REVIEW

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Fracture Liaison Services (FLS): a Review

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ABSTRACT

Fragility fractures, namely fractures from low-energy mechanisms that would not produce fracture in a healthy bone, are most commonly caused by osteoporosis, and constitute a major financial burden worldwide. The effectiveness of systems for the prevention of fragility fractures, also known as fracture liaison services (FLS) has been investigated by numerous programs. The FLS is a coordinated care paradigm where several providers work together to help the patient manage their osteoporosis following a fragility fracture in order to help prevent subsequent fractures. FLS offers a thorough method for not only identifying individuals who are at risk for secondary fracture but also for putting into practice evidence-based therapies to stop further fractures. For the FLS to be successful, doctors, nurses, administration and national healthcare systems must work together toward the common objective of protecting patients aged 50 and older from fragility fractures. This review article discusses the current FLS programs, their pros and cons, and emphasizes on the Greek FLS model.

KEYWORDS: Osteoporosis; Fragility fractures; Fracture liaison services

Introduction

Fragility fractures, namely fractures from low-energy mechanisms that would not produce fracture in a healthy bone, are most commonly caused by osteoporosis. Nearly 9 million of these fractures occur each year due to osteoporosis worldwide (1). Fragility fracture rates will probably continue to rise as osteoporosis prevalence rises with aging and our population gets older, resulting in a lower quality of life and increased mortality; 24% of hip fracture patients who are fifty years of age or older pass away within a year of the fracture (2). Additionally, fragility fractures have significant economic expenses in addition to their immediate impact on the patient. The cost of osteoporosis-related fractures in the US in 2005 was estimated at $19 billion. These expenses are expected to increase to almost $25.3 billion by 2025 (2,3). A patient's risk of subsequent fracture increases by approximately two foldafter suffering a vertebral fracture, and by three fold after suffering a subsequent hip fracture (4). Due

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to the severity of these effects, prevention of a secondary fracture is considered of great importance, both from a patient-care and social perspective.

The effectiveness of systems for the prevention of secondary fractures, also known as fracture liaison services (FLS) has been investigated by numerous programs (5–17). The FLS is a coordinated care paradigm where several providers work together to help the patient manage their osteoporosis following a fragility fracture in order to help prevent subsequent fractures. This review article discusses the current FLS programs, their pros and cons, and emphasizes on the Greek FLS model.

Prediction of secondary fractures

A bone mineral density (BMD) T-score of –2.5 or lower was the operational definition of osteoporosis provided by the World Health Organization in 1994 (18), and this criterion has since been adopted as the diagnostic standard. Although there is a 1.5–2.5 fold increase in fracture risk with each standard deviation decrease in BMD, the sensitivity of BMD alone to identify people at risk for a fracture is <50% (19,20), and many patients experience fractures with a T score > –2.5. For this reason, techniques for predicting fractures have been created to help identify people who are "at risk." The Fracture Risk Assessment Tool (FRAX) was created by conducting a thorough meta-analysis of the primary data from nine geographically dispersed cohort studies. It was then verified in an additional eleven cohorts, and it was published in 2008 (21).

Age, sex, weight, height, previous fracture, parent's hip fracture, current smoking, use of glucocorticoids, rheumatoid arthritis, secondary causes of osteoporosis, alcohol use, and BMD (although this can be disregarded in resource-constrained situations where BMD assessment is not possible) are the parameters used in FRAX. The results include the 10-year likelihood of a major osteoporotic fracture (clinical spine, proximal humerus, distal forearm, or hip fracture), as well as the 10-year likelihood of hip fracture. Globally, fracture incidence varies by geography, and FRAX is calibrated to offer nation-specific models (22).

Thresholds for therapeutic intervention can be determined using these percentage risks. Over 80 guidelines from around the world include FRAX (22). In general, patients who are at risk for primary and secondary fractures can be identified with the help of population screening techniques, BMD measurements (if available), and fracture prediction algorithms such as FRAX. Nevertheless, using an FLS is another way to spot and assist those who are "at risk" for fractures.

Prevention of secondary fractures – FLS programs

FLS is a specialized program created to recognize, investigate, and facilitate the initiation of the right treatment for individuals who have poor bone health and are at high risk for secondary fractures. When a patient suffers a fragility fracture, he/she is considered as having poor bone quality and thus susceptible to more fractures. The FLS model of care automatically enlists those patients for the medically necessary assessment of their risk for a secondary fracture, offers treatment recommendations, and may initiate treatment as needed. The FLS model results in higher rates of diagnosis and therapy and less attrition in the post-fracture phase of care as compared to other osteoporosis management methods, such as referral letters to primary care physicians or endocrinologists following fracture.

