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Research Article

Relationship between Quality of Life and Nurse-led Bedside Symptom Evaluations in Patients with Chemotherapy-induced Peripheral Neuropathy

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SUMMARY

Purpose: This cross-sectional study aimed at determining the relationship between patient-reported quality of life (QOL) and nurse-led bedside evaluations of chemotherapy-induced peripheral neuropathy symptoms.
Methods: One hundred ninety-five patients treated at the oncology clinic at our institution were assessed using Functional Assessment of Cancer Therapy/Gynecologic Oncology Group–Neurotoxicity and nurse-led bedside examinations. The relationship between self-reported QOL and bedside examinations was evaluated using Spearman rank correlations.
Results: Scores of upper and lower extremity muscle strength based on the bedside examinations showed a weak negative correlation with the emotional well-being subscale of Functional Assessment of Cancer Therapy-General. Further, weak negative relationships were present between QOL and the following nurse-reported parameters: vibration perception in the hand, upper extremity muscle strength, touch and vibration perception in the feet, and tendon reflexes.
Conclusion: Collectively, our results indicate that nurse-led bedside evaluation is a noninvasive and useful method for detecting neurotoxicity and evaluating the patient's QOL both during and after treatment.

Introduction

Peripheral neuropathies are among the most frequently occurring and distressing adverse consequences of chemotherapy (Nurgalieva et al., 2010), and can be caused by chemotherapeutic agents such as taxanes, platinum compounds, and vinca alkaloids (Ocean & Vahdat, 2004; Visovsky, 2003). Previous reports have suggested that the incidence of chemotherapy-induced peripheral neuropathy (CIPN) ranges from 10% to 100%, depending on certain patient-specific factors and the specific drugs, doses, schedules, and measurement tools (Hershman et al., 2011; Tofthagen, McMillan, & Kip, 2011).

Although neuropathy affects the patient physically, functionally, and psychosocially (Nielsen & Brant, 2002), CIPN has been relatively neglected by physicians and nurses compared with other chemotherapy side effects. Moreover, physicians and nurses tend to underestimate and underreport the severity and frequency of CIPN symptoms compared to the patient reports, and underestimate the impact of the physical symptoms on the patient's quality of life (QOL) (Shimozuma et al., 2009). Importantly, patients may not acknowledge or report neuropathic symptoms for fear of missing out on an effective cancer treatment (Kaley & Deangelis, 2009).

Since the occurrence of CIPN can result in chemotherapy dose reductions, treatment delays, and treatment discontinuation (Visovsky, Collins, Abbott, Aschenbrenner, & Hart, 2007), CIPN monitoring should be routinely considered in everyday practice. However, useful tools for diagnosing and assessing toxic symptoms and clinical practice guidelines are lacking. Currently, patient-subjective symptoms, neurologic physical examination, nerve conduction velocity, vibration perception threshold, and electromyography are the major methods of measuring CIPN abnormalities in the clinical setting (Hershman et al., 2011). Unfortunately, the symptoms of neuropathies are diverse and patient-specific, making the condition difficult to diagnose accurately (Visovsky & Daly, 2004). Quantitative neurosensory testing results are less subject to recall bias and may play a role in further assessing and evaluating CIPN. However, these methods can be invasive and uncomfortable for patients and generally lack diagnostic value (Shimozuma et al., 2009).

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The total neuropathy score and the reduced versions are comprehensive composite tools used to assess both subjective and objective aspects of peripheral nerve function and have been tested in patients receiving neurotoxic chemotherapy. However, because the inclusion assessment must be performed and interpreted by a neurologist, these instruments are too complex for use by oncology nurses (Lavoie Smith, Cohen, Pett, & Beck, 2011). Nursing staff should be successfully employed in collecting toxicity data after adequate and specific training, as they are often better able to elicit such information from patients than the medical staff and are more accurate in describing any adverse effect of toxicity by grade (Cirillo et al., 2009). Nurses play an important role in the early detection and intervention of neurotoxicity, the success of treatment, and the patient's QOL both during and after treatment. To date, few studies have focused on the validity of bedside assessments by nursing staff for identifying CIPN symptoms.

This study aimed at determining the relationship between nurse-led bedside evaluation of CIPN symptoms and patient-reported QOL.

Methods

Setting and sample

All patients treated with at least one cycle of taxanes and/or platinum compound agents at the inpatient ward of the oncology clinic at Seoul St. Mary's Hospital in South Korea between October 2010 and February 2011 were considered eligible for the current study. Criteria for participants enrolled in the study were more than 18 years old, a histologically confirmed cancer, and a treatment plan that included neurotoxic chemotherapeutic agents or biotherapy. Patients with other comorbid conditions that could potentially cause CIPN, such as diabetes mellitus, cancers of the central nervous system, brain metastasis, uremia, spinal injuries, and alcoholism were excluded.

