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## Discharge Disposition Following Vertebroplasty

**BACKGROUND AND PURPOSE:** A variety of factors, such as pain level at rest and with activity, have been used to assess outcome of the VP procedure. However, few studies have assessed discharge disposition as a reflection of VP efficacy in the inpatient population. The purpose of this study was to compare patient disposition status before and after VP and determine what relationship exists between the treatment and patient discharge status.

**MATERIALS AND METHODS:** We performed a retrospective review of inpatients who underwent consultation for consideration of spinal augmentation for treatment of painful vertebral compression fractures. We gathered data concerning patients' demographics, living arrangements before hospitalization, discharge disposition, quantitative and qualitative pain levels, and length of hospital stay before and following VP.

**RESULTS:** Ninety inpatients underwent VP, 73 (81%) of whom lived independently at home before hospitalization. Of these 73 patients, 31 (42%) returned home after discharge, 9 (12%) returned home with home health care assistance, and 32 (44%) were sent to skilled nursing facilities. Six (7%) of the 90 patients resided in assisted-living centers before hospitalization; all of these patients were discharged to assisted-living or skilled nursing facilities. Eight (9%) of the 90 patients resided at skilled nursing centers before hospitalization, and all returned to nursing centers after their hospital stay. Discharge disposition was not significantly associated with preoperative pain levels at rest or with activity ( $P = .76$  and  $P = .23$ , respectively) or with postoperative pain levels at rest or with activity ( $P = .08$  and  $P = .25$ , respectively).

**CONCLUSIONS:** This study demonstrates that patients undergoing VP as inpatients are often discharged to rehabilitation centers rather than home, irrespective of their status before hospitalization or their pre- and postoperative pain levels.

**ABBREVIATIONS:** NIS = National Inpatient Sample; VP = vertebroplasty

Percutaneous VP is used to alleviate back pain that is associated with vertebral compression fractures and has been shown to provide nearly immediate pain relief in patients with vertebral fractures that are caused by osteoporosis and multiple myeloma.<sup>1-4</sup> Initially limited to patients who failed a trial of conservative management, some investigators now promote early intervention with VP, especially among patients who require hospital admission for pain management. While there is a substantial amount of data available concerning spinal augmentation and pain relief, there exists surprisingly little data<sup>5,6</sup> regarding the disposition status immediately following hospital discharge for these patients. Improved understanding of hospital discharge disposition among patients treated with VP would add important data about the efficacy of the procedure.

The aim of this study was to determine discharge disposition for inpatients treated with VP for painful vertebral compression fractures and to compare discharge disposition with pre-morbid status.

### Materials and Methods

We performed a retrospective chart review of inpatients who were referred for consultation to our spinal augmentation practice between January 1999 and January 2010. The study was approved by the local institutional review board before its initiation. Some of the patient data collected in this study have been included in previous projects

completed at this institution<sup>3,7</sup>; however, this patient cohort has never been studied in regard to VP and discharge disposition. Data concerning patient demographics, hospitalization, and procedural details were collected from electronic medical records. Pain levels were measured on a scale of 0–10, with 0 being no pain and 10 being the worst pain.

Logistic regression analysis was used to determine if there was any association between preoperative and postoperative pain severity and the location of discharge. Discharge location was dependent, while preprocedural and postprocedural pain levels (at rest and with activity) were independent variables.

### Results

We identified 112 patients who underwent consultation for spinal augmentation while admitted to the hospital for pain palliation. Of these patients, 90 (80%) were treated with VP, 1 (1%) was treated with kyphoplasty, and 21 (19%) did not undergo the procedure. Patients who did not undergo spinal augmentation did not receive the treatment for the following reasons: lack of localizing symptoms ( $n = 5$ ), current urinary tract infection ( $n = 5$ ), potential for the procedure to worsen the patient's condition ( $n = 3$ ), conservative management thought to be superior to VP/kyphoplasty ( $n = 3$ ), fracture violation of the vertebral endplate ( $n = 1$ ), inability to properly visualize the patient's spinal column ( $n = 1$ ), alternative surgical procedure performed ( $n = 1$ ), medical instability ( $n = 1$ ), and significant trauma to the back ( $n = 1$ ).