Prior to the implementation of secondary fracture prevention initiatives, 2% to 25% of people worldwide received evidence-based osteoporosis treatment following a known fragility fracture (23). These figures suggest that doctors are not greatly involved in their patients' secondary fracture prevention. With a marked growth in the use of post-fracture care, national healthcare systems and regional centers in many nations have begun to build their own FLS-type systems (5–13,24,25). Additionally, as a result of these programs' longevity, numerous studies have demonstrated an increase in the number of treatments started and a lengthened period of treatment adherence (7,9,10). Additional analysis revealed that these programs over time reduced the incidence of secondary fractures and even mortality (10,14,15,25–27).

FLS has also been demonstrated to be a cost-effective approach in numerous studies (6,15,16,28–33).

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Particularly, cost savings are driven not just by lower osteoporosis management costs but also by a rise in quality-adjusted life years and a decline in fracture rates.

FLS implementation

A clear road map is essential to guarantee that everyone involved in the FLS implementation has the same understanding of the program's goals and objectives,. An FLS coordinator or practitioner, a nurse navigator, and a leading physician can be the founding members of the FLS program while the team can be expanded as necessary in the future. According to previous research less success has been reported with an FLS core made up of primary care physicians, rheumatologists, or endocrinologists (34,35), rather than with orthopaedic surgeons and this is mainly due to: when treating a fracture, the orthopaedic surgeon is already familiar with the patient and family, and he or she is the one who establishes a connection between the fracture and osteoporosis; patients frequently wait until fracture healing before visiting their primary care physician, which creates the misconception that no further treatment is necessary.

The FLS program coordinator is oftena nurse practitioner or physician assistant with a focus on secondary fracture prevention (5,26,36,37). This provider needs to be proficient in many different areas such as being able to involve patients and their families in their care, have a thorough understanding of the most recent treatment algorithms and osteoporosis standards, while being capable to establish connections with other specialties and services within the institution. In order to ensure that patients keep their appointments and receive care as needed, this practitioner should collaborate closely with the leading physician and is frequently housed in the same office. To allow for simultaneous care from both physicians, this practitioner could also practice separately. Depending on the advanced practice practitioner's license, the FLS coordinator may also run a clinic independently from the leading physician. The FLS coordinator should regularly update practice patterns based on national recommendations and stay up to speed with national quality metrics (37).

To ensure that all eligible patients are engaged in the FLS program and to promote communication within the care team, the FLS coordinator needs nursing support (37,38). A "nurse navigator" is necessary in this position to help with osteoporosis education, medicine administration and training, and prescription insurance verifications. Additionally, a nurse navigator is used to find patients who should be referred to FLS by looking at inpatient censuses, emergency room discharges, and outpatient referral trends. The navigator may serve as the FLS program's first point of contact, arranging outpatient referrals and scheduling with the FLS while also offering instructional sessions for inpatients that may include handouts or films. To ensure that all patients who may potentially benefit from the FLS are enrolled, the nurse navigator should build cooperative partnerships with services other than orthopaedic surgery. Other services in the FLS coordination include the departments of radiology, neurosurgery, general practice, women's health, hospital medicine, and so forth because these specialties can also recognize and treat individuals with fragility fractures who do not need orthopaedic care (26). Patients may also be identified as FLS candidates using the electronic health record based on diagnostic or procedural coding.

It has been shown that preventing subsequent fractures lowers overall healthcare costs (23,39). It is recommended that the hospital administration pay for start-up costs as a part of a quality initiative associated with a musculoskeletal service line (40). A business plan can show cost savings from secondary fracture readmissions that are avoidable, and reportable metrics like readmission rates can support program implementation. To include volume predictions of office visits and related ancillary revenue directly related to the FLS service, the program is later integrated into the departmental or service line budget (such as bone densitometry, anabolic or antiresorptive medications, and laboratory studies). For better secondary fracture prevention and to show compliance with osteoporosis measures, data collection is crucial. There are typically two or three exam rooms in an office setting. To strengthen the care team for the disease condition and increase patient access and compliance, it is advised that the office location mirrors that of the leading - physician (40). Currently, billing is distinct from the overall duration of fracture care due to the FLS's

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specialized knowledge in a fee-for-service paradigm; however, shifting to value-based healthcare systems will probably alter this practice.