Potential participants were screened using a simple questionnaire to determine whether they had neuropathic symptoms (numbness, tingling, pain, or impaired sensory function in hands and/or feet, clumsiness in fingers, peripheral muscular weakness, or difficulties in walking). Of the 347 consecutive patients who met the eligibility criteria, 263 patients (76%) reported at least one of the neuropathic symptoms, while 84 patients (24%) did not report any. Of the 263 symptomatic patients, 16 patients refused to participate due to their poor condition. Thus, a total of 247 patients were assessed using the National Cancer Institute Common Toxicity Criteria (NCI CTC version 2) (Postma & Heimans, 2000). Of these 247 patients, 52 patients (21%) had a grade 0 neuropathy, and 195 patients (79%) had grade 1 or higher neuropathy (27% grade 1, 33% grade 2, and 19% grade 3). Patients with grade 1 or higher peripheral neuropathy were enrolled in the study. More detailed information with regard to disease, treatments, QOL, and symptoms was obtained from the 195 patients using questionnaires, medical chart review and a nurse-led bedside examination. Using G*Power 3.1.2 (Faul, Erdfelder, Buchner, & Lang, 2009) for power analysis, the power was .95 for the correlation analysis at a medium effect size of 0.30 and a significance level of .05. The sample size of 195 was satisfactory for identifying relationships between patient-reported QOL and symptoms assessed by nurse-led bedside examination.

The protocol was approved by the Ethics Committee of the Catholic University of Korea, and written informed consent was obtained from all participants before entering the study.

Ethical consideration

The content and the method of this study were approved by the institutional review board of the university.

Measurements

Demographic and clinical characteristics were collected using self-report measures and via medical chart review. QOL was assessed using the Functional Assessment of Cancer Therapy (FACT)/Gynecologic Oncology Group–Neurotoxicity questionnaire (Calhoun et al., 2003; Cella, 1997). The FACT-General (FACT-G), a 27-item self-report questionnaire, comprises subscales assessing physical well-being, social/family well-being, emotional well-being, and functional well-being. The neurotoxicity subscale (11 items) was designed to measure chemotherapy-induced neuropathy (Huang, Brady, Cella, & Fleming, 2007). Scores were calculated according to the Functional Assessment of Chronic Illness Therapy (FACIT) manual, with higher scores reflecting a better QOL. The Cronbach's alpha of internal consistency for FACT/Gynecologic Oncology Group–Neurotoxicity, FACT-G, and the neurotoxicity subscale was .85, .88, and .83, respectively.

Nurse-led bedside examinations were constructed with reference to the total neuropathy score, and included touch and vibration perception in the hands/feet, muscle strength of the upper/lower extremities, and tendon reflexes. All measures were feasible, noninvasive, and widely used in the clinical setting. The nurse-led bedside examinations were conducted by two oncology nurses (clinical experience of $>$ 5 years) trained in peripheral nerve function, CIPN symptoms, and assessment methods. Intra-rater reliability for all measures ranged between .90 and .95. All 7 assessments comprising the nurse-led bedside examinations were evaluated from 0 to 4, with a higher score indicating a worse neuropathy. A score of 0 indicated that the patient had no neuropathy-related impairment and a score of 4 indicated excruciating impairment.

Touch perception was determined based on pinprick perception in the hands and feet using a wooden cotton swab that had been broken to create a sharp tip. The scale was as follows: 0 = *normal*, 1 = *reduced in the fingers or toes*, 2 = *reduced up to the wrist or ankle*, 3 = *reduced up to the elbow or knee*, and 4 = *reduced to above the elbow or knee*.

Vibratory perception was assessed using a 128-Hz tuning fork and established techniques. Specifically, patients were asked to close their eyes while the vibrating tuning fork was systematically and sequentially applied to the dorsum of the interphalangeal joint of the great toe, medial malleolus, the mid-anterior lower leg, the patella, and the mid-anterior upper thigh. Vibratory perception in the fingertips, dorsum of the hand, wrist, forearm, and upper arm was assessed in the same sequential fashion. Patients were asked to describe whether they felt the vibration and/or to report when the vibration ceased. Diminished vibratory sensation was noted if the patient could not feel vibration at all, or if the examiner could feel vibration from the tuning fork for a longer period than the patient did. The vibratory perception scale was the same as that of the touch perception scale.