The median age of those treated with VP was  $78 \pm 13.3$  years of age. Sixty-eight (75%) of the 91 patients were women. Eighty-one (89%) of the patients treated had osteoporotic ver-

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tebral fractures; 10 (11%) patients had fractures that were attributed to neoplasm. Procedural complications occurred in 3 (3%) patients. Complications consisted of a small hematoma at the site of needle incision, which was stabilized with manual compression; endplate extravasation of cement superior to the site of injection; and cement pulmonary embolism.

Among 90 inpatients treated with VP, 73 (81%) had been living independently at home before hospitalization, 3 (3%) had been living at home with home health care, 6 (7%) had been in assisted-living centers, and 8 (9%) had been living in skilled nursing centers. Among the 73 patients previously living independently at home, 31 (42%) returned directly back to their home following discharge, 9 (12%) returned home with home health care, 1 (1%) was discharged to an assisted-living center, and 32 (44%) were discharged to a skilled nursing center. Of the 3 patients who originally resided at home and utilized home health care services, 1 patient returned home and continued with home health care assistance after hospitalization, and 2 patients were discharged to skilled nursing facilities. Four of the 6 patients previously in assisted-living centers were discharged to nursing homes, while 2 patients returned to assisted-living centers. The 8 patients who resided at skilled nursing centers before hospitalization returned to nursing centers after their hospital stay. Information concerning the length of hospital stay is shown in Table 1.

Table 2 shows qualitative information concerning patients' levels of back pain at the time of admission in comparison with their back pain at the time of discharge. Unfortunately, only approximately one-half of patient charts provided discharge pain severity data. In general, most patients had equivalent or improved levels of back pain at the time of discharge, regardless of their discharge disposition.

Figure 1 displays patients' discharge disposition and average level of pain pre-VP and post-VP, at rest and with activity. Regression analysis showed no significant association between discharge disposition and preoperative pain severity either at rest ( $P = .76$ ) or with activity ( $P = .23$ ). Also, there was no significant relationship between discharge disposition and postoperative pain severity either at rest ( $P = .08$ ) or with activity ( $P = .25$ ).

## Discussion

In this relatively small retrospective study of inpatients undergoing VP, we demonstrated that at discharge, many patients were admitted to rehabilitation facilities. This trend applied even to patients who had been living independently at home before hospital admission. These data suggest that rehabilitation is often required even for patients who had good outcomes, in the form of reduced back pain immediately following VP. While patients may have relief from their initial back pain, it is probable that other factors, such as overall health and mental status, play significant roles in the likelihood of being discharged to a rehabilitation facility. However, our results should highlight, for treating physicians, the finding that the simple performance of a VP does not immediately result in a return to premorbid activity and abilities and that ongoing care and rehabilitation should be optimized.

A previous work used the NIS to study trends regarding

**Table 1: Median length of hospital stay (in days) before and after VP**

Discharge Disposition	Before	After
Home ( $n = 31$ )	3	2
Home with home health care assistance ( $n = 10$ )	2.5	2
Assisted-living center ( $n = 3$ )	3	4
Skilled nursing facility ( $n = 46$ )	4	3

**Table 2: Number of patients with the specified qualitative pain levels at the time of discharge in comparison with pain levels on hospital admission**

Discharge Disposition	Much Worse	Somewhat Worse	Somewhat Same	Much Better	Completely Resolved
Home ( $n = 31$ total)			1	9	4
Home with home health care assistance ( $n = 10$ total)			3	1	1
Assisted-living center ( $n = 3$ total)				1	
Skilled nursing facility ( $n = 46$ total)	1	4		18	4

disposition of inpatients following VP. Approximately one half of the patients in that study were discharged to home, while the other half of patients were discharged either to a nursing center or a rehabilitation facility.<sup>5</sup> Our current findings support those reported in that previous study and extend that work by shedding further light on the living arrangements before treatment of patients undergoing VP, which the NIS cannot provide.

