

A Multi-disciplinary Referral Pathway for Improving Secondary Fracture Prevention Post-vertebroplasty: Implementation of a Fracture Liaison Service

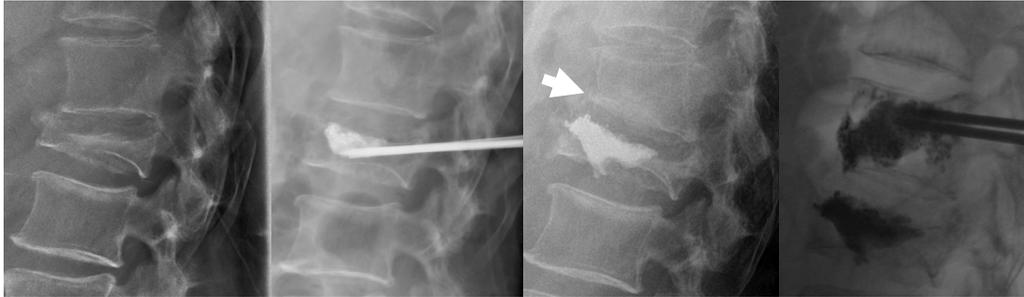
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Background: Secondary Fractures After Vertebroplasty



- Patients with vertebral compression fractures (VCFs) are at high risk for secondary fracture following vertebroplasty.¹
- Osteoporosis treatment may reduce risk of secondary fracture by 30%.^{2,3}
- Many post-vertebroplasty patients do not receive best practice osteoporosis care.¹
- Primary care providers may not have the bandwidth to treat osteoporosis and referral times to bone density clinics may be long.

Problem: How can radiologists reliably refer VCF patients for osteoporosis care after vertebroplasty?

- The *Own the Bone*[®] program, from the American Orthopaedic Association, uses a Fracture Liaison Service (FLS) to evaluate and treat fragility fracture patients.^{1,2}
- Patients treated by FLS:
 - Risk factor evaluation (DEXA, Vitamin D)
 - Improve nutrition, reduce fall risk, counseling
 - Optimize medical management
 - Follow patients for one year and then turn care over to PCP once regimen stabilized



Opportunity: Can radiologists partner with orthopedics to refer vertebroplasty patients for FLS treatment?

1. Anderson PA, Hare K, Truumees E. Secondary fracture prevention in spine surgery. In: *Seminars in Spine Surgery*. Elsevier; 2017
2. Nakayama A, Major G, Holliday E, Attia J, Bogduk N. Evidence of effectiveness of a fracture liaison service to reduce the re-fracture rate. *Osteoporos Int*. 2016;27(3):873-879. doi:10.1007/s00198-015-3443-0
3. Bunta AD, Edwards BJ, Macaulay Jr. WB, et al. Own the Bone, a System-Based Intervention, Improves Osteoporosis Care After Fragility Fractures. *J Bone Jt Surg Am*. 2016;98(24):e109. doi:10.2106/JBJS.15.01494

Objective:

To evaluate the effectiveness of a Fracture Liaison Service (FLS) referral program in improving osteoporosis treatment for patients after vertebroplasty:

- Are more patients treated for osteoporosis after vertebroplasty?
- Is quality of osteoporosis treatment better?
- Is the rate of secondary fracture reduced?

Methods:

- Referral program: Vertebroplasty patients were seen in clinic by radiologist prior to procedure, a referral to the FLS provider was placed at that time starting Dec. 1, 2016.
- Data collection: Retrospective chart review of consecutive vertebroplasty patients from January 2016 to January 2020.
- Statistical analysis:
 - **Demographics**: Patient age, gender, # and level of fracture(s)
 - **FLS referral success**:
 - Proportion of patients referred to FLS, % referred who were seen in clinic, % seen in clinic whose treatment was modified
 - Comparing success of “opt-in” strategy (no referral unless requested by radiologist) and “opt-out” strategy (referral placed by nurse coordinator unless radiologist requests otherwise)
 - **Pre-FLS vs Post-FLS**:
 - Proportion of patients receiving evaluation with DEXA and vitamin D level within 3 months pre- or post-vertebroplasty
 - Rate of secondary spinal fractures using time to event analysis

Results: Patient Demographics and Fracture Characteristics

Item	N (%)
Gender:	
Female	83 (61.0%)
Male	54 (39.0%)
Level treated at index vertebroplasty:	
Lumbar	65 (47.5%)
Thoracic	53 (38.7%)
Lumbar & Thoracic	15 (11.0%)
Sacral	4 (2.9%)
Secondary spinal fractures¹	18 (13.1%)
Occurring in <60 days	13 (9.5%)
Occurring in >60 days	19 (13.9%)

