Comprehensive geriatric assessment and home-based rehabilitation for elderly people with a history of recurrent non-elective hospital admissions

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Abstract

Objective: to determine whether a co-ordinated programme of geriatric assessment and multidisciplinary home-based rehabilitation reduces disability and prevents non-elective hospital readmission in high-risk elderly patients.

Design: nested case–control study comparing usual post-discharge care versus usual care plus a comprehensive geriatric assessment and home-based rehabilitation service, comprising nursing, occupational therapy and physiotherapy with geriatric medical review. Patients were ≥65 years with ≥2 non-elective hospital admissions within the previous 12 months. Disability was assessed using the 100-point Barthel index and Nottingham extended activities of daily living (EADL) score. Non-elective hospital admissions were recorded over 1-year follow-up.

Results: we studied 84 patients; 56 receiving the new service were matched to 28 controls. Intervention subjects received a median of 19 h [interquartile range (IQR) (7,35)] rehabilitation over 19 [IQR (6,42)] domiciliary visits. At 3 months, there was improvement in median Barthel and Nottingham EADL scores in the intervention group of 3 and 2 points, respectively, compared with reductions in controls of 3 and 6 points (both \( P<0.001 \), changes in intervention group versus controls); similar differences persisted in survivors at 12 months. There was a non-significant trend for reduction in the proportion of patients with further non-elective hospital admission in the intervention group (36/56, 64%) compared with controls (21/28, 75%; OR 0.70, 95% CI 0.34, 1.46).

Conclusions: a co-ordinated programme of geriatric assessment and multidisciplinary home-based rehabilitation reduced disability in elderly patients at high risk for non-elective hospital admission. Further research is required to determine whether this approach can reduce the need for hospital admission.

Keywords: comprehensive geriatric assessment, rehabilitation, disability, hospital admission, elderly

Introduction

Recurrent non-elective hospital admission of frail elderly community-dwelling subjects is a common and an increasing problem. Readmission rates within 3 months of hospital discharge of 15% or more are common in elderly patients discharged from acute hospital inpatient care [1]. Increasing numbers of readmissions contribute to current pressures on acute hospital beds. There is currently great interest in whether acute hospital admission can be prevented by improving community support for frail older people.

This study aimed at evaluating a new service of comprehensive geriatric assessment and domiciliary rehabilitation for frail older people with a history of...
recurrent unplanned hospital admission. The new service was designed to reduce disability through a programme of domiciliary rehabilitation, to rationalise prescribed medicines and reduce poly-pharmacy and to co-ordinate enhanced home support and daycare. We wished to determine whether this approach would reduce disability and prevent further non-elective hospital admission and/or death.

Methods
This was a nested case–control study comparing usual post-discharge care versus usual care plus a new comprehensive geriatric assessment and home-based rehabilitation service. A register of potential participants was developed from admission records to acute general medicine or the care of the elderly unit at Glasgow Royal Infirmary from November 1998 to January 2000. Subjects aged 65 years with a history of ≥2 unplanned admissions during this period were eligible for this study. Subjects in long-term care (private nursing homes, private and local authority residential care and NHS long-term care) were excluded. The new service was available for subjects from one general practitioner (GP) locality; consenting subjects from this area formed the intervention group. A separate cohort of patients was gathered from a neighbouring GP locality where the new service was not available; they formed the basis of the control group. The socioeconomic characteristics of these two localities are very similar, both inner city and classified as category 7 in the Glasgow City Council classification of deprivation and poverty.

Potential participants were initially telephoned, and if they were willing to be assessed, appointments were made for review within their own homes. Written informed consent was obtained from patients, or if they had significant cognitive impairment from a close relative. The study was approved by the local hospital and primary care ethical committees.

The home intervention team comprised of a nurse [one full-time equivalent (FTE)], a physiotherapist (one FTE), an occupational therapist (one FTE), rehabilitation assistants (two FTEs) and an administrative assistant (one FTE). This group met weekly with a specialist in geriatric medicine to discuss cases. Process of care included development of individualised home rehabilitation programmes, review of prescribed medicines and liaison with other support services including referral to mainstream hospital services (such as geriatric medical day hospital and outpatient clinics), primary care teams, community allied health professionals, social work and associated resources including home-help support and daycare. The amount of input to the intervention group was quantified in terms of numbers of home visits and hours of rehabilitation intervention.

Baseline assessments included assessment of cognitive function using the abbreviated mental test [2] and recording of all prescribed medication. All other assessments were made at baseline and at 2 and 12 months after entry to the study. Basic and extended activities of daily living (EADL) were assessed using the 100-point Barthel index [3] and the Nottingham EADL [4]. Mobility was further assessed using the timed up-and-go test [5]. Falls risk was assessed using the Tinetti Balance and Gait Assessment tool [6] and functional reach [7]. Life satisfaction was assessed using the Life Satisfaction Index [8]. There was no resource in this study to allow for independent or blinded assessment; measurements were made by the team organising and providing the study intervention and, therefore, were non-blinded.

