

THREE DIFFERENT OUTCOMES IN OLDER COMMUNITY-DWELLING PATIENTS RECEIVING INTERMEDIATE CARE IN NURSING HOME AFTER ACUTE HOSPITALIZATION

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Abstract: *Objectives:* To evaluate the recovery and outcome of older communitydwelling patients admitted to intermediate care (IC) in nursing homes after acute hospitalization, and to compare patients who were able and unable to return directly to their own homes. *Design:* Prospective, observational, cohort study conducted between June 2011 and 2014. *Setting:* A 19- bed IC unit in a nursing home with increased multidisciplinary staffing. *Participants:* A total of 961 community-dwelling patients, ≥ 70 years of age, considered to have a rehabilitation potential and no major cognitive impairment or delirium, transferred from internal medicine, cardiac, pulmonary and orthopaedic hospital departments. *Measurements:* Demographic data, clinical information, comprehensive geriatric assessment (CGA), discharge destination and length of stay. Residence status and mortality 1 month, 2 months, 3 months, and 6 months after discharge from the hospital. *Results:* The trajectory of recovery was divided into 3 groups: 1) Rapid recovery, able to return home after median 14 days in IC (n=785, 82%); 2) Slow recovery, requiring additional transfer to other nursing home after IC, but still able to return home within 2 months (n=106, 11%). 3) Poor recovery, requiring transfer to other nursing home after IC and still in a nursing home or dead at 2 months (n=66, 7%). Significant different clinical characteristics were demonstrated between the patients in the 3 groups. After 6 months, the recovery of patients with rapid or slow recovery was similar, 87% were living at home, compared to only 20% of the patients with poor recovery. In multiple logistic regression analysis, slow or poor recovery was significantly associated with low scores on the Barthel index and orthopaedic admission diagnosis. *Conclusions:* Although the majority of patients selected for treatment in the IC unit were able to recover and return home, a group of patients needed extra time, up to 2 months, to recover and another group had a poor chance of recovering and returning home. Different caring pathways for different patient groups may be considered in the PAC setting.

Key words: Postacute care, intermediate care, nursing home, older patients, recovery.

Introduction

Hospitalization in older patients is associated with functional decline, increasing dependency, and loss of ability to live at home (1-3). Intermediate care (IC) services have been developed to treat and rehabilitate patients more efficiently after episodes of acute hospitalization, assist earlier hospital discharge, promote the greater independence of older people with acute conditions and provide support in the community to prevent hospital readmissions (4-6). IC services are generally, but not always, community-based, interdisciplinary teams. Outside Europe, these treatment/care models are more often referred to as postacute care (PAC) (7-9), and have been shown to improve short- and long-term functional recovery and decrease 1-year mortality in older patients (9, 10). However, there is as an ongoing discussion regarding which patients are best suited for IC and PAC and what this treatment/care model should contain (6, 11-14).

In 2005, a 19 bed IC unit based on Comprehensive Geriatric Assessment (CGA) and increased multidisciplinary staffing, was introduced in our nursing home. The project was a collaboration between the municipality of Bergen and the two hospitals serving the town. The aim was to provide treatment

and care for elderly people within a few days after acute hospital admission (15, 16). Emphasis was put on 1) selecting patients with a treatment and rehabilitation potential and 2) a short-term treatment/rehabilitation period (< 14 days), to allow a rather high turnover of patients that were able to receive CGA based treatment and care. However, the IC unit received patients with varying degree of recovery potential and it was evident that some patients were not able to return to their own home. An observational study, therefore, was established to identify this group as well as elucidate potential predictors for not returning to their own home, aiming for better treatment and decision making. Knowledge of the clinical characteristics and outcome of these patients may give important information regarding future care models that can be included in the IC setting.

Methods

Design and setting

This was a prospective, observational, cohort study that enrolled consecutive patients 70 years or older, transferred to the IC unit after acute admissions to the two hospitals in Bergen, in the period 2011-2014. After a short stay of median

5 days in the hospital for establishing the diagnosis and start of therapy, the patients were transported in ambulance or taxi to the nursing home that was located 3 km away.