Muscle strength was assessed using the manual muscle test (Hough, Lieu, & Caldwell, 2011). The examiners screened and assessed muscle strength of the upper extremities (bilateral shoulder abduction, elbow flexion, & wrist extension) and the lower extremities (hip flexion, knee extension, & foot dorsiflexion). Muscle strength for upper/lower extremities was scored using the following scale with the medical research council equivalent enclosed in parentheses: 0 = *normal* (5), 1 = *mild weakness* (4), 2 = *moderate weakness* (3), 3 = *severe weakness* (2), and 4 = *paralysis* (0–1). If the patient would not or could not perform the test for an individual muscle group, no score was recorded, and data were indicated as missing. The muscle with the worse score was used as the strength score (Hough et al.).

Tendon reflexes were assessed using a Babinski reflex hammer. The examiners tested the Achilles tendon reflex. If this tendon

reflex was impaired, other tendon reflexes such as the patellar tendon reflex and those of the upper extremities were tested. Tendon reflexes were scored as follows: 0 = *normal*; 1 = *ankle reflex reduced*; 2 = *ankle reflex absent*; 3 = *ankle reflex absent, others reduced*; and 4 = *all reflexes absent*.

Data analysis

Descriptive analyses are presented for the demographic/clinical characteristics and the percentage of participants reporting sensory neuropathic symptoms. Spearman rank correlation and canonical correlation analysis were used to analyze the patient-reported relationship between QOL and symptoms assessed by nurse-led bedside examination. The threshold for statistical significance was set at .05. All data analyses were performed using SAS (version 9.1; SAS Institute, Cary, NC, USA).

Results

Demographic and clinical characteristics

The mean age of the study participants was 56.9 years. The majority of patients were female (59.5%), married (83.1%), and unemployed (73.8%). Most patients (77.9%) had a higher than moderate economic status; 28.2% had a college degree, and 50.3% were more than overweight (body mass index $\geq$ 23 kg/m^2).

A wide range of solid tumor malignancies were represented in the study patients, with the majority of patients having colorectal malignancies (21.5%), gastric malignancies (18.5%), lung cancer (17.4%), ovarian cancer (16.4%), breast cancer (10.8%), and others. The patients were predominantly in cancer stage III (34.4%) or IV (59.5%). One hundred and thirty participants (66.7%) received only one neurotoxic agent, either platinum (58.0%) or taxanes (8.7%), while 65 participants (33.3%) had received taxanes combined with a platinum agent. The median number of chemotherapy cycles received was 6 cycles (platinum only), 4 cycles (taxanes only), and 5 cycles (platinum + taxane) (Table 1).

Table 1 *Demographic and Clinical Characteristics of Participants (N = 195)*

Characteristics	*n* (%)	M±SD or Median (range)
Age (yr)		56.9 ± 9.7 (25–81)
≤ 50	41 (21.0)	
51–60	76 (39.0)	
61–70	60 (30.8)	
≥ 71	18 (9.2)	
Gender		
Male	79 (40.5)	
Female	116 (59.5)	
Education level		
≤ High school	140 (71.8)	
≥ College	55 (28.2)	
Marital status		
Single	9 (4.6)	
Married	162 (83.1)	
Widowed/divorced	24 (12.3)	
Current employment status		
Employed	51 (26.2)	
Unemployed	144 (73.8)	
Subjective economic status		
Good	19 (9.7)	
Moderate	133 (68.2)	
Poor	43 (22.1)	
BMI (kg/m^2)		
< 18.5	11 (5.6)	
18.5–22.9	86 (44.1)	
≥ 23.0	98 (50.3)	
Cancer type		
Lung	34 (17.4)	
Colorectal malignancies	42 (21.5)	
Gastric malignancies	36 (18.5)	
Ovarian	32 (16.4)	
Breast	21 (10.8)	
Liver	12 (6.2)	
Renal	6 (3.1)	
Other	12 (6.2)	
Cancer stage		
I	2 (1.0)	
II	10 (5.1)	
III	67 (34.4)	
IV	116 (59.5)	
Chemotherapeutic agents		
Platinum only	113 (58.0)	
No. of cycles		6 (1–34)
Taxane only	17 (8.7)	
No. of cycles		4 (2–14)
Platinum + Taxane combined	65 (33.3)	
No. of cycles		5 (1–21)

Note. BMI = body mass index.

QOL

The mean FACT-G score was 68.0 out of a maximum score of 108. The mean score on the neurotoxicity subscale was 31.6 out of a maximum score of 44, with the lowest QOL corresponding to sensory domain dysfunction (Table 2).

