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Standardized, Coordinated Care in Nursing Homes Lowers Rehospitalization After Hip Fracture

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Abstract

Objectives: To assess the effect of enhanced standardized interdisciplinary cooperation between the orthogeriatric ward, municipality, and nursing home facility (NHF) on readmission rates in patients with hip fracture.

Design: Quasi-experimental design with a nonequivalent control group.

Setting and Participants: From January 2018 to July 2020, patients with hip fracture who were admitted to the department of orthopedic surgery and traumatology at Lillebaelt Hospital, and later discharged to NHF were included.

Intervention: The intervention consisted of a safety program to the NHF for the first 14 days postdischarge and included assessment of vital signs, weight, pain, signs of constipation, hours of mobilization, and daily intake of fluids and high-protein beverages. Acute team nurses undertook visits (planned and unplanned) and could take blood samples and administer intravenous fluids or antibiotics at the NHF. Control participants received usual care.

Methods: The intervention was performed in 2 municipalities with an acute team; the remaining 3 municipalities comprised the control group. The primary outcome was 30-day readmission, and secondary outcomes were mortality, mobility, and quality of life.

Results: There were 100 patients in the intervention group and 152 in the control group. The median age was 86 years, 68% were female, and more than 60% had a low mental score; there were no statistical differences between groups in baseline variables. The 30-day readmission rate was 14% in the intervention group and 30% in the control group (P = .004). The 30-day mortality rate was 6% in the intervention group and 13% in the control group (P = .07). There was no statistically significant difference in mobility between the 2 groups but there was a higher health-related quality of life score in the intervention group (P = .045).

Conclusions and Implications: Enhanced standardized interdisciplinary cooperation between hospital, NHF teams, and visiting acute team nurses can lower readmissions and potentially mortality.

Patients with hip fracture are a fragile group, with a 5% to 23% risk of readmission after the initial surgical treatment.¹ Patients with hip fracture residing in a nursing home facility (NHF) are the most at risk, with a readmission rate of 11% to 39%.²⁻⁴ These patients are therefore in need of extra attention.

Medical reasons for readmission are common,¹ and postsurgical complications such as pneumonia, though potentially preventable, are significantly associated with early mortality following hip fracture in NHF patients.³ Higher early mortality is seen in NHF patients with hip fracture, with a 30-day mortality rate of 11% to 12% compared with 5% to 6% for non-NHF patients with hip fracture.³⁻⁶ A key component of lowering the mortality rate is to improve the management of postoperative complications, which as a hard endpoint would be to reduce hospital readmissions. A multidisciplinary approach has previously been found to reduce the readmission and 30-day mortality rates of NHF patients with hip fracture compared to a standard intervention.⁴⁻⁷
These study designs employed a hospital outreach team to provide the intervention during a follow-up period of 28-30 days, which is costly. It is therefore relevant to investigate if similar results can be achieved using the NHF staff and nurses for the intervention. This study aimed to assess the effect of enhanced standardized interdisciplinary cooperation between the orthogeriatric ward, municipality, and NHF on 30-day readmission of patients with hip fracture. Secondary aims were to assess this program’s effect on mortality, mobility, and quality of life.

Methods

Trial Design

This was a quasi-experimental design with a nonequivalent control group of patients with hip fracture discharged to NHF. The intervention was performed in 2 of 6 municipalities as they were equipped to offer multifaceted NHF care with a tailored treatment plan. The remaining municipalities were not equipped to offer multifaceted NHF care; 3 were included as a control group and continued with their usual care, whereas 1 municipality declined to participate. The intervention was considered an enhancement of usual treatment, whereas 1 municipality declined to participate. The intervention was considered an enhancement of usual treatment, by implementing already available health care practices in a new program, and therefore approval from the regional scientific ethical board was not required. Written informed consent was obtained from all patients for data collection, in collaboration with their closest relatives if necessary. The project was approved by the Danish Data Protection Agency (case number 17/46156). Reporting was performed according to the CONSORT guidelines.