The 19-bed IC unit was staffed approximately to the level of a community hospital, with increased multidisciplinary personnel; two fulltime physicians (one of them being a geriatrician), 15 nurses, 1.2 positions for physiotherapists and 0.8 positions for an occupational therapist. Patients were examined by a doctor on admission and at least twice a week. All patients were examined by a physiotherapist and an occupational therapist. In addition to continuation of the acute medical treatment started in the hospital, additional multidisciplinary treatment was given according to the patient's needs, e.g. physiotherapy, nursing care and social and nutritional intervention. Treatment plans and decisions about discharge were conducted by discussion in the multidisciplinary team. Nurse assisted home care and follow up by the physiotherapist in the community was offered to all patients that were in need of this when they were discharged to their own home.

If the patient could not return home within 14 days, transfer to an ordinary lower-cost, skilled nursing facility should occur, hereafter called an "ordinary" nursing home. In these premises the multidisciplinary staffing was approximately 1/3 of the staffing in the IC unit, and no CGA was performed. If the patients had a further rehabilitation potential they were further transferred to a rehabilitation unit with more physiotherapy resources, rather than an ordinary nursing home.

Patients and selection of patients

The inclusion criteria were:

1. The patients were ≥ 70 years of age, home-dwelling in the municipality of Bergen and considered to be respiratory and circulatory stable.
2. The hospital doctor expected that the patients would be able to return home within 2 weeks of treatment in the IC unit.
3. The patients did not have a major cognitive impairment or delirium.

The selection process was as follows:

1. The hospital doctor selected patients that needed further medical treatment and rehabilitation, according to the three inclusion criterias
2. The hospital doctor or nurse phoned the nursing home giving a short report on the patient including, diagnosis, social status, physical ability and purpose of admission to intermediate care.
3. The doctor in the nursing home decided, based on the informations given from the hospital, whether the patient was suitable for IC. Approximately 80 % of the patients were considered suitable for transferral from the hospital to the IC unit.

Both medical patients (from the departments of internal medicine, cardiology and pulmonology) and orthopaedic patients, were admitted. Most of the medical patients had

infections and had started intravenous antibiotic therapy in the hospital. This treatment could be continued under good surveillance in the IC unit. Most of the orthopaedic patients had suffered a fall, and none were admitted after elective surgery. (For more specific description of the patients, please see the Result section part-Patient characteristics).

Data collection

The data on patient's demographic and baseline clinical characteristics were obtained from hospital records. During the stay in the IC unit, CGA was performed on all of the patients during the first week. Activities of daily living (ADL) and functional status were assessed by the nurses using the Barthel index, BI (17) at the time of admission and at discharge. The Norwegian version of the Mini Mental Status Examination, MMSE, (18, 19), Geriatric Depression Scale, GDS (20), Mini Nutritional Assessment- Short Form; MNA-SF (21) and blood tests were performed in $>90\%$ of the patients, and BI was assessed in all of the patients. Information on whether the patients returned home after transfer to an ordinary nursing home, residence status, and survival, was obtained from the patient administrative system in the municipality.

Statistical analyses

All of the analyses were performed using the Statistical Package for Social Science (IBM SPSS 20), for Windows. To compare the distribution of categorical data between groups, the chi-squared test was used, whereas the Mann-Whitney U Test was used to test for group differences in continuous data. The p-values were two-sided and $p \leq 0.05$ was considered to be statistically significant.

For identifying the clinical characteristics that were independently associated with having a slow and a poor recovery, odds ratios (ORs) with 95% confidence intervals (CIs) were estimated using logistic regression models. The characteristics associated with $p < 0.25$ in univariate analysis were noted as likely predictors and included in multivariate, adjusted logistic regression models. In this analysis, $p \leq 0.01$ was considered to be statistically significant to account for multiple testing.

We detected a potential co-linearity between BI at the time of admission and discharge ($\rho = 0.8$). Consequently, only the most relevant and explanatory variable, BI at the time of admission was included in the multivariate analysis.

Results

Patients

As shown in Figure 1, of 1085 patients who fulfilled the inclusion criteria, 112 were not asked to participate in the study at times when the geriatrician in charge was absent. Two patients died during IC and two patients were lost to follow up, thus altogether 957 patients with a median age of 85 years could be further investigated for recovery after IC.

