The effectiveness of a comprehensive geriatric assessment intervention program for frailty in community-dwelling older people: a randomized, controlled trial

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1. Introduction

Frail individuals are at high risk of becoming disabled and are the most likely to benefit from preventive interventions (Ferrucci et al., 2004). Independent of the presence of co-morbid diseases, health habits, and psychosocial characteristics, frailty predicts mobility and progressive disability in activities of daily living (ADL) in the elderly (Fried et al., 2001; Boyd et al., 2005). The investigation of effective intervention strategies to prevent or delay disability in older people is a priority issue in community medicine. Although there is evidence showing the effectiveness of performing CGA and interventions targeting multiple risk factors in community-dwelling frail elderly patients (Fabacher et al., 1994; Stuck et al., 1995; Leveille et al., 1998; Cohen et al., 2002; Gill et al., 2002; Villareal et al., 2006; Huss et al., 2008; Melis et al., 2008), and randomized controlled trials of physical exercise training (Chandler et al., 1998; Brown et al., 2000; Binder et al., 2002, 2004; Gill et al., 2002; Ferrucci et al., 2004; Faber et al., 2006; Peterson et al., 2007) have shown beneficial results in frail elderly, the search for agreed-upon criteria to be used as objective indicators has continued.

The FFC were developed by Fried et al. (2001); they consist of unintentional weight loss of at least 4.5 kg in the previous year, self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity. These criteria have been recognized as being among the best diagnostic criteria for frailty. The objective of this study was to assess the effectiveness of CGA and relevant interventions in prefrail and frail community dwelling elderly based on the FFC (Fried et al., 2001).

2. Subjects and methods

2.1. Study design

A prospective, randomized, controlled study with study enrollment from November, 2007 to January, 2008 was conducted. The study was approved by the Institutional Review Board of National Taiwan University Hospital.

2.2. Setting and subjects

This study was conducted in an urban community in Taipei city, Taiwan. The community has a high percentage of senior residents who mostly receive medical care from the same community hospital. The community hospital is affiliated to and staffed by a...
nearby university medical center to provide high-quality primary and specialty care. Most of the services provided by this community hospital are focused on geriatric care. Two neighborhoods with 1,843 registered older people age 65 years and over were chosen for this study. Both neighborhoods were within 15 minutes’ walking distance from the hospital and were chosen due to their easy access to the community hospital to ensure good compliance of people in the intervention program if referrals were arranged. A total of 1,500 elderly persons were included as study subjects using a simple random sampling method. Exclusion criteria included conditions such as being bedridden, receiving home care by visiting nurses, less than 6 months’ life expectancy (such as terminal cancer patients), and difficulty in verbal communication (such as severe cognitive or hearing impairments). A total of 561 elderly persons completed the first stage home visit interview and entered the study after providing their written informed consent by the end of 2007.

2.3. Screening evaluation

Data on socioeconomic status, medical history, BI (Mahoney and Barthel, 1965), instrumental activities of daily living (IADL) (Lawton and Brody, 1969), frequency of admission and falls in the past year, and FFC (Fried et al., 2001) were collected by four trained interviewers using a standardized questionnaire. A Taiwanese version of the international physical activity questionnaire (IPAQ) (Craig et al., 2003; Hallal and Victora, 2004; Qu and Li, 2004) was used to evaluate average physical activity and calorie consumption per week. All information was used for frailty screening.

2.4. Randomization and interventions

A total of 310 subjects fulfilled the criteria and were categorized as pre-frail or frail elderly. They were assigned to the intervention (n = 152) or control (n = 158) group by simple randomization. Subjects in the intervention group were screened by CGA, and an appropriate intervention program followed when indicated based on the assessment results. The intervention programs were conducted by medical professionals at the community hospital, as well as at appropriate community facilities. In the intervention group, 95 subjects (62.5%) completed this process. The research assistants were skilled nurses trained specially for this study. They used standardized questionnaires as assessment tools to collect information on geriatric syndromes (falls, incontinence, polypharmacy, sleep disturbance, nutrition, and pain conditions) (Rockwood et al., 1998), scores on the mini-mental state examination (MMSE) (Folstein et al., 1975; Tombaugh and McIntyre, 1992) and the short-form geriatric depression scale (GDS) (Sheikh and Yesavage, 1986), and nutritional status using the mini nutritional assessment (MNA) (Guigoz et al., 1996). Screening also included a visual acuity test, the timed up and go (TUG) test (Podsiadlo and Richardson, 1991; Fleming et al., 1995), orthostatic hypotension screening (Streeten et al., 1988), and the functional reach test (FRT) (Duncan et al., 1990). Two board-certified geriatricians independently reviewed the participants’ assessment results along with their present and past medical histories, current medication, and recent laboratory data. Treatment was prescribed on an individual basis when indicated. The treatment provided included medication adjustment, exercise instruction, nutrition support, physical rehabilitation, social worker consultation, and specialty referrals. The control group received screening evaluation only (Figure 1).

2.5. Outcomes

Assessments were carried out for every individual in both groups at their home at the beginning and 6 months later by research nurses not involved in the intervention program (single blind). Outcomes were assessed based on the FFC and the BI. Those who were frail or pre-frail initially and made progress to better categories or gained points in the BI 6 months later were considered “improved”. Those who moved down to worse categories or lost points in the BI at 6 months were considered “deteriorated”.

