

ORIGINAL PAPER/PŮVODNÍ PRÁCE

Post-Fracture Care in the Czech Republic: Adherence to Guidelines and Attitudes Toward Fracture Liaison Services

Péče o pacienty po osteoporotické fraktuře v České republice:

adherence k doporučeným postupům a postoj k programu Fracture Liaison Services

**KVETA VRABLIKOVA¹, VLADIMIR PALICKA¹, VALERIE TOTHOVA², MARIAN RYBAR³,
LUDMILA BRUNEROVA⁴, RICHARD PIKNER⁵, MARTINA SOCHMANOVA⁶**

¹Institute for Clinical Biochemistry and Diagnostics, Osteocenter, University Hospital Hradec Kralove, Faculty of Medicine Charles University in Hradec Kralove, Czech Republic

²The University of South Bohemia in Ceske Budejovice, Czech Republic

³Faculty of Biomedical Engineering CTU in Prague, Czech Republic

⁴Department of Internal Medicine of the Third Faculty of Medicine of Charles University, Czech Republic

⁵Department of Clinical Laboratories, Klatovy Hospital, Czech Republic.

⁶Institute for Clinical and Experimental Medicine, Prague, Czech Republic

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Corresponding author:

Kveta Vrablikova, PhD
Department of Clinical Biochemistry
University Hospital Hradec Kralove
Faculty of Medicine Charles University
in Hradec Kralove, Czech Republic
vrablikovakveta@gmail.com

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ABSTRACT**Purpose of the study**

Untreated osteoporosis often leads to subsequent fractures associated with high morbidity and mortality. In the Czech Republic, approximately 15,000 patients are hospitalized annually with femoral neck fractures, with up to 25% mortality within the first year after a hip fracture. Establishing a coordinated post-fracture care program, such as Fracture Liaison Services (FLS), may substantially reduce this burden. In the FLS model, the role of the coordinator is pivotal. This study aimed to assess baseline adherence to national post-fracture care guidelines and to evaluate

nurses' attitudes toward the FLS program and the role of FLS coordinators in the Czech Republic.

Material and methods

Between May 25 and July 14, 2023, an anonymous electronic questionnaire was distributed to members of the Czech Association of Nurses working in surgical, orthopedic, and trauma departments. The survey assessed adherence to guideline-recommended discharge procedures and attitudes toward FLS implementation and coordinator certification.

Results

Adherence to national guidelines was poor across all evaluated domains of post-fracture care. Only a minority of respondents reported consistent patient education, scheduling of follow-up visits, referral for DXA examination, or

prescription of vitamin D and calcium supplements. Nevertheless, 76% of participants believed that implementing an FLS program would improve the quality and effectiveness of post-fracture care, and 61% expressed interest in specialized training to become certified FLS coordinators.

Conclusions

Despite substantial gaps in current adherence to post-fracture care guidelines, nurses demonstrated strong support for the FLS model and recognized the importance of the coordinator role. These baseline findings indicate that successful implementation of FLS programs in the Czech Republic will require both system-level coordination and motivated, trained nurse coordinators.

Key words: osteoporotic fractures; post-fracture care; FLS coordinator.

INTRODUCTION

Fragility fractures represent a major and growing challenge in aging populations and are associated with substantial morbidity, mortality, and healthcare costs (7, 12). In the Czech Republic, around 15,000 patients with femoral neck fractures are hospitalized annually, with up to 25% dying within the first year after a hip fracture (7). The country exceeds the European average in fracture-related mortality rates. Despite this, 79% of the 572,376 Czech men and women at high risk for osteoporotic fractures remain untreated, primarily due to under-recognition of osteoporosis and competing healthcare priorities (7). A critical strategy to reduce this burden involves identifying high-risk patients and ensuring effective management to mitigate fracture risk (6). Various international and national guidelines emphasize the importance of both primary and secondary prevention in osteoporosis care. Recent recommendations from the International Osteoporosis Foundation (IOF), the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis, and Musculoskeletal Diseases (ESCEO), the Bone Health & Osteoporosis Foundation (BHO), and other authoritative bodies advocate for the implementation of the Fracture Liaison Service (FLS). The FLS is a structured, post-fracture care program that has demonstrated cost-effectiveness, significant reduction in fracture recurrence rates, and addresses treatment gaps. However, despite strong evidence and international endorsement, implementation of structured post-fracture care programs remains limited in many healthcare systems (4, 5, 6, 7). Comprehensive, specific guidelines for post-fracture care in the Czech Republic were established in 2015 by the Czech Rheumatology Society, the Czech Society for Metabolic Skeletal Diseases (SMOS), and the Czech Society for Orthopaedics and Traumatology. These guidelines, titled “Care of Patients with Low-Trauma Fracture of the Proximal Femur,” underscore the significance of long-term osteological follow-up. They provide detailed recommendations for diagnostics and differential diagnosis, secondary prevention strategies, fall prevention and management, and the organization of fracture prevention programs (11). An updated version (2023) of the Czech guidelines for osteoporosis further emphasizes the urgent need to enhance secondary prevention measures as a critical component of fracture care improvement (10). Both sets of guidelines highlight several key points: before discharge, patients should be educated about their risk of subsequent fractures, instructed to seek specialized care promptly after discharge, scheduled for a follow-up appointment, referred for densitometric examination, and provided with prescriptions for vitamin D and calcium supplements (10, 11). Guidelines from international organizations such as ESCEO and IOF, in alignment with Czech societies, provide a straightforward, effective, and cost-efficient algorithm for coordinated post-fracture care, commonly referred to as the FLS (4, 5, 6, 7). The IOF has developed Capture the Fracture[®],

