Research paper

Association of comprehensive geriatric assessment with quality-related care practices during implementation and development of an orthogeriatric hip fracture program

H.M. Pajulammi [*,1], H.K. Pihlajamäki [2,3], T.H. Luukkaala [4,5], J.J. Jousmäki [2], M.S. Nuotio [1]

[1] Department of Geriatric Medicine, Seinäjoki Central Hospital, Hanneksenrinne 7, 60220 Seinäjoki, Finland
[2] Division of Orthopedics and Traumatology, Seinäjoki Central Hospital, Hanneksenrinne 7, 60220 Seinäjoki, Finland
[3] University of Tampere, Koskenalantie 16, 60220 Seinäjoki, Finland
[4] Research and Innovation Center, Tampere University Hospital, Biokatu 6, 33520 Tampere, Finland
[5] Health Sciences, Faculty of Social Sciences, University of Tampere, Lääkärinkatu 1, 33014 Tampere, Finland

A R T I C L E   I N F O

A B S T R A C T

Introduction: This study was performed to examine the association of a comprehensive geriatric assessment (CGA) with quality-related care practices during the implementation and development of an orthogeriatric hip fracture program.
Materials and methods: Population-based, prospective data were collected on 1644 consecutive hip fracture patients aged $\geq$ 65 years between September 2007 and December 2015. The outcome variables were delay from admission to surgery < 24 h, transfusion of red blood cells and removal of indwelling urinary catheter during the acute period of hospitalization. The adjustments used were age, sex, American Society of Anesthesiologists score, diagnosis of memory disease and prefracture living arrangements and mobility level.
Results: Since beginning the orthogeriatric program, performing the CGA (*OR*: 1.43, 95% CI 1.36–1.50), delay from admission to surgery < 24 h (*OR*: 1.06, 95% CI 1.02–1.11) and urinary catheter removal before discharge (*OR*: 1.51, 95% CI 1.43–1.58) increased significantly. In the adjusted analysis, interaction of CGA with follow-up time increased urinary catheter removal (*OR*: 10.0, 95% CI 7.34–13.7) and red blood cell transfusions (*OR*: 1.32, 95% CI 1.02–1.71), but had no effect on the delay to surgery (*OR* 1.07, 95% CI 0.83–1.38).
Conclusions: Implementation of an orthogeriatric program led to several quality improvements: more patients received CGA, underwent surgery within 24 h of admission, and had their urinary catheter removed during the acute period of hospitalisation. Administering the CGA was associated with prompt urinary catheter removal and increased red blood cell transfusions. The timing of surgery improved independent of the CGA.

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1. Introduction

The number of hip fractures continues to increase worldwide as the population ages. The burdens of mortality [1], incomplete recovery [2] and economic costs of acute and long-term care [3] following hip fracture are well documented. The clear need for improvements in the care and outcomes of older hip fracture patients has led to the innovation and implementation of co-managed hip fracture care models. The care models vary in comprehensiveness from consultation on request to the full integration of orthopedics and geriatrics in dedicated orthogeriatric hip fracture units [4].

Orthogeriatric units effectively decrease costs [5,6], decrease mortality [4,7] and improve mobility after hip fracture [6]. As orthogeriatric care models usually include an evidence-based care protocol, the quality improvements observed following implementation of an orthogeriatric care model are thought to contribute to the better outcomes [8]. Based on previous research, several individual parts of the care protocols may contribute to enhancing the overall quality of care. Evidence indicates that

* Corresponding author.
E-mail addresses: hanna.pajulammi@fimnet.fi (H.M. Pajulammi),
harri.pihlajamaki@epshp.fi (H.K. Pihlajamäki), tiina.luukkaala@uta.fi
(T.H. Luukkaala), janne.jousmaki@epshp.fi (J.J. Jousmäki), maria.nuotio@epshp.fi
(M.S. Nuotio).

minimizing the delay to surgery decreases mortality and complications [9,10]. The duration of time with indwelling urinary catheter (IUC) should be minimized, as prolonged catheterization leads to urinary tract infections [11], incontinence [12] and delirium [13] and is associated with increased mortality [14] and adverse outcomes with regard to mobility and living arrangements [15]. The evidence is less clear about a liberal vs. restrictive red blood cell (RBC) transfusion policy [16], but a more liberal practice of RBC transfusions may be beneficial for the most frail hip fracture patients [17].

Aiming at short delay from admission to surgery, treating detected anemia with RBC transfusion and removing IUC promptly are essential goals in orthogeriatric hip fracture protocols, thus they are included in our hip fracture program (HFP) and data collection. The aim of this study was to examine changes in the delay to surgery, RBC transfusion and IUC removal policies during the implementation and development of an orthogeriatric HFP. In particular, we evaluated the association of a comprehensive geriatric assessment (CGA) performed in the orthopedic ward during acute hospitalization with these practices. To the best of our knowledge, this is the first study of this design.

