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Title Page

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Establishing a hospital based fracture liaison service to prevent secondary insufficiency fractures

In the aging population worldwide, osteoporosis is a relatively common condition and a major cause of long-term morbidity. Every year, osteoporosis leads to almost 9 million fractures. (1) About 24% of patients following a hip fracture who are fifty years or older die within one year after the fracture. (2) As many as half of all patients with a hip fracture will have long term disability, and 25% will require long term nursing home care. Besides causing pain and loss of function, fractures in elderly patients also represent an enormous financial burden in terms of both direct and indirect health care costs. In United States in 2005, osteoporosis-related fractures accounted for approximately US\$19 billion. It has been extrapolated that by 2025, these costs would amount to about US\$25.3 billion. (3) (4) After a vertebral fracture, the risk of any another fracture increases 200% and that of a subsequent hip fracture increases 300%. (5) Kanis et al. (6) reported that patients who have had any one fracture have an 86% increase in their risk for another fracture. In this narrative review, we evaluate the different health care models described in the literature to prevent the second fracture. Furthermore, we synthesize the evidence to establish a hospital based fracture care system for insufficiency fractures including the impediments faced and potential solutions to ensure the system functions smoothly resulting in enhanced patient outcomes.

Secondary Fracture Prevention Systems

Initial fragility fractures can lead to subsequent fractures. The most common sites for osteoporosis related fracture are the vertebrae, hip and distal forearm. Lewiecki (7) described low trauma fracture as a “bone attack” which is a sentinel event that should trigger appropriate clinical attention directed to reducing the risk of future fractures, just as a ‘heart attack’ is usually followed by efforts to reduce the risk of future heart attacks. Data suggests that subsequent refractures can be prevented leading to significant outcome improvements for patients and health care budgets. (8) (9) (10) (11) (12) Presentation to the emergency department with a minimal trauma fracture (MTF) is often the first opportunity to diagnose and treat osteoporosis. Comprehensive coordinator led programs have been more widely used with more success as compared to limited interventions like handouts or follow-up care brochures. (13) (14) Although many health care models exist, they are challenged by innovations and continuous improvement. Reducing fragmentation in health care of insufficiency fracture patients by improving coordination and communication is essential. Ganda et al. (62) evaluated the effectiveness of published models of care for the secondary prevention of osteoporotic fractures. They categorized four models of care: type A: identification, assessment, and treatment of patients as part of the service; type B: similar to A, without treatment initiation; type C: alerting patients plus primary care physicians; and type D: patient education only. They recommended that the ideal approach to secondary fracture prevention is a type A model of care in an integrated electronic health network, overseen by a coordinator and using a dedicated database measuring performance as opposed to approached involving alerts and / or education only. (62)

A FLS is a multidisciplinary system approach to reducing subsequent fracture risk in patients with a recent fragility fracture due to compromised bone health by identifying them at or close to the time when they are treated at the hospital for fracture and providing them with easy access to osteoporosis care. (60) In the FLS model of care, in order to reduce the risk of another fracture, the patient is automatically enrolled for assessment of his/her risk for a secondary fracture, and started on treatment needed to improve bone quality and strength. Kaufman et al (61) have shown that when compared to other models such as referral letters to primary care physicians or endocrinologists, the FLS model results in a higher rate of diagnosis and treatment with less attrition in the postfracture phase. Many programs have evaluated the efficacy of systems for preventing secondary fractures, known as fracture liaison service (FLS). (15) The International Osteoporosis Foundation (IOF) fracture working group (16) in 2013 published a detailed analysis showed that internationally, the rate of evidence-based treatment for osteoporosis after a fragility fracture ranged from 2% to 25%. The poor postfracture care has been largely attributed to lack of ownership of osteoporosis by any single medical specialty. In several countries, the local health authorities have developed fracture care systems with a view to enhance post-fracture care. (15) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) Because setting up and maintaining a FLS requires considerable effort, some stakeholder organizations have developed resources that provide motivation and methodologies to improve the chance of success. (7) The International Osteoporosis Foundation has Capture the Fracture (42) whose goals are to support the implementation of FLS internationally by providing implementation

guides, standards of post-fracture care, and national toolkits in addition to relevant manuscripts. In the United States, National Bone Health Alliance (a public-private partnership) has Fracture Prevention Central (43) whose goal is to reduce fractures in the USA by 20% by the year 2020. With the passage of time, studies have shown that in addition to treatment initiation, patients have also followed up with osteoporosis management. (18) (22) (23) (24) (26) (33) (31) (40) (44) (45) (46) (47) (48) With the projected increase in fragility fractures and the associated burden to local health care systems, these extended fracture care services have also been shown to be cost effective. (17) (31) (37) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) These cost savings are achieved by osteoporosis management and also by opportunity costs of decreased fracture rates and increased quality-adjusted life years. The international Osteoporosis Foundation in 2013 (16) recommended setting up Fracture Liaison Services (FLS) for prevention of secondary fractures. FLS is a coordinated, collaborative approach to the capture, referral and management of patients who sustain a MTF due to osteoporosis in order to prevent future fractures.