The prevalence and severity of symptoms for each of the 11 items on the neurotoxicity subscale are shown in Figure 1. "Numbness or tingling in the hands/feet" of the sensory domain, and "weak all over" and "trouble walking" of the motor domain were the most common symptoms. Patients mentioned that among neurotoxicity symptoms, "numbness or tingling in feet" (39%), "weak all over" (36%), "numbness or tingling in hands'" (33%), and "trouble buttoning buttons" (31%) had a severe, negative impact on their QOL.

Outcomes of nurse-led bedside examination

Nurse-led bedside examinations were performed to assess CIPN. Fourteen patients (7.2%) scored 1 or higher in the hand perception of touch, and 6 patients (3.1%) scored 1 or higher in the hand perception of vibration. Sixty-eight patients (34.9%) scored 1 or higher in the foot perception of touch. Of these 68 patients, 5 (2.6%) scored 3. In the foot perception of vibration, 76 patients (39.0%) scored 1 or higher. Of these, 27 patients (13.8%) scored 3. In the upper extremity muscle strength test, 27 patients (13.8%) scored 1 or higher, and in the lower extremity muscle strength test, 28 patients (14.4%) scored 1 or higher. In the tendon reflex test, 83 patients (42.6%) scored 1 or higher, although none showed serious damage with a score of 3 or higher (Table 2).

Relationship between QOL and nurse-led bedside symptom evaluations

Scores of upper/lower extremity muscle strength based on nurse-led bedside examinations showed a weak negative correlation with the emotional well-being subscale of FACT-G. Our results indicated that weak negative relationships were present between the perception of vibration in the hands and the QOL affected by "trouble buttoning buttons"; between upper muscle strength and QOL affected by feeling "weak all over"; between touch perception in the feet and QOL affected by "numbness or tingling in hands or feet," "discomfort in hands," "trouble walking," and "trouble buttoning buttons"; between perception of vibration in the feet and QOL affected by "numbness or tingling in hands," "numbness or tingling in feet," "discomfort in feet," and "trouble walking"; and between tendon reflex and QOL affected by "numbness or tingling in feet, discomfort in feet" and "trouble walking" (Table 3).

Table 2 *Quality of Life Related to CIPN of Participants and Outcomes of Nurse-led Bedside Examination (N = 195)*

FACT/GOG-Ntx (possible range)				*M* ± *SD*
FACT-G total score (0–108)				68.0 ± 17.5
Physical well-being (0–28)				17.1 ± 7.4
Social/family well-being (0–24)				18.6 ± 4.8
Emotional well-being (0–28)				17.2 ± 4.8
Functional well-being (0–28)				15.1 ± 5.5
Neurotoxicity subscale (0–44)				31.6 ± 8.3
Sensory (0–4)				2.4 ± 1.2
Hearing (0–4)				3.5 ± 0.7
Motor (0–4)				2.6 ± 1.0
Dysfunction (0–4)				3.6 ± 0.7
Type of bedside examination	Scores, *n* (%)[a]			
	0	1	2	3
Hands touch sensibility	181 (92.8)	9 (4.6)	5 (2.6)	0 (0.0)
Hands vibration sensibility	189 (96.9)	1 (0.5)	4 (2.1)	1 (0.5)
Feet touch sensibility	127 (65.1)	9 (4.6)	54 (27.7)	5 (2.6)
Feet vibration sensibility	119 (61.0)	10 (5.1)	39 (20.0)	27 (13.9)
Upper extremity muscle strength	168 (86.1)	21 (10.8)	6 (3.1)	0 (0.0)
Lower extremity muscle strength	167 (85.6)	21 (10.8)	6 (3.1)	1 (0.5)
Tendon reflexes	112 (57.5)	77 (39.4)	6 (3.1)	0 (0.0)

Note. CIPN = chemotherapy-induced peripheral neuropathy; FACT/GOG-Ntx = Functional Assessment of Cancer Therapy/Gynecologic Oncology Group-Neurotoxicity; FACT-G = FACT-General.

[a] No scores of 4 were observed among patients in the study.

The canonical correlation analysis, conducted to examine the overall relationship between the patients' perceived QOL and the nurse-led bedside examination scores, yielded five canonical functions. The canonical correlation coefficient of canonical function 1 was .472, and was statistically significant. The relationship between the seven nurse-led bedside examinations (independent variables) and the five subscales of the QOL measure (dependent variables) was examined with respect to the canonical loadings ≥ 0.30. Results showed that among the nurse-led bedside examinations, feet vibration sensibility had the highest correlation with QOL scores, followed by tendon reflexes. Among the QOL subscales the neurotoxicity subscale showed a high correlation with the nurse-led bedside examination scores (Table 4).