Participants

From January 2018 to July 2020, patients with a hip fracture admitted to the department of orthopedic surgery and traumatology at Lillebaelt Hospital were screened for eligibility. The inclusion criteria were patients discharged to NHF and able to give informed consent (or consent by guardian). Exclusion criteria were inability to provide written informed consent, transfer to a different ward before discharge, transfer to a different hospital’s referral area, discharge to an NHF not financed by a municipality, or discharge to an NHF for palliative care.

In Denmark, hospitals perform 70% of hip fracture surgeries within 24 hours, with an average length of stay of approximately 1 week. After discharge to the NHF, the hospitals are no longer involved in any postsurgical treatment; thus, the municipalities are responsible for postsurgical care from 1 week after surgery. All NHFs, regardless of municipality, have to maintain a government-issued standard and therefore deliver similar services.

Intervention

The intervention was developed by hospital-employed nurses, orthopedic surgeons, and geriatricians and consisted of 3 primary initiatives:

1. The responsibility of care continued with the orthogeriatric ward for 14 days following discharge, including an open admission. Each patient received a tailored treatment plan containing a plan for laxatives, fluids, analgesics, wound care, anticoagulant treatment, and mobilization (full weight-bearing or restricted weight-bearing and walking aids). If needed, health care professionals at the NHF could contact doctors and nurses at the orthogeriatric ward for treatment-related help.

2. A safety program consisting of a paper booklet was implemented for the first 14 days after discharge primarily carried out by the NHF staff, which consisted of the following observations: assessment of vital signs (blood pressure, heart rate, respiratory rate, body temperature, saturation, and change in awareness), weight, pain (none, easy, moderate, or severe pain during rest and mobilization), signs of constipation (observed defecation), hours out of bed, and daily intake of fluids and protein beverages (Table 1). The observations were noted in the paper booklet that was returned to the department.

3. Acute team nurses from the municipalities were assigned to the NHF. There is usually no nurse employed at the NHF other than for medicine distribution (not intravenous [IV] fluids), and if a patient gets sick, a general practitioner would have to be called on. In the intervention group, a specialized nurse in acute care from the municipality with permission to take blood samples and administer IV fluids was allowed to assess the patient and could call the orthogeriatric ward for help. The acute team nurses contacted the NHF on day 0 and assessed the patient on days 3, 6, and 14 postdischarge. The NHF health care professionals could also request that the acute team assess the patients. On days 3 and 6, an on-site blood test (finger) consisting of hemoglobin and C-reactive protein was performed, and in cases of suspicious blood sample levels or clinical deterioration, the orthogeriatric ward was contacted for a new treatment plan.

Furthermore, medical record entries in the safety program were completed by the visiting acute team nurse on the day 3 and 6 visits consisting of follow-up on vital signs, pain assessment, fluid intake, and hours out of bed on the previous days since discharge or last acute visit as well as measures of weight and hemoglobin and C-reactive protein levels. Finally, an evaluation and plan based on these observations were made for the NHF staff to follow.

In addition to the 3 primary initiatives, on day 14, hemoglobin and C-reactive protein levels were again measured and the following were assessed: pain, hours out of bed the previous day, follow-up on

| Table 1: Timing of Observations and Acute Team Visits After Discharge |
|-------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                         | Day 0 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 14 |
| **Vital signs**         | XX    | XX    | X    | X    | X    | X    | X    | X    |
| **Pain**                | XX    | XX    | XX   | XX   | XX   | XX   | XX   | X    |
| **Intake of protein beverage** | XX    | XX    | XX   | XX   | XX   | XX   | XX   | X    |
| **Intake of fluids**    | XX    | XX    | XX   | XX   | XX   | XX   | XX   | X    |
| **Hours out of bed**    | XX    | XX    | XX   | XX   | XX   | XX   | XX   | X    |
| **Weight**              | X     | X     | X    | XX   | XX   | XX   | XX   | X    |
| **Constipation**        | XX    | XX    | XX   | XX   | XX   | XX   | XX   | X    |
| **Acute team visit**    | (X)*  | X     | X    | X    | X    | X    | X    | X    |
| **Blood samples**       |       |       | X    | X    | X    | X    |       | X    |

An observation is marked with an X, 2 observations per day with 2 Xs.