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Discharge from the IC unit

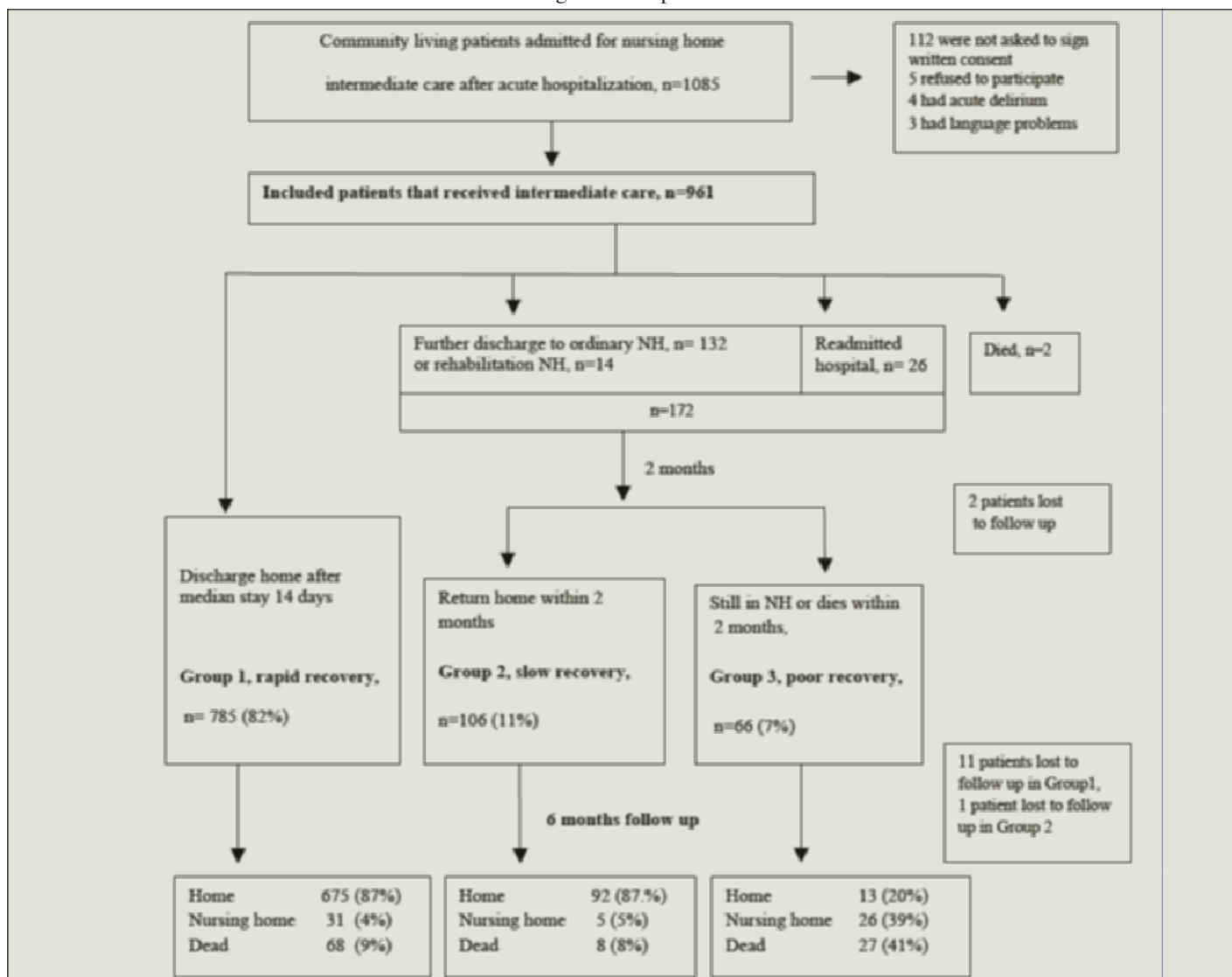
Overall patient recovery is described in Figure 1. The majority of patients (n=785, 82%) demonstrated a rapid recovery and were able to return home; 755 (74%) within 14 days, thus fulfilling the primary goal of the IC unit. One hundred forty six (15%) patients were still, after 14 days, in such a generally poor condition that safe transfer to their own home was not possible. These patient were transferred to an ordinary nursing home. Only 14 of these 146 patients were considered to have more rehabilitation potential and were discharged to a nursing home with more physiotherapy resources. Twenty-six (3%) of the patients were not adequately medically diagnosed or stabilized and were readmitted to hospital.