a global initiative designed to facilitate the implementation of Postfracture Care (PFC) Coordination Programs, such as the FLS, to enhance secondary fracture prevention. The FLS model promotes well-organized and effective post-fracture care through a structured, multidisciplinary approach. At the core of the FLS team is the coordinator, often a nurse with specialized training, who leads team management and coordinates care. Nurses, as FLS coordinators, play a central role in delivering targeted post-fracture care by directly interacting with patients to provide guidance and support, a role that is critical to the program’s success (1, 2, 3). The efficacy of the FLS model is substantiated by evidence from the Netherlands, where “fracture nurses” were deployed to implement specific guidelines addressing the risk of subsequent fractures and mortality in patients with nonvertebral fractures. This intervention resulted in a 35% reduction in the risk of subsequent fractures and a 33% reduction in mortality within a two-year follow-up period (2). These findings underscore the significant impact that well-trained nursing professionals can have on improving clinical outcomes for patients at high risk of osteoporotic fractures. In the Czech Republic, the primary departments providing post-fracture care are surgery, orthopedics, and traumatology. Currently, six Czech FLS centers are registered on the IOF Map of Best Practices under the Capture the Fracture[®] initiative, joining a network of 1,259 FLSs across 62 countries (data as of January 2026). Of the registered Czech FLS centers, three operate within hospitals and three in private practices (4). The national multicentric OSTEO pilot (2016–2022) study confirmed the feasibility of FLS implementation, with an estimated annual cost of 72 million CZK (≈3 million EUR) (8, 9). In comparison, the cost of pharmacological intervention (including assessment and treatment) reached 350 million CZK (≈ 14–15 million EUR) in 2019 (7). However, systematic nationwide implementation of FLS has not yet been achieved.

Data on real-world adherence to post-fracture care recommendations and on the readiness of nursing staff to participate in FLS programs remain limited, particularly in countries where FLS is not yet routinely implemented.

Therefore, the aim of this study was to assess adherence to national post-fracture care guidelines and to evaluate nurses’ attitudes toward the implementation of Fracture Liaison Services and the role of FLS coordinators in a national survey in the Czech Republic. By identifying existing care gaps and workforce readiness, this study provides baseline data to support future implementation of structured post-fracture care programs in healthcare systems where FLS has not yet been fully established.

MATERIAL AND METHODS

From May 25 to July 14, 2023, an electronic questionnaire (in Czech) was distributed via the mailing list of the Czech Association of Nurses to all registered members working in orthopedic, and traumatology departments across the Czech Republic. The questionnaire was therefore accessible to the entire target population of nurses involved in post-fracture inpatient care, without pre-selection of participants.

According to the Hospital Bed Fund of the Ústav zdravotnických informací a statistiky České republiky (ÚZIS), approximately 3,485 beds in Czech acute care hospitals are classified under orthopaedics and musculoskeletal traumatology, representing about 3.3% of all acute care hospital beds. After exclusion of midwifery staff, the acute care nursing workforce can be conservatively estimated at approximately 45,000–47,000 full-time equivalents (FTEs). Because intensive care units require substantially higher nurse-to-bed ratios than standard orthopaedic wards, a lower proportional allocation of 2% was applied, yielding an estimated ~900–1,000 nurses (FTEs) working in orthopaedic and trauma inpatient units nationwide.

Based on this conservative estimate, the 104 respondents included in the final analysis represent approximately 10–12% of the national nursing workforce involved in orthopaedic and trauma inpatient care. The questionnaire, developed in collaboration with the Czech Association of Nurses and the Czech Society for Metabolic Skeletal Diseases, was administered anonymously via the Survio.com platform (www.survio.com).