Establishing a Hospital Based Fracture Liaison Service

For starting a FLS program, the nucleus is based on a physician champion, a FLS coordinator, and a nurse manager and the program is anticipated to expand with time. Miller et al (63) recommended an Orthopaedic Surgeon to be the physician champion because earlier studies have shown poor results when primary care physicians, rheumatologists or endocrinologists served as the FLS core. (61) (64) (65) (66) (67) (68) (69) The Orthopaedic Surgeon is the best choice for the physician champion because the index fragility fracture is already being treated by a surgeon and preventing further fractures by managing osteoporosis is a “holistic” extension of the treatment phase.

The FLS program coordinator has been recommended to be a person in the research cadre who has a specific interest in secondary fracture prevention. The coordinator has to make sure that all eligible patients are registered in the program and should also facilitate communication within the team. The FLS program coordinator is expected to identify patients by reviewing inpatient census, emergency department discharges and outpatient records. The coordinator may be the initial point of contact for the program providing educational material like handouts as well as scheduling time with the FLS nurse manager. It is imperative that all patients at a potential risk for a secondary fracture be enrolled in the program and it is critical for the FLS coordinator to ensure this. Electronic health records and databases can tag these patients on the basis of diagnostic or procedure codes. Specialty built, osteoporosis specific templates and order sets help to capture data relating to patients with insufficiency fractures.

The nurse manager should be in the nurse practitioner, advance practice nurse or physician assistant cadre, depending on the jurisdiction, who has or will develop a specific interest in secondary fracture prevention. The nurse manager should be skilful enough to motivate patients to enroll in the program and enable patient's family support as well to continue to participate in the program. This practitioner should also be aware of the current osteoporosis treatment guidelines and algorithms. For enhancing outcomes, the nurse manager should liaise with other specialty services in the hospital such as physiotherapy for gait training and fall prevention, primary care, internal medicine, endocrinology, nutrition services, neurosurgery and radiology. The nurse manager should work closely with the Orthopaedic Surgeon physician champion and should remain current with national quality measures and guidelines. The nurse manager should provide osteoporosis education as well as medication administration advice. Working with the FLS coordinator, the nurse manager should ensure that the registered patients get appropriate outpatient referrals. The office location for the nurse manager and FLS program coordinator should be in the outpatient setting to facilitate patient access and compliance as well as to support the clinical care team. A standardized order set for laboratory tests utilizing best practice guidelines ensures cost-effective ordering.

After patients have been enrolled one needs to proceed to diagnose osteoporosis. The nurse manager should refer patients for a DEXA scan via a standardized order set or by the treating Orthopaedic Surgeon in collaboration with the FLS program coordinator. Some programs recommend that patients with a low energy hip fracture or an insufficiency vertebral fracture over the age 50 to be assumed to have osteoporosis. (60) Once the diagnosis of osteoporosis is established, the nurse practitioner or the Orthopaedic Surgeon need to instruct patients and their families with regards to osteoporosis care guidelines. Thereafter osteoporosis medications need to be started based on the patient's medical history. Follow up care including physiotherapy and adherence to treatment is to be confirmed by the FLS coordinator and the nurse manager. The FLS coordinator would also ensure and document

universal osteoporosis nutritional and lifestyle recommendations and engage services to help with fall prevention and balance training. Falls in the elderly are usually the result of many pathophysiological processes associated with aging and fragility, including impaired neuromuscular and visual functions, as well as environmental factors in the home such as loose rugs, clutter, slippery floors/roads and other hazards. Poor performance on different gait assessments, using sedative hypnotics and difficulty rising from a chair are among the physical traits of individuals at risk for recurrent falls. Identifying and treating these at risk persons prone to falls can substantially improve the long term outcome for these patients.