Subdivision of patients into rapid, slow and poor recovery group

Patient recovery was divided into 3 groups according to the ability to return home after acute hospitalization and IC (Figure 1). All of the patients who were able to go directly home from IC were characterized as having a rapid recovery and belonging to Group 1. For the remaining patients, to evaluate if there was a cut-off time period for return to their own home, residence status 1 month, 2 months, 3 months and 6 months after hospital discharge was examined (Please see Fig. 2 and Result section: Patient recovery according to time). Based on these findings, an additional subdivision of patients was performed based on residence status at 2 months. The patients who had returned home at 2 months were characterized as having slow recovery and belonging to Group 2. Patients who were still in the nursing home or who had died within 2 months

Figure 1

Flow diagram showing subdivision of patients into three groups according to outcome after nursing home (NH) intermediate care following acute hospitalization



were characterized as having a poor recovery and belonging to Group 3.

Table 1
Characteristics of patients admitted to nursing home intermediate care

| | |
|------------------------------------|-----------------|
| Number | 961 |
| Age, years | 85 (70-102) |
| Male sex | 304 (32) |
| Medical patients* | 615 (64) |
| Orthopaedic patients† | 346 (36) |
| Hospital admissions last year | 1 (0-33) |
| Hos Hospital days pre nursing home | 5 (1-51) |
| Live alone | 644 (67) |
| Receives home care | 379 (39) |
| ≥5 diagnoses | 567 (59) |
| Using ≥5 drugs | 760 (79) |
| BI at admission | 75 (10-100) |
| BI at discharge | 85 (15-100) |
| Bi Improvement | 5 (0-70) |
| MMSE | 26 (8-30) |
| GDS | 7 (0-29) |
| MNA-SF | 10 (2-21) |
| Hb g/dL | 12.3 (7.6-19.0) |
| Creatinin (umol/L) | 78 (33-502) |
| CRP g/l | 18 (1-331) |

BI, Barthel index, MMSE, Minimental state examination, GDS, Geriatric depression scale (range 0-30), MNA-SF, Mini nutritional assessment short form, CRP: C-reactive protein. Categorical variables are described as numbers and % of all patients. Numerical variables are described as median and min-max values. *Patients from internal medicine, cardiac and pulmonary departments. †Patients from orthopaedic departments with contusions and fractures, (n=76 hip fractures)

Patient characteristics

The baseline clinical characteristics, shown in Table 1, demonstrated a variation, including severely impaired patients as well as more healthy and fit patients. A total of 615 (64%) patients were admitted from the internal medicine, cardiology or pulmonology departments. The most common medical diagnoses were acute infections (n= 232), heart conditions (n=140) and chronic obstructive pulmonary disease (COPD) (n=45). Of the 346 (36%) patients admitted from orthopaedic departments, 230 had suffered a trauma with fractures (76 hip fractures, 26 fractures of humerus, 26 fracture of the pelvis, 42 compression fractures of the columna) and 121 patients had no fracture.

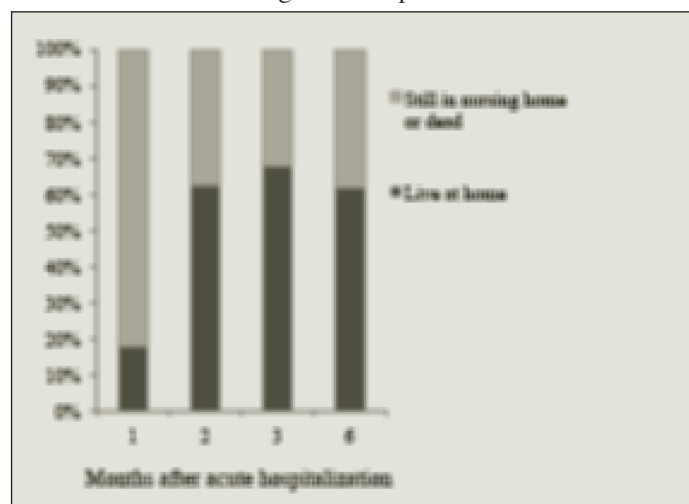
Patient recovery according to time

Figure 2 shows the recovery of the patients who were transferred to ordinary nursing home or readmitted hospital after the stay in the IC unit. While only 30 patients (18%) had returned to their own home at 1 month, the number had increased to 106 (62%) at 2 months. This number seemed to level off after 2 months (n=116 patients (68%) living at home at 3 months and n= 103 (62%) living at home at 6 months). Thus, a cut-off time regarding the ability to return home was observed to be between 1 month and 2 months after hospital discharge.