To enhance the reporting of claims data and patient outcomes, segregating the FLS in the electronic health record seems to be efficient. Additionally, templates and order sets created specifically for osteoporosis aid in gathering information about patients' vulnerability to fragility fractures. To improve patient access and compliance, it is best to have laboratory and imaging services in the same place. Cost-effective ordering is also guaranteed when laboratory test orders are standardized and entered into the electronic health record using best-practice principles. Radiographs and bone densitometry should be included in imaging modalities. Insurance agencies frequently demand bone densitometry before beginning pharmacologic treatment, even when the patient has a known fragility fracture with poor bone quality (26).

Prior to the implementation of FLS (5), the leading physician, FLS coordinator, nurse navigator, referring providers, and administrative stakeholders must establish shared objectives to guarantee that everyone involved has the same vision. With a targeted FLS deployment for patients with low-energy hip fractures, a new program may be successful. The program can subsequently be expanded to encompass all low energy fractures in patients who are older than forty-nine years old after confirming the correctness of the referral procedure and data reporting. Data reporting is crucial and should cover the ratio of referrals to eligible patients, the rate of missed appointments, treatment compliance, and mortality and secondary fracture rates (41–46). This data can assist in reevaluating FLS resources and predicting the program's future requirements.

A specific FLS should work to address the problem of fragility fractures in their specific region; of course, there will be differences in the patient population's demographics and the healthcare facilities that are available. The resources needed to implement FLS are, however, actually quite meager. The only technological requirements are a DXA scanner and a computer, and in low-resource settings, paper copies of the FRAX® tool are available for use and treatment decisions can be made without bone mineral density information. While FLS is typically reserved for patients with less severe fractures or abnormal laboratory results, in some regions the orthopaedic team will initiate a single dose of zoledronate in patients with hip fractures and normal laboratory results with calcium and vitamin D supplementation.

Potential benefits

FLS offers a base to benefit from both recent and anticipated improvements in health-care reform (39). Organizations in the healthcare industry can benefit from FLS as they make the switch from volume to quality payment. The current system of reimbursement is fee-for-service driven and not often connected to the overall quality of care. Regardless of the standard of care delivered or the results for patients, providers are paid equally for treatments. Another paradigm may switch to renumeration based on quality-of-care standards and patient outcomes as the system transitions to value-based or quality-based payments. A health care system will need to implement quality-care initiatives and provide evidence of better patient outcomes in order to reap the rewards of these new incentives. The FLS model of care is an illustration of a strategy that can enhance results in the treatment of patients with fragility fractures and lower secondary fracture rates.

Potential pitfalls and solutions

Certain barriers occasionally prevent the initiation of FLS (47). One such situation involves insufficient funding to hire an FLS nurse specialist; one possible option is to hire (or re-deploy) a member of the secretarial staff to do the administrative responsibilities that are a part of the FLS nurse specialist function. Language can be a barrier to using international resources although the Best Practice Framework (BPF) document is currently available in 12 major languages. All FLS registering for the Capture the Fracture (CTF) program must complete it. Lack of prior FLS management expertise may cause a lack of trust and the suspension of an FLS initiative. Through the use of instructional resources and personal mentoring from skilled FLS providers, this can be solved. Since 2015, webinars have been held as a part of the CTF Educational Program with the goal of interacting with the FLS community of the CTF and disseminating perti-

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nent information about FLS and secondary fracture prevention.

With the help of the CTF mentorship program, organizations interested in launching a new FLS can interact with eminent FLS professionals. The initiative establishes a forum for the exchange of crucial knowledge and abilities between FLS champions and FLS in the early stages of development, locally and regionally. The mentorship program has been in operation since its launch in 2016, giving a combination of on-site training and FLS seminars to provide advice on FLS implementation. During the on-site training, a FLS champion (mentor) hosts a FLS candidate (mentee) and spends a day teaching them how to implement a FLS and apply to CTF by completing the BPF questionnaire. The content is customized to match the mentee's specific needs because the training is conducted one-on-one. Conversely, FLS workshops draw in a bigger crowd, frequently more than 15 FLS applicants from the same nation.