Our study has several limitations. Analysis of patient pain levels in relation to discharge disposition was hampered by unavailable data—approximately half of patients had qualitative pain information charted. While patients in this study were admitted to the hospital with the primary diagnosis of vertebral compression fractures, there may have been confounding health factors that warranted a rehabilitation facility placement after hospital discharge. To determine if vertebral insufficiency and VP are solely affecting discharge disposition, one would have to control for other comorbidities that may lead to placement into a nursing facility. In addition, there are other factors that can influence patient posthospital disposition, such as finances and family circumstances. Because discharge disposition is being analyzed, we are only considering the patient state immediately after discharge and cannot comment on patient location and functional state weeks to months after the VP was performed. In the future, completing a study that analyzes the 6-month and 1-year residences of patients who underwent VP would allow us to analyze disposition status on a long-term basis.

## Conclusions

We have demonstrated that inpatients who are treated with VP may or may not maintain the level of functioning that they

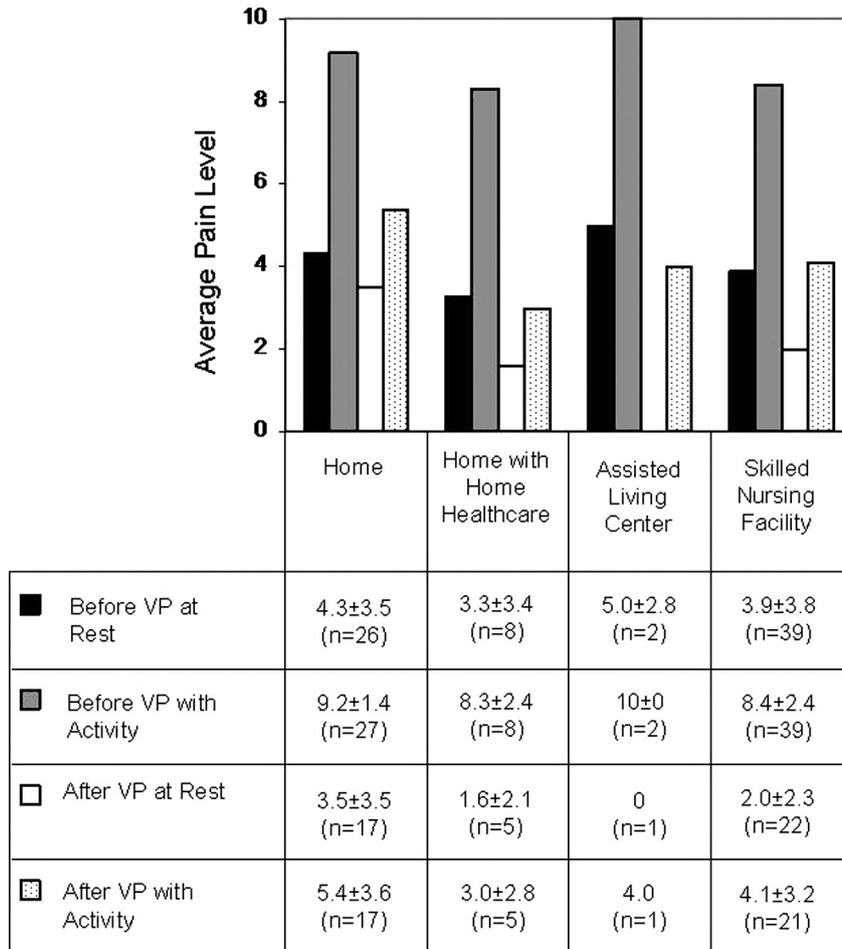


Fig 1. Average pain levels (mean ± SD) preprocedure and postprocedure (0–10).

had before hospital admission because their discharge disposition is equally likely to be to an institution for on-going rehabilitation as to their original location. These findings suggest that simple care of fracture-related back pain may fail to encompass the complex medical and nursing requirements for elderly patients with osteoporosis.

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