Table 1. Study Patient Characteristics (n=137)

¹Fractures occurring in <60 days were classified as unavoidable and excluded from subsequent time to event analysis as osteoporosis treatment will not have taken effect within this time frame

Results: Referral Rates and Strategies

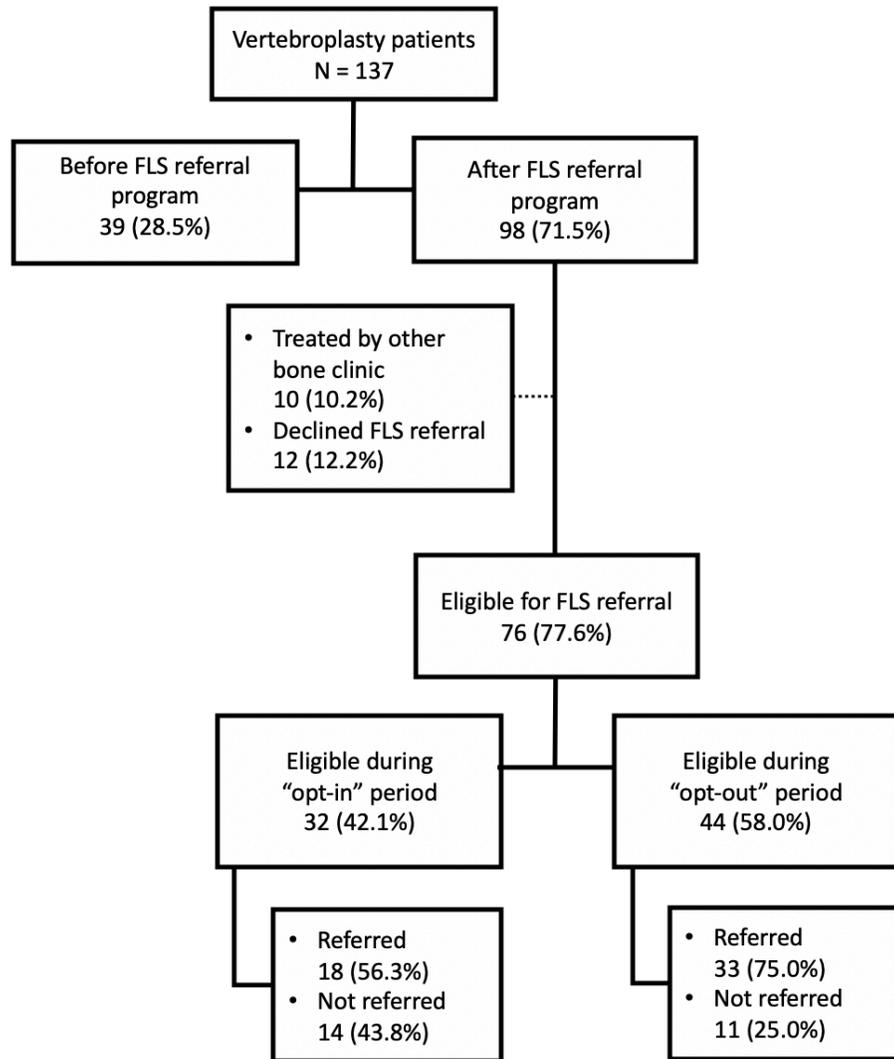


Fig 1. Overview of study patient workflow

Referral rates and impact on treatment

- Only 10% of patients were already being treated adequately for osteoporosis
- The “opt-out” referral strategy was more effective with a 75.0% referral rate vs. 56.3% for “opt-in” (p=0.71)
- Overall referral rate for all eligible patients was 67%
- Of those referred, 73% kept their appointments and were evaluated by the FLS provider in clinic
- Of those evaluated in clinic, 73.0% had their osteoporosis treatment modified

Results: Quality of Osteoporosis Treatment

Proportion of patients with vitamin D level and/or DEXA scan obtained within 3 months of their vertebroplasty