Measuring the effectiveness of FLS

Eleven patient-level key performance indicators (KPIs) for FLS have been developed by the IOF CTF® Campaign in collaboration with the Fragility Fracture Network (FFN) and National Osteoporosis Foundation (NOF) to help guide quality improvement. These 11 FLS KPIs that have been suggested, give a comprehensive picture of how the FLS delivers secondary fracture prevention at the patient level. The degrees of achievement correspond to those that economic models employ to show the anticipated advantages of secondary fracture prevention in the local context. For an FLS to realize its predicted ability to lower re-fracture rates through secondary fracture prevention, it must reach a green level of accomplishment across all KPIs. Up until this point, FLS should actively pursue quality improvement. In some regions, meeting these KPIs may rely on modifying local healthcare systems outside the purview of the FLS. These KPIs should be viewed as instruments for enhancing service provision while utilizing already available resources. They should also be used to communicate to payers the precise service gaps that exist and suggested targets for development. The reduction of secondary fracture rates is the ultimate objective of FLS (5).

The majority of individuals with reportedly fractured spines do not require secondary fracture prevention (48). Improved techniques for identifying people with spine fractures are being developed. Text analysis of radiological reports or medical records may be required (49). Although these techniques are precise, they might not be sensitive since they rely on radiologists, whose reporting of spine fractures is notoriously inaccurate (48).

Patients who are evaluated by the FLS after having fractured during therapy frequently need a different approach to treatment (50,51). Testing for specialized laboratory tests is another potential KPI. This is relevant given that laboratory testing has detected secondary causes in up to 35% of FLS patients with osteoporosis (52). Several national guidelines for the prevention of secondary fractures recommend a variety of laboratory testing, although there is little agreement among them. Testing for vitamin D is one instance. Given the effectiveness of regular supplementation (53) and the difficulty in interpreting results due to seasonal variation and changes brought on by acute inflammation, some guidelines pragmatically advise high-dose empirical supplementation over systematic testing for the majority of patients following a fragility fracture if oral AOMs are advised. However, some investigations have called into doubt the effectiveness and security of greater vitamin D doses (54), emphasizing the requirement to assess vitamin D status in many individuals. Nearly all clinical guidelines state that patients in need of AOM should receive calcium and vitamin D replenishment; however, calcium replenishment can be easily obtained by diet, over-the-counter supplements, or prescribed medications, making calcium replenishment measurement difficult. Additionally, clinical investigations have shown that calcium and vitamin D supplementation alone is ineffective in the post-fracture scenario to lower the risk of re-fracture (55,56).

The Hellenic experience

There are two reports of FLS implementation in Greece. The first one was conducted at the 251 Hellenic Air Force and VA General Hospital of Athens (17) and the second was a multicenter study involving four orthopaedic departments across the country (66). The recruitment efficacy was very low (29.3%), significant-

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ly lower than the first FLS Greek report (54.5%) (17), or other national programs, such as those in The Netherlands, Spain, and UK (5,9,10), despite the fact that a large number of patients were deemed eligible to participate in the program. The majority of eligible patients who volunteered to participate in this FLS had a hip fracture. Nevertheless, despite the surprisingly low recruitment rate, 99% of those who were recruited completed the study and showed up for the 12-month follow-up appointment (66). This is in contrast to the first FLS Greek report, which was conducted in a single hospital and found that the completion rate was <20% (17), but it is consistent with other studies that found that between 65% and 80% of patients adhered to their treatment plans and scheduled follow-up visits (7,9,10). This startling discrepancy in the two FLS structures can be explained by variances in the recruitment rate and the percentage of patients who ultimately completed the follow-up visits. In the first FLS program (17), the registered nurse who was explicitly tasked with this work and as a result was both motivated and committed, conducted the screening and recruitment of eligible patients. The treating physicians were required to be active in the recruitment of the eligible patients during their usual clinical work at the hospital in the current trial, in which Orthopaedic Departments were involved rather than hospitals, and this may have influenced the outcome. In other words, in addition to their often busy schedules, the orthopedic surgeons had the extra responsibility of patient recruiting. The relatively high percentage of patients (57.3%) receiving treatment for osteoporosis may have been another likely factor in the high percentage of uncooperative individuals. As a result, patients probably chose to be monitored by their own doctor rather than in a FLS environment. Furthermore, this large proportion of patients who had previously had osteoporosis follow-up could be a sign of population selection bias in the study. A likely yet not solid explanation for this would be the urban and rather central location of these University Departments, which is likely to make them easily accessible to patients with unrestricted access to health services and thus make them adequately treated for a variety of medical conditions. A patient in Greece can typically choose among the hospitals of his or her residential area. However, despite the low recruitment rate of eligible patients, the treating physician's contribution to the recruited patients' completion rate turned out to be crucial, as almost all of them followed through with the follow-up appointments for up to one year. These adherent individuals lacked any distinctive traits that could pinpointed, and neither their treatment within the FLS nor outside of it differed from other patients. Additionally, as this was a general finding across all four locations, it is not possible to be attributed to the FLS staff members' unique communication skills. Therefore, it makes sense to draw the conclusion that the patient remains under medical care anytime the treating physician is active in the process of recruiting and motivation.