Six months after hospital discharge, the outcome of patients with rapid or slow recovery was similar; 87% of the patients were living at home, compared to 20% of the patients who exhibited poor recovery.

Figure 2

Outcome according to time in 170 patients who were unable to return directly home from nursing home intermediate care following acute hospitalization



Clinical characteristics and factors associated with rapid, slow or poor recovery after acute hospitalization and IC

As shown in Table 2, significant differences were observed among the patients in the three recovery groups. Compared with those in the rapid recovery group, the patients in the poor recovery group were older, received more home care and had worse scores on all of the geriatric assessments tests. Notably, these patients in general had no improvement in BI. The patients in the slow recovery group more often had an orthopaedic admission diagnosis, a lower BI and lower MMSE.

In the adjusted logistic regression model (Table 3), orthopaedic patients were more likely to experience both slow and poor recovery compared with medical patients (OR= 3.37 and 5.4, respectively). Patients with higher BI at the time of admission were associated with lower odds of both slow and poor recovery (OR= 0.96 and 0.92). Improvement in BI, from the time of admission to discharge, was also inversely associated with poor recovery, but not with slow recovery.

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Table 2
 Clinical characteristics of patients with three different outcomes after nursing home intermediate care

| | Group 1, Rapid recovery* n=786 | Group 2, Slow recovery† n=106 | Group 3, Poor recovery‡ n=64 |
|----------------------|---|--|---|
| Age | 85 (70-101) | 85 (70-97) | 89 (71-102) ¶ |
| Male sex, | 254 (32) | 32(30) | 18 (27) |
| Hospital days | 5 (1-51) | 5 (2-28) | 4 (1-16) |
| Live alone | 523 (71) | 70 (68) | 47 (75)) |
| Receives home care | 293 (38) | 39 (37) | 46 (72) ¶ |
| ≥5diagnoses | 476 (64) | 51 (53) § | 38 (63) |
| Using ≥5 drugs | 615 (79) | 87 (85) | 53 (83) |
| Orthopaedic patients | 240 (31) | 68 (65) ¶ | 34 (52) |
| BI admission | 80 (10-100) | 60 (25-95) ¶ | 55 (20-100) ¶ |
| BI discharge | 85 (35-100) | 70 (25-100) ¶ | 55 (15-95) ¶ |
| Improvement in BI | 5 (0-70) | 5 (0-45) | 0 (0-30) |
| MMSE | 26 (11-30) | 24 (12-30) | 23 (8-29) ¶ |
| GDS | 6 (0-29) | 9 (0-27) § | 10 (0-24) ¶ |
| MNA-SF | 10 (2-19) | 10 (2-21) | 9 (3-13) § |
| CRP, g/L | 16 (1-331) | 30 (1-245) ¶ | 33 (1-132) ¶ |
| Hb, g/dl | 12.5 (7.6-19.0) | 11.7 (8.9-16.3) | 12.2 (9.1-17.3) |
| creatinin (umol/L) | 79 (33-502) | 70 (34-187) § | 71 (40-314) |
| Days in NH | 14 (2-33) | 38 (18-57) ¶ | |

BI, Barthel index, MMSE, Mini mental state examination, GDS, geriatric depression scale (0-30), MNA-SF, Mini nutritional status-short form, NH, nursing home. Categorical variables are described as numbers and % of patients within each of the three recovery groups. Numerical variables are described as median and range. *Patients were able to return home directly from postacute intermediate care. †Patients unable to return directly home from intermediate care, further transferred to "ordinary" NH before return to own home < 2 months after discharge from hospital. ‡Patients still in NH or dying ≤ 2 months after discharge from hospital. Comparison was done between patients in group 1 and 2 and between patients in group 1 and 3. § p< 0.05, ||p<0.01, ¶p< 0.001.

Discussion

The present article describes three different patterns of recovery and outcome in patients selected for nursing home IC after acute hospitalization.