It was designed to be anonymous, with no collection of identifying information such as names, addresses, or personal details, to ensure participant confidentiality. The questionnaire consisted of 14 items organized into three sections. Section A collected *Respondent Characteristics*, including gender, workplace, years of experience, and highest level of education achieved. Section B focuses on discharge-related patient care, specifically *adherence to the Czech Guidelines*:

- *Are patients educated about their high risk of subsequent fractures before being discharged from the hospital?*
- *Are follow-up clinic appointments scheduled for patients prior to their discharge from the hospital?*
- *Are patients scheduled for a densitometric examination (e.g., DXA scan) before hospital discharge?*
- *Are patients discharged with prescriptions for vitamin D and calcium supplements?*

Section C addressed the structure and implementation of the FLS (FLS) program, examining participants' attitudes toward the FLS program, including their views on the role and certification of FLS coordinators. Questions related to *attitudes toward the FLS program* were:

- *Do you agree that the implementation of the FLS program to ensure a higher quality of post-fracture care would result in more effective care?*

- *Do you believe that the role of FLS coordinator should be a specialized role with well-defined responsibilities and certification?*
- *Are you interested in specialized education to be able to obtain a license to be an FLS coordinator?*

Statistical analysis

Descriptive statistics were used to summarize responses to questions on post-fracture care and attitudes toward coordinated care. All statistical analyses were performed using R software (version 4.3.1; R Core Team, Vienna University). Categorical variables were expressed as frequencies and percentages. Associations were examined using Pearson's chi-square test for the following comparisons: (1) hospital type and adherence to post-fracture guidelines (Section B), and (2) educational background and attitudes both toward coordinated post-fracture care and willingness to pursue further training (Section C). All statistical tests were two-sided, with a significance level set at $p < 0.05$.

RESULTS

A total of 155 questionnaires were collected, of which 104 were fully completed and included in the final analyses. Assuming an estimated national workforce of approximately 900–1,000 nurses working in orthopaedic and trauma inpatient units, the 104 respondents represent approximately 10–12% of the target population.

A. Respondent characteristics

The majority of respondents were women (98%), with an average of 20.8 years of professional experience. Most participants (73.1%) had over 20 years of experience, while only 4.8% had less than 5 years of practice. Regarding education, over half (53.9%) had graduated from nursing school, while 17.3% held bachelor's degrees and 24% earned master's degrees. The largest proportion of respondents worked in university hospitals (71.2%), followed by regional hospitals (16.3%) and other facilities, including private and local hospitals (12.5%). General nurses made up nearly half of the sample (48.1%), with nurse specialists comprising 19.2%. Head nurses and station nurses were equally represented, each accounting for 14.4% of respondents (Table 1).

B. Adherence to the National Guidelines

A majority of respondents (55.8%) reported that patients are educated about their high risk of subsequent fractures before discharge. However, 34.6% were unsure whether this practice is consistently implemented, suggesting a potential

Table 1. Respondent characteristics

CATEGORY	NUMBER	PERCENTAGE (%)
SEX		
Female	102	98
Male	2	2
YEARS OF EXPERIENCE		
1-5	5	4.8
6-10	6	5.8
11-15	5	4.8
16-20	12	11.5
More than 20	76	73.1
Mean	20.8	
EDUCATION		
Master's degree	25	24
Bachelor's degree	18	17.3
Nursing school	56	53.9
Other	5	4.8
TYPE OF HOSPITAL		
University Hospital	74	71.2
Regional Hospital	17	16.3
Other	13	12.5
TYPE OF NURSE		
Head	15	14.4
Stational Nurse	15	14.4
Nurse Specialists	20	19.2
General Nurse	50	48.1
Other	4	3.9

lack of clear protocols or communication. Barely 9.6% stated that patients are not educated, indicating a notable gap in this critical aspect of secondary prevention. Only 24% of respondents confirmed that follow-up clinic appointments are scheduled for patients prior to discharge. Twenty-nine

point eight percent indicated that such appointments are not scheduled, while 46.2% were unsure, highlighting significant inconsistency in ensuring continuity of care. A mere 22.1% of respondents reported that patients are scheduled for a densitometric examination (e.g., Dual-energy X-ray absorptiometry, or DXA scan) before hospital discharge. Thirty point eight percent stated that this step is not taken, and a large proportion (47.1%) were unsure, indicating that diagnostic follow-up for osteoporosis is often overlooked. Only 33.7% of respondents confirmed that patients are discharged with prescriptions for vitamin D and calcium, despite their established role in fracture prevention. Furthermore, 23.1% stated that such prescriptions are not provided, and 43.3% were unsure, suggesting variability or lack of adherence to best practices in supplementation. This indicates inconsistencies in practice or knowledge, as summarized in Table 2.

