

Correcting Vitamin D Deficiency to Prevent Paclitaxel-Induced Peripheral Neuropathy: A Practice Change Evaluation

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BACKGROUND: Chemotherapy-induced peripheral neuropathy (CIPN) is a persistent problem in ambulatory oncology and is associated with low serum vitamin D levels.

OBJECTIVES: This quality improvement project evaluated a practice change at a rural community cancer center (preimplementation: N = 20; postimplementation: N = 27) aimed at mitigating CIPN associated with paclitaxel treatment in patients with breast cancer by recommending vitamin D supplementation. The key goal was to reduce CIPN incidence by at least 10%.

METHODS: A pre-/postimplementation comparison of CIPN incidence among patients with breast cancer receiving paclitaxel was used before (January 2022 to December 2023) and after (June 2024 to December 2024) a practice change recommending vitamin D supplementation.

FINDINGS: CIPN incidence decreased from 80% (n = 16 of 20) preimplementation to 67% (n = 18 of 27) postimplementation, a 13% reduction that met the 10% goal. All patients with vitamin D insufficiency (N = 11) developed CIPN.

KEYWORDS

chemotherapy-induced peripheral neuropathy; vitamin D; paclitaxel

DIGITAL OBJECT IDENTIFIER

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CHEMOTHERAPY-INDUCED PERIPHERAL NEUROPATHY (CIPN) in the ambulatory oncology setting is a persistent problem associated with low serum vitamin D levels. CIPN occurs when cancer treatment drugs damage the peripheral nervous system, altering sensations in the skin, muscles, and joints, resulting in pain and difficulty with fine motor skills that interfere with everyday life.

Paclitaxel, a taxane chemotherapy, disrupts microtubule function and blocks cancer cell division (Mylan Institutional, 2016). CIPN from paclitaxel affects as many as 70% of treated patients (Molassiotis et al., 2019), with 30% experiencing severe symptoms (Seidman et al., 2008). CIPN is a dose-limiting toxicity leading to treatment reduction, reduced efficacy, and decreased survival (Jennaro et al., 2020). Long-term CIPN diminishes quality of life and increases healthcare burden (Simon et al., 2017).

Background

Nursing interventions such as cryotherapy have been evaluated to prevent CIPN, but their effectiveness remains inconclusive (Ford et al., 2024). American Society of Clinical Oncology guidelines provide no CIPN prevention recommendations (Loprinzi et al., 2020). Evidence indicates a strong association between vitamin D insufficiency and increased CIPN incidence (Chen et al., 2023), suggesting that correcting vitamin D levels before paclitaxel may be a neuroprotective, low-cost strategy. Lixian et al. (2024) reported that individuals with vitamin D deficiency have more than six times higher odds (odds ratio = 6.214, 95% confidence interval [2.308, 16.729]) of developing CIPN compared to those without this deficiency. Compared with other risk factors such as anemia, hypertension, and age, vitamin D deficiency appears to be among the more influential factors (Lixian et al., 2024).

It is standard practice to correct vitamin D deficiency or insufficiency in general clinical practice by recommending and prescribing vitamin D supplementation (Pludowski et al., 2022). Serum 25-hydroxyvitamin D (25[OH]D), representing the combined concentration of 25(OH)D₂ and 25(OH)D₃, is recognized as the standard biomarker for assessing vitamin D status (Giustina et al., 2024). Internationally endorsed clinical guidelines recommend maintaining 25(OH)D levels within the range of 50–75 nmol/L (20–30