To the best of our knowledge, the assessment of short-time recovery at 1 month, 2 months, 3 months and 6 months after hospital discharge and IC has not previously been presented. From this assessment, we demonstrate that in the group of patients who were unable to return directly home after a stay in the IC unit, additional recovery occurred between 1 and 2 months; however, after 2 months, additional recovery levelled off. Others have demonstrated that the absence of recovery 1 month after hospitalization for medical illness was associated with worse long-term outcome (1), and that failure to regain ADL function at 3 months after acute hospitalization predicts institutionalization within 12 months (22). The present study also supports the observation by Hardy et al. that acute recovery from disability may be missed if intervals between assessment periods are prolonged (23).

We were surprised to find that at 6 months, the patients in the slow recovery group had achieved the same recovery

as the patients in the fast recovery group. The patients with slow recovery generally had lower BI scores, both at the time of admission and at discharge. This observation confirms that in multi-morbid older patients with reduced functional reserves, a new acute disease or accident may lead to a worsened functional impairment that improves at slower rate than the actual illness, and therefore a longer treatment and rehabilitation period might be required (24). Still, older patients with decreased functional reserves have the potential to regain function to allow transfer to their own home after an acute disease or injury if they are allowed extra time to recover in a skilled nursing facility (25).

The patients with poor recovery were older, received more home care and had worse scores on BI and all of the other geriatric assessment tests. The low score on MMSE, GDS and MNA-SF in these patients, is in agreement with a recent paper demonstrating association between low MNA-SF and frailty in acute hospitalised elderly patients (26).

As demonstrated in previous studies, ADL status measured using BI is a strong predictor for recovery (7, 8, 16, 24, 27). This assessment test is simple, does not require extensive training or special equipment and can easily be performed at

Table 3
Unadjusted and adjusted Odds Ratios for having a slow or poor recovery after nursing home intermediate care

| Variables | Slow recovery* | | | | | | Poor recovery† | | | | | |
|---------------------|----------------|-----------|--------|--------------|-----------|--------|----------------|-----------|--------|--------------|------------|--------|
| | Univariate | | | Multivariate | | | Univariate | | | Multivariate | | |
| | OR‡ | 95% CI | p | OR‡ | 95% CI | p | OR‡ | 95% CI | p | OR‡ | 95% CI | p |
| Age§ | 1.00 | 0.97-1.04 | 0.84 | | | | 1.10 | 1.05-1.15 | <0.001 | 1.06 | 0.98-1.14 | 0.16 |
| Male sex | 1.14 | 0.73-1.78 | 0.56 | | | | 1.22 | 0.69-2.15 | 0.49 | | | |
| Live alone | 0.90 | 0.58-1.77 | 0.57 | | | | 1.28 | 0.70-2.33 | 0.43 | | | |
| Receives home care | 0.92 | 0.64-1.39 | 0.62 | | | | 4.38 | 2.46-7.79 | <0.001 | 1.56 | 0.57-4.47 | 0.37 |
| Using ≥5 drugs | 1.42 | 0.82-2.50 | 0.21 | | | | 1.35 | 0.67-2.72 | 0.40 | | | |
| Orthopaedic patient | 4.22 | 2.75-6.47 | <0.001 | 3.37 | 2.00-5.70 | <0.001 | 2.41 | 1.44-4.02 | 0.001 | 5.40 | 2.10-13.87 | <0.001 |
| BI at admission§ | 0.95 | 0.94-0.96 | <0.001 | 0.96 | 0.95-0.98 | <0.001 | 0.94 | 0.93-0.96 | <0.001 | 0.92 | 0.89-0.94 | <0.001 |
| BI at discharge§ | 0.93 | 0.92-0.95 | <0.001 | | | | 0.90 | 0.88-0.92 | <0.001 | | | |
| Improvement in BI§ | 1.00 | 0.98-1.02 | 0.98 | | | | 0.95 | 0.91-0.99 | 0.007 | 0.88 | 0.83-0.94 | <0.001 |
| MMSE§ | 0.92 | 0.87-0.96 | 0.001 | 0.93 | 0.87-1.00 | 0.02 | 0.81 | 0.76-0.86 | <0.001 | 0.89 | 0.80-0.99 | 0.03 |
| GDS§ | 1.04 | 1.00-1.07 | 0.04 | 1.01 | 0.97-1.06 | 0.50 | 1.08 | 1.04-1.13 | <0.001 | 1.05 | 0.97-1.13 | 0.20 |
| MNA-SF§ | 0.98 | 0.91-1.06 | 0.66 | | | | 0.88 | 0.80-0.97 | 0.01 | 1.02 | 0.86-1.21 | 0.80 |
| Hemoglobin§ | 0.82 | 0.72-0.94 | 0.003 | 0.89 | 0.76-1.04 | 0.15 | 0.94 | 0.81-1.10 | 0.46 | | | |
| CRP§ | 1.01 | 1.00-1.01 | <0.001 | 1.01 | 1.00-1.01 | 0.09 | 1.01 | 1.00-1.02 | 0.001 | 1.01 | 1.00-1.02 | 0.24 |