Data were recorded for all hospital admissions (including bed days), admissions to long-term care (private nursing homes, private and local authority residential care and NHS long-term care) and deaths. Other health service utilisation information included day hospital and hospital outpatient clinic attendance as well as GP home visits (recorded by telephone call to general practice receptionists).

A total of 132 patients with a history of ≥2 non-elective hospital admissions were screened for inclusion in the intervention group, of whom 61 consented to take part in the study; 100 patients were screened for entry to the control group, of whom 46 consented. Matching the groups (two intervention patients to one control) was performed on gender, age (within 5 years difference) and baseline disability (within 10 points difference Barthel score) using a frequency-matching technique (blind to patient outcome). This matching process yielded the final study cohort of 56 in the intervention group and 28 controls.

Power calculations revealed that to have 80% power at \( P = 0.05 \) (two-tailed) to detect a reduction from 60 to 30% in hospital, admission would require a total of 93 patients with a 2:1 ratio of numbers of patients in the two groups. Results are expressed as median and interquartile range (IQR) or mean and standard deviation. Statistical comparisons were made using Mann–Whitney U test for non-parametric data, Student’s unpaired t-test (two-tailed) and chi-squared test. Statistical significance was accepted at \( P = 0.05 \). Estimates (B) of the differences (and 95% CIs) in outcomes between intervention and control groups were calculated by linear regression, with 3- or 6-month outcome score as the dependent variable and baseline of the respective outcome score and study group (control = 1, intervention = 2) as the independent variables. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 14.0.

Results
The matching process resulted in very similar baseline characteristics in the intervention group compared with the control group (Table 1).

Intervention subjects received a median of 19 h [IQR (7,38)] of additional rehabilitation over a mean of 19 (6,46) domiciliary visits.

Patients in the intervention group had significant improvements in basic activities of daily living and EADL, reduction in falls risk, increased functional reach and improvement in life satisfaction at both 3 and 12 months compared with those of controls. At 1 year, the total number of prescribed medicines rose in the control group.
Table 1. Baseline characteristics of intervention (comprehensive geriatric assessment plus home-based rehabilitation) and control (usual care) groups

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<tr>
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<th>Intervention group</th>
<th>Control group</th>
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<tr>
<td>Number</td>
<td>56</td>
<td>28</td>
</tr>
<tr>
<td>Gender (male:female)</td>
<td>22:34</td>
<td>11:17</td>
</tr>
<tr>
<td>Age [mean (SD)]</td>
<td>76 (7)</td>
<td>75 (6)</td>
</tr>
<tr>
<td>Abbreviated mental test score</td>
<td>9 (7,10)</td>
<td>9 (6,10)</td>
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<tr>
<td>Barthel index (100-point scale)</td>
<td>86 (63,95)</td>
<td>88 (75,95)</td>
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Results are number counts and median (interquartile range) except where stated.

compared with the intervention group (Table 2). Estimates of the differences in outcomes between intervention and control groups are provided in Table 3.

Intervention was associated with non-significant trends for reduction in proportion of patients with further non-elective hospital admission (36/56, 64%) in the intervention group compared with 75% (21/28) of controls (OR 0.70, 95% CI 0.34, 1.46) and deaths (11/56, 20%) of intervention group compared with 7/28 (25%) of controls (OR 0.91, 95% CI 0.71, 1.17).

The total number of days spent in hospital over 1 year of follow-up was very similar in the two groups, with a median of 8 days [IQR (0.41)] in the intervention group compared with 8 days (IQR 0.38) in the controls. There were no significant differences between the two groups in utilisation of other health service resources, with a median number of attendances at GP of 1 (IQR 0.3) versus 1 (IQR 0.4) in the intervention group compared with the control group respectively. There was no significant utilisation of geriatric medical day hospital, with a median number of attendances of 0 (IQR 0.0) in both groups.

Discussion

We found that comprehensive geriatric assessment and home-based rehabilitation for elderly people with a history of recurrent non-elective hospital admission reduced disability and improved life satisfaction compared with usual care. Measures that are predictors of falls risk, the Tinetti falls risk score and functional reach, also improved with intervention compared with controls. The patients we studied, with a history of multiple non-elective hospital admissions, were clearly a high-risk group with a substantial mortality and very high risk of non-elective hospitalisation. There were trends for reductions in non-elective hospital admissions and deaths in the intervention group and a significant reduction in the post hoc combined endpoint of hospitalisation or death.

