

Balance and Gait Impairment

Sensor-based assessment for patients with peripheral neuropathy

Grace Campbell, PhD, MSW, RN, CRRN, and Marjorie A. Skubic, PhD



BACKGROUND: Individuals with peripheral neuropathy (PN) frequently experience balance and gait impairments that can lead to poor physical function, falls, and injury. Nurses are aware that patients with cancer experience balance and gait impairments but are unsure of optimal assessment and management strategies.

OBJECTIVES: This article reviews options for balance and gait assessment for patients diagnosed with cancer experiencing PN, describes advantages and limitations of the various options, and highlights innovative, clinically feasible technologies to improve clinical assessment and management.

METHODS: The literature was reviewed to identify and assess the gold standard quantitative measures for assessing balance and gait.

FINDINGS: Gold standard quantitative measures are burdensome for patients and not often used in clinical practice. Sensor-based technologies improve balance and gait assessment options by calculating precise impairment measures during performance of simple clinical tests at the point of care.

KEYWORDS

postural balance; gait; peripheral neuropathy; assessment; financial toxicity

DIGITAL OBJECT IDENTIFIER

10.1188/18.CJON.316-325

INDIVIDUALS WITH PERIPHERAL NEUROPATHY (PN) frequently experience balance and gait impairments, leading to persistent mobility issues, falls, and injury (Campbell, Hagan, Gilbertson-White, Houze, & Donovan, 2016; Tofthagen, Visovsky, & Berry, 2012). PN can result from various etiologies, including diabetes (Morrison, Colberg, Parson, & Vinik, 2014); malignancies, such as multiple myeloma (Leone et al., 2016) and colorectal cancer (Wang et al., 2016); and vitamin deficiencies, toxins, and medications (Staff & Windebank, 2014).

Patients with cancer often experience medication-related PN as a result of neurotoxic chemotherapies. Chemotherapy-induced PN occurs in 68%–80% (Park et al., 2011; Seretny et al., 2014) of individuals receiving platinum agents, taxanes, and bortezomib (Bhatnagar et al., 2014; Verstappen, Heimans, Hoekman, & Postma, 2003). Hallmark signs and symptoms of PN include numbness, tingling, burning pain, and decreased sensation (Smith et al., 2014), starting with the fingers and toes and progressing proximally. In some patients, PN symptoms decrease when treatment stops, but others experience continued worsening of symptoms, known as coasting (Miltenburg & Boogerd, 2014; Park et al., 2011). Reports estimate that chemotherapy-induced PN can persist for six or more months after treatment cessation in as many as 50%–80% of individuals (Bandos et al., 2018; Briani et al., 2014; Majithia et al., 2016). No established treatment exists for chemotherapy-induced PN, but current guidelines suggest that duloxetine may reduce painful symptoms (Hershman et al., 2014).

Balance and gait impairments are common among individuals with PN (Kneis et al., 2016; Miaskowski et al., 2017; Tofthagen, Visovsky, et al., 2012; Visovsky & Daly, 2004; Visovsky, Meyer, Roller, & Poppas, 2008; Winters-Stone et al., 2011), creating an increased risk of falls (Gewandter et al., 2013; Hile, Fitzgerald, & Studenski, 2010; Marshall, Zipp, Battaglia, Moss, & Bryan, 2017; Tofthagen, Overcash, & Kip, 2012). Individuals with PN who have balance and gait impairment are at risk for numerous negative outcomes, including falls and injuries (Chen et al., 2005; Ward, Wong, Moore, & Naeim, 2014), fear of falling, decreased physical activity, deconditioning, and disability (Fletcher, Guthrie, Berg, & Hirdes, 2010; Pautex, Herrmann, & Zulian, 2008). PN-related balance and gait impairments may persist for years after treatment stops (Winters-Stone et al., 2016). Early rehabilitation is key to minimizing long-term functional impairments (Teasell, Bitensky, Salter,