OR= odds ratio, CI=confidence interval, BI, Barthel index, MMSE, Mini mental state examination, GDS, geriatric depression scale, (0-30), MNA-SF, Mini nutritional status-short form. ‡OR were estimated using logistic regression models and adjusted for the covariates as described in the Methods section. §Variables are per unit increase, *Patients unable to return directly home from intermediate care, further transferred to “ordinary” NH before return to own home ≤ 2 months after discharge from hospital. †Patients still in NH or dying ≤ 2 months after discharge from hospital.

any institution that does not have the capability conducting a complete CGA or frailty investigation.

The composite outcome “ability to live at home” was used as a surrogate marker for recovery of functional status after discharge from the IC unit. This parameter may be influenced by social conditions; however, because all older patients in our country are offered home care and no influence of living alone status was demonstrated, we conclude that the ability to live at home is a good and practical measure of recovery. This finding is consistent with Kane, who states that “The ultimate and appropriate test of postacute care effectiveness is how well the patient functions after the treatment period has ended” (9).

The major weakness of the present study is that only patients who were considered to have a treatment/rehabilitation potential were selected for treatment in the IC unit and that this selection was based primarily on the subjective judgement of the hospital doctors (which nevertheless proved to be adequate for 82% of the patients). Furthermore, the patients were recruited from the same area and treated in a single institution. Therefore the generalizability of the study may be limited. Additionally, the numbers of frail patients with severe physical and cognitive impairment (belonging mainly to the slow and poor recovery groups) were small, and the results of the present study cannot be used to tailor IC to individual patients. The strength of the study is that the inclusion rate was high, CGA was performed on nearly all of the patients and follow-up

was conducted at a short interval during the first 6 months. Furthermore, although the majority of other studies include either medical or orthopaedic patients or only a subgroup of these patients, the present study includes all of them, because they, in general, share many clinical characteristics and are cared for in the same type of facilities. These elderly patients, although highly selected, represent a large, increasing and important group of patients admitted to hospitals, and a high proportion of them are at risk for increased dependency and institutionalization if they do not receive adequate IC.

Comprehensive Geriatric Assessment based, short-term multidisciplinary IC, as outlined in the present study, may be an optimal treatment option for selected medical and orthopaedic patients who need further treatment and have a rehabilitation potential. However, it is an expensive care model and cannot be offered to all community-dwelling patients who need further care after acute hospitalization. Furthermore, it might not be optimal for the patients with a poor recovery potential, because it may include several transmissions between different care institutions. Based on our experience, we outline three likely different IC pathways: 1) A short-term IC, based on CGA and increased multidisciplinary staffing such as the one presented in the present study. 2) An IC model with the likelihood of a longer treatment and care period, likely up to 2 months, in a skilled nursing home facility. This model should have adequate rehabilitation resources and regular attendance by doctors,

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although not to the same extent as for the short-term IC. 3) IC in a skilled nursing home facility with primary focus on care and palliation rather than rehabilitation.

Future research should include patients with a wider spectrum of functional decline and a longer follow-up period. Additionally, more knowledge of the importance of specific diagnoses, stratification according to ADL function and cognition, may give important information of how to select patients to these different IC models.

In conclusion, whereas the majority of patients selected for treatment in the IC unit in this study were able to recover and return home, a group of patients needed extra time of up to two months to recover, and still another group had poor recovery and could not return home. ADL function (BI) was a strong predictor for recovery. Developing more specific care models based on the subgrouping of patients may in the future improve nursing home intermediate care.

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Conflicts of interest: JFA, CH, RMN and AHR have no conflicts of interests to declare.

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Ethical standards: The study was approved by the Regional Committee for Medical and Health Research Ethics, and a written, informed consent was signed by the patients before entering the study. No experimental interventions were performed.

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