*Phone call.
rehabilitation program, Cumulated Ambulation Score (CAS), EQ-5D-3L score, whether the patient had stopped using painkillers (yes, reduced to previous dose, reduced but not completely, cannot be reduced), and complications since discharge (pneumonia, cystitis, other infection, low hemoglobin, lung stasis, delirium, fall, or readmission). Whether the patient had received treatment with IV fluids, IV antibiotics, or blood transfusion during the previous 14 days was also noted, including an assessment of whether readmission was prevented as a result of the intervention and the number of additional acute team visits.

The intervention was introduced during the autumn of 2017 through two 7.5-hour workshops, 1 for leaders and nurses at NHF and 1 for acute team nurses. The aim was to increase the quality of nursing care for patients with hip fracture and to present the responsibilities, tasks, and tools related to this intervention. The workshop started with a multidisciplinary educational profile with talks from nurses, orthopedic surgeons and geriatricians in general subjects on hip fracture treatment focusing on nursing home patients. Next, the trial was reviewed and group activity was performed for implementation of the trial. In addition, the doctors and nurses at the orthogeriatric ward and the general practitioners in the involved municipalities were briefed.

**Control Group**

The control group received usual care, which normally consists of discharge to the NHF 1-2 days following surgery with no hospital follow-up. In Denmark, NHF competence is variable, with staff groups composed of unskilled workers, social and health care helpers, and assistants, with often just 1 day-shift nurse available at each NHF. There is no systematic approach to early detection of incipient diseases. The general practitioner is contacted when a patient requires medical attention.

**Outcomes**

The primary outcome measure was 30-day readmission rate following discharge. Secondary outcome measures were 30-day mortality, mobility (CAS), and quality of life (EQ-5D-3L). Patient characteristics gathered were age, sex, American Society of Anesthesiologists classification system,11 type of fracture, type of surgery, length of stay, and a mental test dichotomized into 2 categories, low (0-6) and normal (7-9), when used in analysis. Data on first readmission, cause, and time to readmission were extracted from hospital records.

Whether readmission was prevented by intervention was assessed on day 14 of the intervention; if patients had received IV fluids, IV antibiotics, or planned blood transfusion, a readmission was considered prevented.

All data were entered in a Research Electronic Data Capture database. Data entry was performed by one author but was reviewed and confirmed by a second author. A third author performed data
had minimum 100 patients. We rounded up to 100 (n = 200) for detecting a decrease in 30-day readmission from 34% to 15%. Owing to the high proportions test yielded 80 patients per group (n = 160) for detecting a final sample size of 96 per group, which we rounded up to 100 (n = 200) and kept including until both groups had minimum 100 patients.

Statistical Methods

Descriptive analysis for categorical variables was performed using numbers and percentages. Continuous variables were assessed for distribution; variables with nonnormal distribution were presented as median and range, and variables with normal distribution as mean and 95% CI. A chi-square test was applied for comparison of categorical variables and a Mann-Whitney U test or Student t test was applied for continuous variables depending on the distribution. All analysis was made on an intention-to-treat basis using the statistical software program Stata/IC 16.0 (StataCorp LLC). The level of significance was set at P < .05 for all analyses.

Results

Eligibility for inclusion in the study was assessed for 1058 patients with hip fracture, and 783 patients were excluded owing to discharge destinations other than NHF (Figure 1). We excluded 23 patients after application of the exclusion criteria, and the final cohort consisted of 252 patients. The median age was 86 years, 68% were female, and more than 60% had a low mental score (Table 2). There were no statistical differences between groups in the baseline variables. The 30-day readmission rate was 14% in the intervention group compared with 30% in the control group (P = .004) (Table 3). The mean time to readmission was 5 days (95% CI 3-7) in the intervention group compared with 10 days (95% CI 7-12) in the control group (P < .026). There were 24 (24%) prevented readmissions due to IV antibiotics, IV fluids, or blood transfusion administered at the NHF.