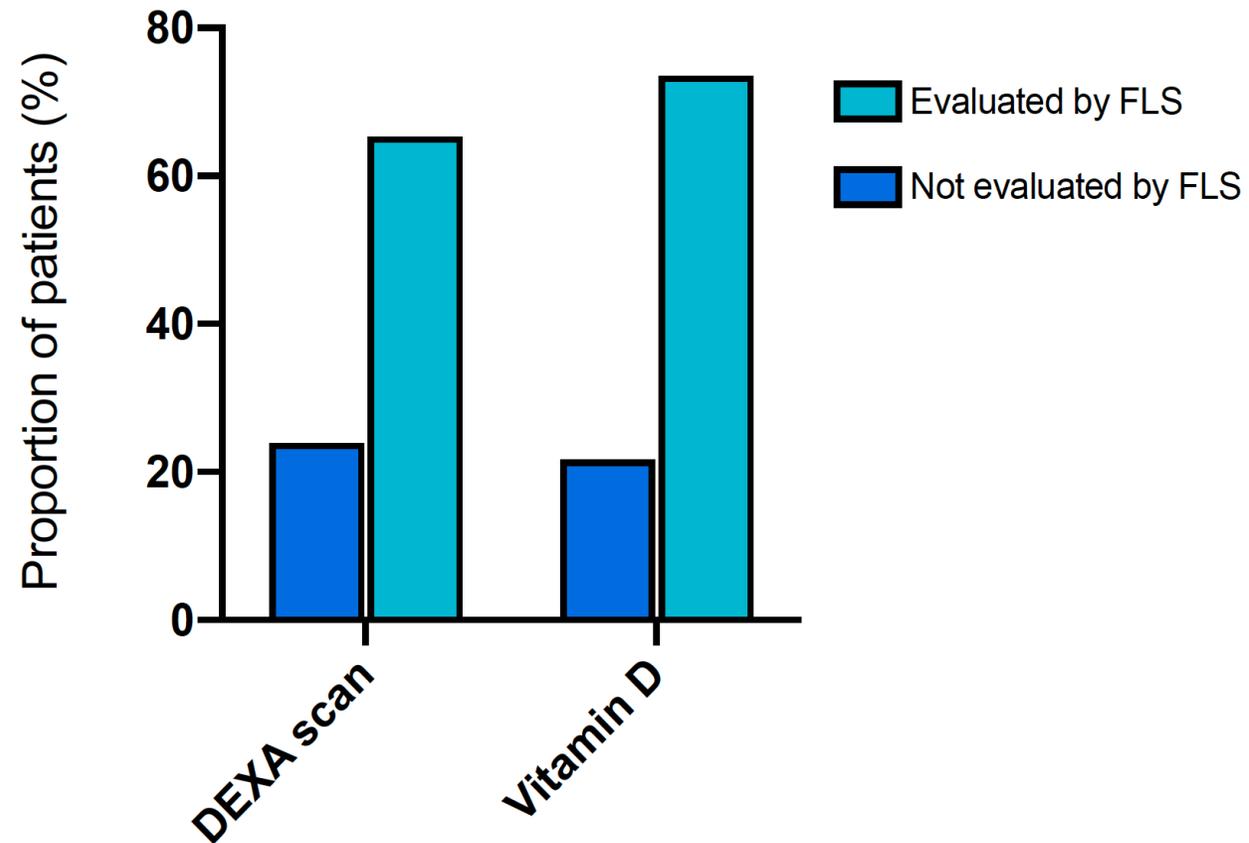


Fig 2 Patients who were evaluated by the FLS were significantly more likely to have a DEXA scan and/or a vitamin D level drawn in the 3 months prior to or following their vertebroplasty ($p < 0.001$ for both)