Association between hospital type and adherence to post-fracture guidelines showed that most participants from university hospitals (55%) believed that post-fracture patients were educated about their high risk of subsequent fractures before discharge from a hospital, as were participants from regional hospitals (47%) and other facilities (69%). There was no relationship between the type of hospital and the response ($p = 0.552$).

Regarding the scheduling of follow-up appointments with specialists for high-risk patients, 23% of respondents from university hospitals, 18% from regional hospitals, and 39% from other facilities confirmed adherence to this guideline. Similar to patient education, there was no significant ($p = 0.385$) relationship between hospital type and responses to this question.

The next two questions evaluated adherence to guideline recommendations, specifically regarding the scheduling of DXA examinations and the initiation of vitamin D and calcium supplementation prior to hospital discharge. Among respondents, only 19% from university hospitals, 29% from regional hospitals, and 31% from other facilities reported that patients were scheduled for DXA before discharge. Statistical analysis revealed no significant ($p = 0.465$) association between hospital type and this practice.

Similarly, the initiation of vitamin D and calcium supplementation during the index hospitalization was reported by

Table 2. Adherence to the National Guidelines

QUESTION	YES %	NO %	I DON'T KNOW %
Are patients educated about their high risk of subsequent fractures before being discharged from the hospital?	55.8	9.6	34.6
Are follow-up clinic appointments scheduled for patients prior to their discharge from the hospital?	24	29.8	46.2
Are patients scheduled for a densitometric examination (e.g., DXA scan) before hospital discharge?	22.1	30.8	47.1
Are patients discharged with prescriptions for vitamin D and calcium supplements?	33.7	23.1	43.3

31% of respondents from university hospitals, 29% from regional hospitals, and 54% from other facilities. As with DXA scheduling, no significant ($p = 0.255$) relationship was observed between the type of hospital and the responses for supplementation.

C. Attitudes Toward the FLS Program

Section C addressed potential implementation of the FLS program, examining participants' attitudes toward the program, including their views on the role and certification of FLS coordinators. The survey assessed participants' attitudes toward the implementation of the FLS program and the role of an FLS coordinator. A majority (76%) of respondents agreed that implementing the FLS program would ensure a higher quality of post-fracture care and lead to more effective management. However, 10% disagreed, and 14% were uncertain, indicating a need for further education or clarification about the program's benefits. A large majority (91%) of respondents believed that the role of the FLS coordinator should be a specialized position with well-defined responsibilities and certification. Only 9% disagreed, and no respondents selected „I don't know,” suggesting strong consensus on the importance of role formalization. Regarding interest in specialized education to obtain an FLS coordinator license, 61% expressed interest, while 39% were not interested (Table 3).

A majority of respondents across all education levels agreed that the FLS coordinator is a meaningful role: 72% of those with a master's degree, 89% with a bachelor's degree, 80% from nursing school, and 83% from other educational backgrounds. Disagreement was limited, with 8% of respondents with a master's degree, 11% with a bachelor's degree, and 11% from other educational backgrounds stating that the FLS coordinator is not a meaningful role. No participants from nursing school expressed disagreement. Uncertainty was observed among 20% of participants with a master's degree and nursing school background, while it was lower for those with a bachelor's degree (0%) and other educational backgrounds (6%). No significant difference was observed between those with and without a university education in their agreement with the FLS approach ($p = 0.534$).

Interest in obtaining an FLS license varied across education levels: 60% of participants with a master's degree, 78% with a bachelor's degree, 56% from nursing school, and 54% from other educational backgrounds expressed interest. Conversely, 40% of participants with a master's degree, 22% with a bachelor's degree, and 44% from both nursing school and other educational backgrounds were not interested in pursuing an FLS license. No significant difference was observed between those with and without a university education regarding no interest in pursuing an FLS license ($p = 0.586$).

DISCUSSION

This study was designed as a baseline assessment preceding largescale implementation of Fracture Liaison Services in the Czech Republic. In line with the rationale presented in the Introduction, the primary objective was not only to quantify current adherence to secondary prevention guidelines but also to determine whether the nursing workforce is prepared and motivated to assume the coordinator role that is central to successful FLS implementation. The results therefore need to be interpreted primarily as an evaluation of system readiness for coordinated postfracture care.