2. Material and methods

2.1. Study population

The prospectively collected study population comprised 1756 consecutive hip fracture patients aged ≥ 65 years treated for their first hip fracture in Seinäjoki Central Hospital, Finland, between September 2007 and December 2015. The final study population comprised 1719 hip fracture patients, as 37 (2.1%) patients declined participation in the study. Pathologic and periprosthetic fractures were excluded. The study data are population based: in the Hospital District of Southern Ostrobothnia, with a population of 199,000, Seinäjoki Central Hospital is the only hospital providing acute surgical care.

2.2. Orthogeriatric model and study design

The orthogeriatric service in the Seinäjoki Central Hospital hip fracture program (HFP) is located in an orthopedic ward. The orthopedic surgeon meets patients daily and the CGA is delivered by means of interdisciplinary geriatrician-led ward rounds, which take place on weekdays. Responsibility for the care is shared and both services write their own orders during hospitalization and for discharge. The geriatric unit in our hospital is relatively small, and like in many regions in Finland, we have experienced occasional shortage of geriatricians. Consequently, interruptions in the availability of geriatric service and delivering CGA in the orthopedic ward have occurred and enabled the formation of the study groups. However, if a geriatrician was available for the service, all hip fracture patients in orthopedic ward were treated alike and received a CGA.

Since its initiation in 2007, the HFP has been gradually expanded and updated. In its present form, the HFP includes extensive, evidence-based instructions regarding pre, peri, postoperative and surgical care, CGA during hospitalization, discharge criteria and care recommendations for the discharge location. The contents of our HFP have been described in detail elsewhere [18]. Also, every hip fracture patient is invited to the geriatric outpatient clinic for geriatric assessment 4 months after the fracture.

2.3. Data collection

During hospitalization for hip fracture, the patients' medical records and interview conducted by a nurse with the patient or a caregiver were used to collect data on patient characteristics [age, sex, American Society of Anesthesiology (ASA) score, prefracture diagnosis of memory disorder and prefracture mobility level and living arrangements], care-related indicators (delay from admission to surgery, transfusion or non-transfusion of RBCs, IUC removal or non-removal before discharge from acute hospital care) and receiving or not receiving CGA.

2.4. Predictor and outcome variables

The outcome variables were delay from admission to surgery < 24 h, transfusion or non-transfusion of RBCs and IUC removal or non-removal before discharge from acute hospital care. The predictor variable of interest was CGA performed during hospitalisation for hip fracture.

2.5. Statistical analyses

The distribution of patient characteristics in case numbers and percentages or by medians with ranges according to the CGA was calculated. Differences between groups were tested using the Mann–Whitney test, Pearson χ^2 test or Fisher's exact test.

Associations of CGA and time were analyzed by logistic regression models and results are reported as odds ratios (OR) with 95% confidence intervals (CI). First, unadjusted CGA and follow-up time were analyzed separately (model 1). Follow-up time was modelled both as continuous and as categorized for two time groups, years 2007–2011 and 2012–2015. The division was made according to years with approximately the same number of patients in the two groups. Second, CGA and time were modelled together without and with their interaction as unadjusted (model 2). Third, the analyses in model 2 were adjusted for age, sex, ASA score, diagnosis of memory disorder and prefracture mobility level and living arrangements (model 3). Patients with missing information regarding any of the outcome variables were excluded ($n = 75$). A P value of < 0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS for Windows, version 23.0 (IBM Corp, Armonk, NY).

2.6. Ethical statement

The study was performed according to the 1964 Helsinki Declaration and its later amendments and approved by the South Ostrobothnia Hospital District Ethics Committee. Informed consent was obtained from the participants or their caregivers.

3. Results

After exclusion of patients with missing information, data were available for 1644 hip fracture patients (Table 1). The median age was 84 years (interquartile range: 78–88, range: 65–105) and the median length of hospitalization was 6 days (interquartile range: 5–7, range: 1–37). Of the 1644 patients, 1072 (65%) received CGA.

3.1. Distribution of variables according to time and CGA

Comparing the basic patient characteristics from years 2007–2011 with those of 2012–2015, the proportion of men ($P = 0.014$) and proportions of patients with ASA score 1–3 ($P = < 0.001$), with memory disease ($P = 0.006$) and living at home ($P = 0.001$) increased (Table 1). In addition, more CGA was performed ($P = < 0.001$) and IUCs removed ($P = < 0.001$) (Table 1).

There was no difference in the basic patient characteristics of patients receiving CGA while hospitalized, compared to those who did not receive CGA (Table 1). Patients receiving CGA were more likely to have received RBC transfusions ($P = 0.011$) and to have