The level of rehabilitation input to achieve these effects was substantial. The medical input included regular review and rationalisation of prescribed medicines; this resulted in fewer additional medicines prescribed over the 12 months of the study compared with the control group. The utilisation of GPs and hospital outpatient services (including day hospital) was not affected by the intervention.

Table 2. Changes in functional capacity, falls risk, medicine intake and life satisfaction after intervention (comprehensive geriatric assessment plus home-based rehabilitation) and control (usual care)

<table>
<thead>
<tr>
<th></th>
<th>Intervention group changes 2 months</th>
<th>Control group changes 2 months</th>
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<tr>
<td></td>
<td>Changes to 3 months</td>
<td>Changes to 12 months</td>
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Results are median (interquartile range) except where stated. EADL, extended activities of daily living. Change in intervention group compared with change in controls. Mann–Whitney U test or Student’s unpaired t-test (*P ≤ 0.05; **P ≤ 0.01; ***P ≤ 0.001).
Acute hospital admission.

Mine whether this approach can reduce requirements for early people with a history of previous multiple non-elective assessment and home-based rehabilitation in high-risk elderly satisfaction can be improved by comprehensive geriatric care.

A reduction in non-elective hospital admissions or associations with disability and life satisfaction [9] and environmental adaptations [10] can be effective. Our intervention was relatively intensive, with a median of 19 home visits per patient.

There are many limitations of our study. Funding was not available for a randomised controlled trial; the money provided to establish the service included limited resources for evaluation. Similarly, we did not have any resource for a blinded assessor, separate from the rehabilitation team, or for economic evaluation. Utilisation of the study database to provide a nested case–control comparison resulted in groups that were apparently well matched at baseline; however, there remains a possibility of residual confounding. Our study did not have sufficient statistical power to detect a reduction in non-elective hospital admissions or associated bed days.

Therefore, our study suggests that disability and life satisfaction can be improved by comprehensive geriatric assessment and home-based rehabilitation in high-risk elderly people with a history of previous multiple non-elective hospital admissions. Further research is required to determine whether this approach can reduce requirements for acute hospital admission.

Key points
- Elderly patients with a recent history of recurrent non-elective hospital admission are at high risk of further unscheduled admission.
- A co-ordinated programme of geriatric assessment and multidisciplinary home-based rehabilitation reduced disability in frail older people with a recent history of repeated non-elective hospital admission.
- Benefits from this intervention persisted up to 12 months.
- There was a non-significant trend for this intervention to reduce further non-elective hospital admission.

Acknowledgements
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Conflicts of interest
None.

References
11. van Haastregt JC, Diederiks JP, van Rossum E, de Witte LP, Voorhoeve PM, Crebolder HF. Effects of a programme of multifactorial home visits on falls and mobility impairments in...
Health-protective behaviours and risk of fall-related hip fractures: a population-based case–control study

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Abstract

Background: fall-related hip fractures are one of the most common causes of disability and mortality in older age. The study aimed to quantify the relationship between lifestyle behaviours and the risk of fall-related hip fracture in community-dwelling older people. The purpose was to contribute evidence for the promotion of healthy ageing as a population-based intervention for falls injury prevention.

Methods: a case–control study was conducted with 387 participants, with a case–control ratio of 1:2. Incident cases of fall-related hip fracture in people aged 65 and over were recruited from six hospital sites in Brisbane, Australia, in 2003–04. Community-based controls, matched by age, sex and postcode, were recruited via electoral roll sampling. A questionnaire designed to assess lifestyle risk factors, identified as determinants of healthy ageing, was administered at face-to-face interviews.

Results: behavioural factors which had a significant independent protective effect on the risk of hip fracture included never smoking [adjusted odds ratio (AOR): 0.33 (0.12–0.88)], moderate alcohol consumption in mid- and older age [AOR: 0.49 (0.25–0.95)], not losing weight between mid- and older age [AOR: 0.36 (0.20–0.65)], playing sport in older age [AOR: 0.49 (0.29–0.83)] and practising a greater number of preventive medical care [AOR: 0.54 (0.32–0.94)] and self-health behaviours [AOR: 0.56 (0.33–0.94)].

Conclusion: with universal exposures, clear associations and modifiable behavioural factors, this study has contributed evidence to reduce the major public health burden of fall-related hip fractures using readily implemented population-based healthy ageing strategies.

Keywords: hip fractures, case–control study, risk reduction behaviour, aged population, falls prevention, falls, life style, elderly

Introduction

Hip fractures are one of the most common causes of disability and mortality in older age, and the frequency is increasing by 1–3% per year in most areas of the world because of population ageing [1]. Such injuries are a major public health problem and will present a serious challenge to health-care systems in future years [2].

Over 90% of hip fractures are the result of direct trauma to the hip following a fall [3]. Numerous studies have identi-