Results: Probability of Secondary Spinal Fracture

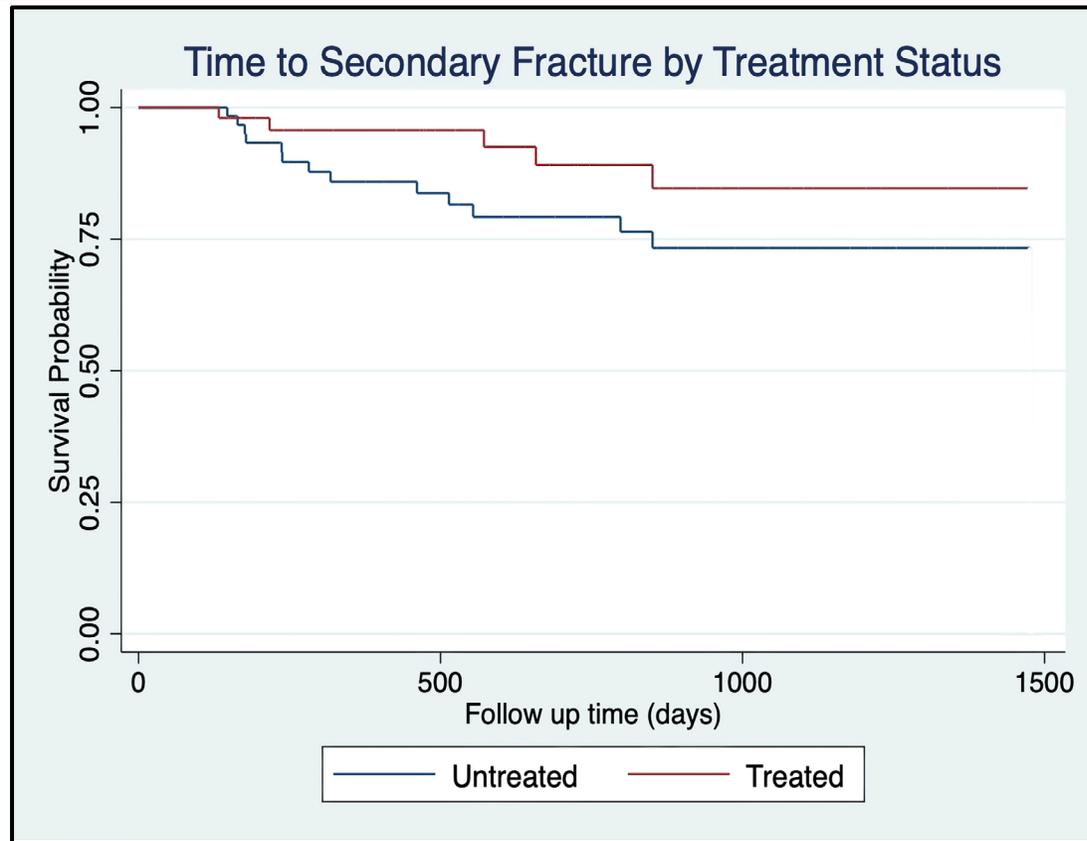


Fig 3. Kaplan-Meier survival curve for time to secondary fracture following vertebroplasty for patients treated and untreated for osteoporosis.

Characteristic	Unadjusted Model HR (95% CI)	Adjusted Model* HR (95% CI)
FLS Clinic Treatment	0.41 (0.14-1.15)	0.38 (0.13-1.11)
Age	0.97 (0.93-1.02)	0.98 (0.94-1.02)
Gender		
Female	Reference	
Male	0.95 (0.37-2.47)	0.72 (0.27-1.93)
Number of Levels Treated		
Single Level	Reference	
Multiple Levels	1.17 (0.42-3.27)	0.78 (0.19-3.2)
Index Fracture Site		
Lumbar	Reference	
Thoracic	0.83 (0.31-2.24)	0.82 (0.29-2.30)
Lumbar and Thoracic	1.93 (0.52-7.23)	2.8 (0.47-17.29)
Sacral [†]	1.18	6.23

Table 2. Multivariate Cox regression analysis for time to secondary fracture post-vertebroplasty

*Adjusted model included age, sex, number (#) of vertebral levels treated, and vertebral level treated

[†]Count less than 5 for sacral secondary fractures

Discussion: Impact of Radiologists on Fracture Prevention

- Vertebroplasty patients are at high risk for secondary spinal fractures and radiologists have an opportunity to impact their care beyond performing vertebroplasty
- Recommending referral for osteoporosis treatment in a chart note is inadequate to ensure patients will be treated. A concrete referral pathway is needed. The majority of patients in our study were not already being treated for osteoporosis and prior to the FLS referral program did not have their treatment optimized after vertebroplasty.
- The FLS program from the American Orthopedic Association provides a framework to refer patients at high risk for secondary fracture for treatment.
- Our study identified a strong trend towards decreased fractures with appropriate osteoporosis treatment and this is supported by the FIT and FREEDOM trials demonstrated a 44% and 68% reduction in radiographic vertebral fractures with appropriate osteoporosis treatment.^{4,5}
- Limitations: Single institution retrospective study, potential for selection bias during “opt-in” referral strategy period, potential for losing patients to follow up

4. Cummings SR, Black DM, Thompson DE, et al. Effect of alendronate on risk of fracture in women with low bone density but without vertebral fractures. Results from the fracture intervention trial. *J Am Med Assoc.* 1998;280(24):2077-2082

5. Cummings SR, Martin JS, McClung MR, et al. Denosumab for prevention of fractures in postmenopausal women with osteoporosis. *Obstet Gynecol Surv.* 2009;64(12):805-807. doi:10.1097/01.ogx.0000363236.41902.96

Conclusion



A formal referral program using the framework of the American Orthopedic Association Fracture Liaison Service provides an opportunity for radiologists to improve secondary fracture prevention care for their vertebroplasty patients.

Thank You!



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