The allocated personnel's commitment to spending time outlining the hazards of osteoporosis and the advantage of therapy appears to be a key factor in whether osteoporotic patients are successfully recruited. Similar studies (11,17) have demonstrated that FLS workers are typically not employed exclusively; rather, the task is performed in conjunction with the rest of their duties and is primarily voluntary. However, it is evident from the experience gained in Greece that even when a program as complex and time-consuming as an FLS is run by committed and motivated staff who are willing and able to thoroughly explain the risks of osteoporosis to patients and persuade them of the immediate need for treatment, the results are, on the whole, highly satisfactory and successful. Specific guidelines (57,58), unambiguous FRAX cutoffs for cost-effective treatment (59,60), and convenient access to BMD testing with adequate reimbursement promote osteoporosis management in Greece. The national registration and audit FLS programs, however, will perform poorly anytime there is a paucity of funding, at least in terms of disease awareness.

Osteoporosis requires preventative and ongoing therapy to lower the risk of future problems, just like other silent and asymptomatic chronic diseases like diabetes and hypertension. However, for a variety of reasons, treatment compliance is currently very low (61,62). According to a recent study, only 19% of patients with hip fractures were receiving therapy for bone-active osteoporosis prior to the fracture, and this number barely changed after the fracture, climbing to 21% (63). Given that there are effective medi-

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cines to prevent future fractures, this type of diagnostic gap is too great, which highlights the need for a more concentrated public health strategy (64,65). Hip fractures made up more than 50% of the eligible and ultimately included cases in this study, which may indicate a selection bias. This is explained by the fact that in Greece almost all hip fractures result in admission to an orthopaedic department, while less serious fractures may be treated in outpatient facilities that are either public or private. Therefore, a large proportion of hip fractures will be present in any Greek FLS that occurs in an orthopaedic department that receives trauma cases. The first Greek study revealed that a male relative younger in age with a single NVF other than the hip fit the description of osteoporotic patients reluctant to take part in an FLS program. Patients with a hip fracture and several comorbidities who were older than 75 also seemed to be more likely to give up on the endeavor. These are the patients who don't stick to therapy as well because they either don't understand how serious fractures are or have a tough time getting to an outpatient clinic due to a bad transportation system. Greece lacks a public non-emergency transportation facility that is patient-centered, which is essential for elderly patients, especially those who live alone. The ability to confirm whether the aforementioned characteristics applied to the included subjects was limited by the fact that pertinent data on the patients who rejected to participate or who were lost to follow-up were missing from this study. Finally, of the 392 patients who finished the latest Greek project, 12 additional fragility fractures developed during the follow-up visits of our current study (66). The numbers were too small to draw any firm conclusions, and the treatment duration was too brief to significantly affect the re-fracture rates, despite the fact that all of these fractures were documented in patients who had rejected or stopped anti-osteoporotic medication. This finding suggests a chance occurrence more than an occurrence directly linked to or motivated by the absence of anti-osteoporotic therapy.

Based on the knowledge gained from the FLS implementation in Greece, it is necessary to significantly enhance recruitment rates. The treating physician must be well-educated, driven, and capable of devoting the necessary time to persuading patients to enroll in order to increase both the recruitment and completion rates. Additionally, certain target populations require special consideration, including young people and older adults with comorbidities and/or polypharmacy. Additionally, there is an urgent need for a national fracture database, and HSSBM is working with the ministry of health and other medical societies to achieve this objective. All FLS activities will undoubtedly benefit from this, particularly at the national level. The operational structure of the FLS, which is a very labor-intensive and time-consuming effort, should be adequately and consistently supported by the national healthcare system for a vital role in the final outcome.

Conclusion

Fragility fracture care includes more than just stabilizing a shattered bone through surgery. Osteoporosis, the underlying condition that led to the fracture, needs to be actively managed as a disease. The majority of healthcare professionals do not thoroughly assess this underlying medical state and then develop a treatment plan for it, and this lack of action could have long-term financial repercussions. FLS offers a thorough method for not only identifying individuals who are at risk for secondary fracture but also for putting into practice evidence-based therapies to stop further fractures. For the FLS to be successful, doctors, nurses, administration and national healthcare systems must work together toward the common objective of protecting patients aged 50 and older from fragility fractures.

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