To make the FLS program successful, one has to create local and community awareness. Local and regional press releases, webinars and presentations at local and regional meetings should be carried out to alert the surrounding community. Internal awareness is equally important and should be carried out by hospital wide announcements, physician champion presentations at departmental meetings and conferences whereas the nursing manager / FLS coordinator should present at staff and nursing education sessions to discuss how the FLS program interfaces with various patient categories catered for by the hospital. Networking should start with referrals within the musculoskeletal service line providers and eventually expanding to other service lines. Close liaisons with pain management services, physiotherapy for rehabilitation and fall prevention is important to ensure that patients receive holistic care. At the outset, a new program could start with a focus on low energy hip fractures. Once the program is up and running, one can then expand to include all low energy fractures in patients greater than forty nine years old. (70) (71) (72) Defining outcomes for the FLS is important not only from a funding standpoint but also as a quality variable. To show a fracture reduction in future years, would be difficult in small populations over a short time frame. From a quality perspective an important and valid outcome is to show that the treatment evidence base is applied to clinical practice. (60)

Obstacles and Solutions in establishing a Fracture Liaison Service

To benefit fragility fracture patients there are potential barriers at several stages that have to be taken care of for the program to run successfully. Impediments in successfully initiating and running a FLS include 'turf battles' by specialty physicians over patient ownership, apprehension of lost earnings for individual physicians as well as institutions. At the hospital level, there may be reservations regarding the salary of the FLS coordinator, nurse manager as well as infrastructure setup for the program as to how these costs could be accounted for as well as the long term sustainability of the program. Miller AN et al (63) recommended that startup cost of FLS could be provided by the hospital as a quality initiative. This would enable embedding the FLS permanently within a wider service infrastructure.

Once the program has started, then for maintaining the program one has to manage staff turnover, particularly in teaching hospitals where residents and fellows are on short rotations. Having a dedicated FLS coordinator can develop protocols and liaise with these teams to ensure compliance. Process for the treatment of osteoporosis would have to be contingent on the patient's condition. If a patient with a hip fracture is too sick or has multiple comorbidities, then the FLS program should offer the flexibility to follow this process on an outpatient basis starting with the first outpatient visit for wound check / suture removal, once the patient is more medically stable. It is also important to involve family members in this process to ensure maximum chances of success in preventing the second fracture. Attempts to render these services remotely via follow-up telephone calls are not productive. There would be patients who pose a treatment dilemma for osteoporosis such as those with advanced dementia or those with malignancies. To prevent variations in the FLS program, one should standardize these potential exceptions that can be anticipated. (60)

Key elements of the hospital based FLS program have been listed in Table 1. The FLS process should be initiated by the identification of the patient with a fragility fracture in the emergency room or during hospitalization by the FLS coordinator / nurse manager. All patients over forty nine years of age should be included. One would have to ensure that for inpatients a bone density scan is done prior to discharge. Preliminary education including handouts / pamphlets / computer based learning or videos should be provided during the inpatient admission. In case the patient is not admitted, then the education should be completed in the outpatient settings. At the first outpatient orthopaedic visit, the FLS referral should be confirmed and the Orthopaedic surgeon should emphasize the importance of the FLS program and the potential risk of a subsequent fracture. (6) (73) (74) (75) (76) (77) (78) (79) (80) This would catch the attention of the patient and family and help them understand the results of non-compliance with the program. FLS evaluation should continue to proceed at follow-up visits.

Documentation of the program is essential to support the current program as well as to ensure its future growth. The hospital's electronic health record should provide robust data. Data should be reported quarterly to include number of referrals compared to the number of eligible patients, appointment no-show rate, treatment compliance, and rates of secondary fracture and mortality in order to plan optimal utilization as well as future expansion of the program. Patient lists generated by residents, nursing staff and hospital census can be used to identify FLS patients. Hospitals implementing the FLS can also access benchmarking capabilities to document both attainment of the standard of care and improved value in care. (81) (82)

Summary

Insufficiency fracture care requires more than surgery to ensure rapid and strong union with diminished chance of future fractures. The FLS program provides an opportunity to treat osteoporosis from a public health perspective rather than leaving this to the whims of individual physicians. This is achieved by providing a seamless integration of care by health care providers, nursing staff and administration. The FLS can be adapted to any model of care including academic health systems. FLS provides a holistic approach to identify patients as well as to provide evidence-based interventions to prevent subsequent fractures. The long term goal is that internationally FLS will result in decreased fracture-related morbidity, mortality and overall health care expenditure.

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Table 1: Key elements of a hospital based FLS program

• Identify insufficiency fracture patient
• Enroll patient in the program
• Obtain previous Vitamin D / DEXA results / osteoporosis treatment data
• Arrange physiotherapy Falls prevention Rehabilitation
• Recommend pharmacologic treatment based on DEXA scan results.
• Follow up Treatment compliance Second fracture reduction rate

Highlights

- In the aging population worldwide, osteoporosis is a major cause of long-term morbidity.
- After a vertebral fracture, the risk of any another fracture increases 200% and that of a subsequent hip fracture increases 300%.
- Fracture Liaison Service (FLS) program provides an opportunity to treat osteoporosis from a public health perspective.
- FLS leads to decrease in fracture-related morbidity, mortality and overall health care expenditure.
- For starting a FLS program, the nucleus is based on a physician champion, a FLS coordinator, and a nurse manager
- FLS provides a seamless integration of care by health care providers, nursing staff and administration.