2.6. Statistical analysis

The analyses were conducted following the intention-to-treat principle. A polytomous logistic regression model was used to calculate odds ratios (OR) of improved and deteriorated frailty status and BI with intervention. All hypothesis tests were conducted at a p < 0.05 significance level and a two-sided alternative hypothesis. Statistical analysis was performed using SPSS software (SPSS Inc, Chicago, IL, USA; Version 17.0).

3. Results

The mean ± S.D. age of the participants was 78.8 ± 8.4 (range 65–106) years; 148 (47.7%) were female. The baseline characteristics were similar for the two groups (Table 1). Twenty-six (17.1%) participants in the intervention group and 31 (19.6%) in the control group were classified as frail; 129 (84.9%) in the intervention group and 140 (88.6%) in the control group received follow-up assessment.

Of the 95 subjects who received complete geriatric evaluations, 61 (64.2%) obtained new diagnoses. After evaluation, 36 (37.9%) received on-site instruction for lower extremity muscular training exercise, 25 (26.3%) received simple diet education, and 24 (25.3%) received exercise prescriptions. Of the 67 subjects who brought their medication to the evaluation clinic for further instruction, 21 (31.3%) required new medications, and 14 (20.9%) needed to
stop taking certain medications. Overall, 26 subjects (27.4%) were referred to a rehabilitation clinic, 12 (12.6%) to a neurology clinic, nine (9.5%) to a dietician, five (5.3%) to a social worker, and three (3.2%) to a psychiatric clinic.

The increase in the percentage of frail subjects at the 6-month post-trial follow-up was greater in the control group (19.6% vs. 17.1%) (Table 2).

Table 2
Frailty status and Barthel Index at baseline and at 6-month follow-up, n(%), mean ± S.D.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Frailty status</th>
<th>Intervention group (n = 129)</th>
<th>Control group (n = 140)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Non-frail</td>
<td>Pre-frail</td>
<td>Frail</td>
</tr>
<tr>
<td>Baseline</td>
<td>0</td>
<td>126 (82.9)</td>
<td>26 (17.1)</td>
</tr>
<tr>
<td></td>
<td>BI = 95.7 ± 15.7</td>
<td>92.8 ± 19.4</td>
<td>92 ± 19.4</td>
</tr>
<tr>
<td>6 months</td>
<td>5 (3.9)</td>
<td>101 (78.3)</td>
<td>23 (17.8)</td>
</tr>
<tr>
<td></td>
<td>BI = 95.6 ± 14.7</td>
<td>92.7 ± 15.7</td>
<td>91.6 ± 20.7</td>
</tr>
</tbody>
</table>

The frailty status and BI of the intervention group were more likely to improve, with an OR = 1.19 (95% CI = 0.48–3.04, p = 0.71) and 3.29 (95% CI = 0.65–16.64, p = 0.15), respectively. The frailty status and BI of the intervention group were less likely to deteriorate, with an OR = 0.78 (95% CI = 0.34–1.79, p = 0.57) and 0.94 (95% CI = 0.42–2.12, p = 0.88), respectively. However, there were no significant differences between the two groups (Table 3).

4. Discussion

In this study population, CGA interventions tended to improve patients’ frailty status and BI at 6-month follow-up, though the improvements were not statistically significant. Several studies have shown positive effects of interventions in frail older adults. These interventions include exercise programs or physical therapy (Binder et al., 2002; Gill et al., 2002; Villalrea et al., 2006; Peterson et al., 2007) and CGA alone (Leveille et al., 1998; Melis et al., 2008). However, there are also studies that have failed to prove the effectiveness of comprehensive geriatric assessment to prevent functional decline (Hebert et al., 2001).

There are several possible explanations for our results. Firstly, the suggestions after geriatric assessment may not have been fully implemented. Among subjects who were referred to the rehabilitation clinic, only 16 subjects (61.5%) completed the whole program. Only four subjects (44.4%) were able to follow the dietician’s recommendations after referral. Previous studies indicated that compliance rates for community-based CGA programs ranged from 46% to 76% (Aminzadeh, 2000). If we could improve the compliance rate, we may improve the effectiveness of the CGA program. Secondly, the subjects in the control group also received variable degrees of instructions for frailty from their physicians during hospital visits. Action might have been taken to improve their frailty status. Thirdly, the 95 subjects (62.5%) in the intervention group (n = 152) who received the complete CGA had a higher likelihood of improvement in the frailty status and BI compared to subjects without the complete CGA. The ORs were = 2.57 (95% CI = 0.97–6.78) and = 20.5 (95% CI = 0.50–8.42), respectively. We would expect a better outcome if more subjects received a complete CGA in the intervention group.

This study had several strengths. Firstly, the internal validity was good, as it was based on a randomized, controlled study design, and the interviewers were blind to the interventions study subjects received. Secondly, it provided more evidence to support the use of the FFC as an outcome measure. Thirdly, our study indicated a favorable trend for effectiveness of the CGA intervention program. However, this study also had limitations. Firstly, the study was based on a single community hospital. The results might be different if more communities and hospitals were included. Secondly, there was no Taiwanese version of the FFC available when the study started. The cut-out-point for low physical activity, slow...
walk time, and weak grip strength based on the FFC phenotypes may differ by ethnicity.

5. Conclusion
For pre-frail and frail older people, CGA intervention programs tend to, but not significantly, improve their frailty status and BI score at six-month follow-up. Further, larger studies and greater efforts to improve patient compliance are worth considering to prove better the effectiveness of CGA intervention programs on frailty deterioration prevention or improvement for the elderly.

Conflict of interest statement
None.

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