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# Preoperative Vitamin D Repletion in Total Knee Arthroplasty: A Cost-Effectiveness Model

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## Abstract

**Background:** Recent studies have identified vitamin D deficiency (serum 25-hydroxyvitamin D [25(OH)D] < 20 ng/L) as a potentially modifiable risk factor for prosthetic joint infection (PJI) in arthroplasty. The purpose of this study is to determine whether implementation of preoperative 25(OH)D repletion is cost-effective for reducing PJI following total knee arthroplasty (TKA).

**Methods:** A cost estimation predictive model was generated to determine the utility of both selective and nonselective 25(OH)D repletion in primary TKA to prevent PJI. Input data on the incidence of 25(OH)D deficiency, relative complication rates, and costs of serum 25(OH)D repletion and 2-stage revision for PJI were derived from previously published literature identified using systematic review and publicly available data from Medicare reimbursement schedules. Mean, lower, and upper bounds of 1-year cost savings were computed for nonselective and selective repletion relative to no repletion.

**Results:** Selective preoperative 25(OH)D screening and repletion were projected to result in \$1,504,857 (range, \$215,084-\$4,256,388) in cost savings per 10,000 cases. Nonselective 25(OH)D repletion was projected to result in \$1,906,077 (range, \$616,304-\$4,657,608) in cost savings per 10,000 cases. With univariate adjustment, nonselective repletion is projected to be cost-effective in scenarios where revision for PJI costs  $\geq$ \$10,636, incidence of deficiency is  $\geq$ 1.1%, and when repletion has a relative risk reduction  $\geq$ 4.2%.

**Conclusion:** This predictive model supports the potential role of 25(OH)D repletion as a cost-effective mechanism of reducing PJI risk in TKA. Given the low cost of 25(OH)D repletion relative to serum laboratory testing, nonselective repletion appears to be more cost-effective than selective repletion. Further prospective investigation to assess this modifiable risk factor is warranted.

**Keywords:** arthroplasty; cost-effectiveness; metabolism; periprosthetic joint infection; vitamin D.