

## **Empiric High-Dose Vitamin D Therapy in Orthopaedic Trauma: An Analysis of Safety and Cost-Effectiveness**

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**Purpose:** Among the orthopaedic literature, vitamin D deficiency is recognized as a well-established risk factor for fracture and maladaptive bone healing. While the optimal level of serum vitamin D is controversial, a number of recent studies report vitamin D deficiency in over 80% of orthopaedic trauma patients. Coinciding with a global increase in testing for vitamin D deficiency, and subsequent increase in vitamin D supplementation, health-care payers have grown increasingly apprehensive to reimburse for routine vitamin D testing. Here we present an analysis of vitamin D levels among a cohort of outpatient orthopaedic trauma patients referred from a Level-I trauma center in the Northeast US. The purpose of this study is to determine the cost-effectiveness of testing for vitamin D deficiency in this population versus empiric vitamin D supplementation at a dosage of 100,000 IU weekly for 8 weeks.

**Methods:** We performed a retrospective chart review of 115 patients over the age of 18 years, presenting to an outpatient orthopaedic trauma office for an initial visit following an operative fracture from 2018-2019. 25(OH) vitamin D levels, as well as basic laboratory evaluation obtained at presentation, were analyzed to establish the incidence of vitamin D deficiency in our population. Patient demographic information including age, comorbidities, body mass index (BMI), American Society of Anesthesiologists (ASA) class, and fracture type and location were recorded. Patients on vitamin D therapy at the time of fracture were strictly excluded. A normal vitamin D level of 32-80 ng/mL was used to define deficiency. A cost analysis was conducted using publicly available Medicare testing cost and reimbursement data.

**Results:** The mean age of study participants was  $55.2 \pm 21.1$  years with a range of 19-101 years. 101 of 115 patients (87.8%) were found to be deficient in 25(OH) Vitamin D. Mean 25 (OH) vitamin D among those deficient was  $22.3 \pm 9.7$  ng/mL whereas that of patients with vitamin D levels in the normal range was  $44.3 \pm 14.1$  ng/mL ( $P < 0.5$ ). No patients were found to have hypervitaminosis D. Analysis of vitamin D-deficient patients revealed that combined testing and supplementation was associated with a cost of \$6956.88 USD (\$68.88 per person), compared to empiric total population vitamin D supplementation, which was associated with a total cost of \$2171.20 (\$18.88 per person) ( $P < 0.001$ ). There were no adverse events among any patients associated with vitamin D supplementation.

**Conclusion:** A high incidence of vitamin D deficiency exists among orthopaedic trauma patients across all age groups. Empiric high-dose vitamin D therapy is not only safe and well tolerated in this population, but is also associated with a 360% reduction in cost when compared to individualized 25 (OH) vitamin D level testing and supplementation.