The low adherence to key guidelinerecommended measures reflects the current fragmentation of postfracture care in the Czech healthcare system. Discharge from orthopedic or trauma wards is traditionally focused on acute surgical management, while responsibility for osteoporosis assessment and longterm prevention is often deferred to outpatient care without clearly defined handover pathways. The high proportion of nurses who were uncertain whether education, DXA referral, or supplementation were routinely implemented suggests that discharge procedures are not standardized and that secondary prevention is not yet perceived as an integral component of fracture management. Similar gaps have been reported in countries without structured coordination programs, indicating that these deficiencies are not primarily related to individual performance but rather to the absence of clearly organized care pathways.

Table 3. Responses to questionnaire items on attitudes toward the FLS program

QUESTION	YES %	NO %	I DON'T KNOW %
Do you agree that the implementation of the FLS program to ensure a higher quality of post-fracture care would result in more effective care?	76	10	14
Do you believe that the role of FLS coordinator should be a specialized role with well-defined responsibilities and certification?	91	9	0
Are you interested in specialized education to be able to obtain a license to be an FLS coordinator?	61	39	0

The lack of differences between hospital types further supports the interpretation that the observed gaps are systemic. Even in university hospitals, where access to specialized care and diagnostic facilities is generally better, adherence did not exceed that observed in regional or other institutions. This finding underscores the importance of national-level organizational solutions rather than isolated institutional interventions.

In contrast to the fragmented clinical practice, nurses' attitudes toward the FLS model were remarkably positive. Strong support for the formalization of the FLS coordinator role and the high level of perceived benefit from coordinated care indicate that the professional environment is receptive to organizational change. This is a crucial prerequisite for successful implementation, as the effectiveness of FLS programs depends not only on protocols and resources but also on motivated coordinators who understand the clinical relevance of secondary fracture prevention and are willing to actively engage patients and multidisciplinary teams.

The observed interest in specialized training further suggests that a substantial proportion of the nursing workforce could be mobilized as future coordinators. At the same time, the sizeable group of nurses who were not interested in further training highlights potential barriers that may limit program scalability. These barriers are likely multifactorial and may include workload constraints, limited institutional recognition of advanced nursing roles, uncertainty about career development, and insufficient financial or organizational incentives. Addressing these factors will be essential to ensure sustainable staffing of FLS programs.

Taken together, these findings support the central assumption of the FLS concept outlined in the Introduction: effective secondary fracture prevention requires both system-level coordination and an engaged professional workforce. The present data demonstrate that while coordination is currently insufficient, professional readiness represents a major opportunity for improvement in the Czech Republic. Establishing standardized discharge pathways, clearly defining the responsibilities of FLS coordinators, and integrating nurse-led coordination into routine fracture care may therefore substantially reduce the current treatment gap.

Several limitations should be considered when interpreting these results. The survey relied on self-reported information, which may not fully reflect actual clinical practice and may be influenced by limited awareness of institutional procedures. Nevertheless, the consistency of responses across hospital types and educational backgrounds suggests that the main conclusions are robust and reflect true organizational deficiencies rather than isolated reporting bias.

In conclusion, this baseline study demonstrates that post-fracture care in the Czech Republic remains largely uncoordinated but that nurses are highly receptive to the principles of the FLS model. These findings provide a strong rationale for the systematic introduction of FLS programs and offer an essential reference point for future evaluation of their impact on adherence, treatment initiation, and patient outcomes.

Limitations of the study

The study was conducted in the Czech Republic, and the sample size reflects the country's population and healthcare organization. As such, the findings may not be directly generalizable to larger countries or to healthcare systems with different models of osteoporosis care.

CONCLUSIONS

This study reveals significant gaps in adherence to post-fracture care guidelines in the Czech Republic, particularly in patient education, follow-up appointments, DXA scheduling, and supplementation with vitamin D and calcium. Nurses demonstrated strong support for the FLS model and the formalization of the FLS coordinator role, highlighting their potential to address these deficiencies.

Implementing nurse-led FLS programs with certified training, clear responsibilities, and adequate resources is essential for improving care. Collaboration between healthcare providers, professional societies, and policymakers is needed to secure funding and integrate these programs into routine practice. Additional efforts should include increasing awareness of guideline-based care, standardizing protocols, and monitoring adherence to ensure sustained improvement. Future studies should evaluate the impact of these interventions on patient outcomes and fracture prevention. ■

Ethics statement

Participation in the survey was voluntary and anonymous. Completion of the questionnaire was taken as implied consent.

Patients and public statement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Data availability statement

Data are available upon reasonable request. All data relevant to the study are included in the article.

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