The 30-day mortality rate was 6% in the intervention group compared with 13% in the control group (P = .07). Mean time to death was 13 days (95% CI 5-20) in the intervention group compared with 16 days (95% CI 11-20) in the control group (P = .34).

There was no statistically significant difference in mobility between the 2 groups, but there was a statistically significant difference in health-related quality of life scores, though no statistical difference in mobility.

Discussion

We found a large difference in the 30-day readmission rate of our groups, with 14% in the intervention group compared with 30% in the control group. There was also a borderline lower 30-day mortality rate and higher health-related quality of life scores, though no statistical difference in mobility.

The present study is similar to the study by Gregersen et al demonstrating that an individualized hospital-at-home method for NHF patients with hip fracture had a significant impact on readmissions (14% vs 26% in controls) and 30-day mortality (8% vs 19% in controls). The major difference between the studies is that the intervention by Gregersen et al was carried out by a team from the hospital consisting of a geriatrician, nurse, and/or physiotherapist. There was a visit on day 1 with individual follow-up visits until day 30 postdischarge. In the present study, the NHF staff was educated to follow a 14-day safety program with simple vital assessments and a municipality acute team nurse acted as an extended arm of the hospital, which could be contacted in case of need for treatment or questions. A randomized controlled trial from Australia also aimed to improve quality of life and mobility in patients with hip fracture in NHFs. The intervention group received a 4-week ambulatory geriatric rehabilitation program consisting of a comprehensive geriatric assessment, physiotherapy, and nutritional assessment and care plan. At 4 weeks, the intervention group had better mobility and lower mortality (8% vs 18% in controls), but there were no differences in quality of life. Readmissions were only presented for falls, constituting 10% in the intervention group compared to 12% in the control group. In comparison, we achieved similar results through education of the NHF staff on a safety program without a doctor present, without extra...
physiotherapists, and over a shorter postdischarge period (14 days). A short observational postdischarge period seems reasonable as the median time to readmission was 5–10 days. In agreement with a previous study, we found the primary cause of readmission to be medical, with infection as the most frequent, and no difference detected between groups. An assessment including blood samples and treatment at the NHF using primarily intravenous fluids led to the prevention of readmission of 24 patients. There are limitations to this study. Even though the 2 groups were considered comparable at baseline, there is a potential for bias in knowing the treatment groups at discharge. When knowing the intervention group, a more vigorous treatment during admission could happen and vice versa for the control group. Although the municipalities do not have formal cooperation, the municipalities are all from the hospitals’ catchment area, and knowledge of the intervention group may affect the control group. There was also no supervision of how well the safety program was followed. The analyses were unadjusted and univariate owing to study size and outcome rate, and the results should be considered in that context because it is not possible to adjust for confounders. The mortality results are most likely underpowered as it was a secondary outcome measure.

The strengths of this study lie in the feasibility of the two 7.5-hour workshops, NHF staff performing observations, municipality nurses contacting the hospital for treatment plans, and easy access to hospital doctors. In addition, Denmark has uniform treatment from hospitals and municipalities and has to live up to government standards. In perspective, the studies discussed above and the present study all demonstrate an improvement in treatment of frail patients. The studies try to improve the recognition of patients in need of higher levels of care and are not limited by the usual health care pathways. It is, therefore, in the authors’ opinion, important to critically assess the traditional health care pathways and instead assess systems with interventions that would improve appropriate health care utilization. The present study calls for close collaboration between hospital, NHF, and municipality when discharging patients. This can be done by setting simple postdischarge measurements, giving the NHF staff the possibility for easy access to acute team nurses as well as doctors from the hospital.

## Conclusions and Implications

Enhanced standardized interdisciplinary cooperation between hospital, NHF staff, and visiting acute team nurses can lower readmissions and potentially mortality in patients with hip fracture.

### References