments, we had missing ADL outcome data among survivors. However, our analytic model included all randomized persons in both the random intercept and baseline measure. The 6-month outcome assessment closely followed the 6-month visit by the CCRN. As a result, some of the participants considered the additional home visit for the outcome assessment to be burdensome. Moreover, the outcome assessments of the participants with cognitive impairment had to be conducted with the closest proxy, and some proxies did not reply to requests for assessment. The strength of the present trial is the inclusion of vulnerable patients with a high risk of functional decline as well as those with cognitive impairment. These groups are often excluded from trials.

## Conclusions

This multicenter randomized clinical trial on systematic CGA and transitional care until 6 months after discharge demonstrated no effect of the intervention on ADL functioning compared with systematic CGA alone. Although there was a significant reduction in mortality at 1 month and 6 months after admission, there were no effects on other secondary outcomes. A systematic CGA, followed by a transitional care program, might improve patient safety during the vulnerable period that occurs shortly after hospital discharge. Further studies are needed to confirm these results.

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