Discussion

In this study, we provided evidence that nurse-led bedside CIPN symptom evaluation can be a valuable tool for assessing patient symptoms and QOL.

The NCI-CTC neurotoxicity scale is commonly used to quantify neuropathy signs and symptoms, although it has been criticized for poor reliability and suboptimal sensitivity (Lavoie Smith et al., 2011). Here, 79% (n = 195 of the total 247 patients) of the initial enrollment participants were considered to be grade 1 or higher on the NCI-CTC neurotoxicity scale. The scale grading is based on whether a symptom interferes with function (grade 2), with daily life activities (grade 3), or permanently interferes with function or causes paralysis (grade 4). In the present study, only cases with an NCI-CTC grade 1 or higher were analyzed. During initial enrollment, 21% of the enrolled patients were classified as grade 0, and were determined to be normal by the NCI-CTC assessment performed by the nurses, even though the patients indicated experiencing more than one CIPN symptom on the questionnaire. These findings suggest that in CIPN assessment simply asking patients about the existence of neuropathy should be considered as important as sophisticated testing (Armstrong, Almadrones, & Gilbert, 2005).

Among the CIPN symptoms, "numbness or tingling in feet," "weak all over," "numbness or tingling in hands," and "trouble buttoning buttons" were the symptoms the participants mentioned as significantly lowering their QOL. Typically, sensory domain dysfunction on the neurotoxicity subscale had the most negative impact on patients' QOL, while "numbness or tingling in the hands/feet" of the sensory domain and feeling "weak all over" and "trouble walking were the most common symptoms of the motor domain. The rates of these symptoms were higher than those reported in the study by Hershman et al. (2011), where 27% and 25% of breast cancer patients who underwent chemotherapy reported severe numbness in the hands and feet, respectively. Numbness in the hands and feet was the most common symptoms, and patients may have difficulty adjusting to this chronic loss of sensation. Injuries such as burns, blisters, and falls are likely to occur from a combination of diminished sensation, weakness, and loss of proprioception and balance (Tofthagen, McAllister, & McMillan, 2011). Nonetheless, our results are consistent with those in prior studies

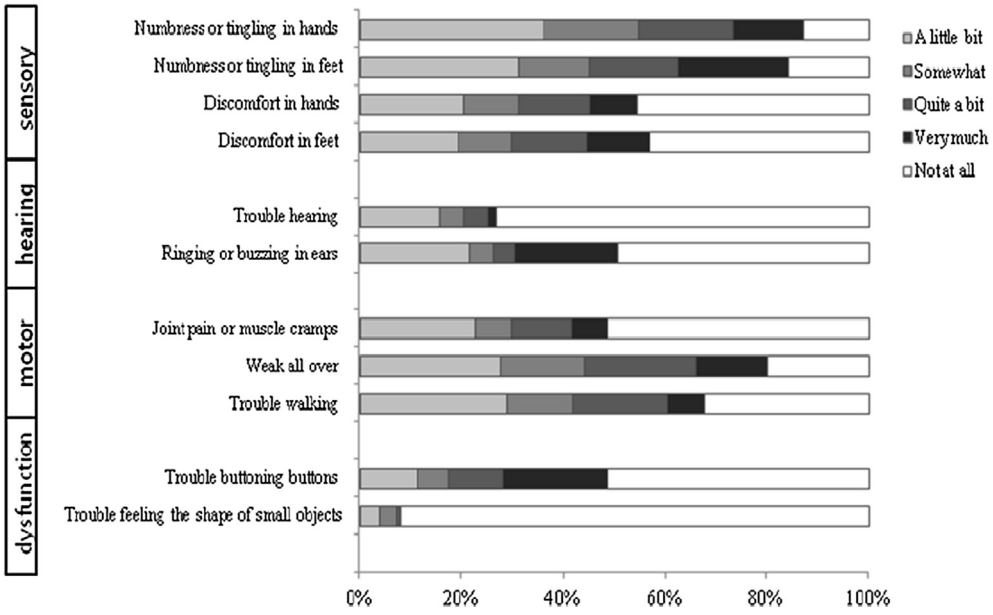

Figure 1. The prevalence and severity of symptoms of neurotoxicity subscale (11 items).

Table 3 *Correlation between Quality of Life and Nurse-led Bedside Examination (N = 195)*

Quality of life	Nurse-led bedside examination[a]						
	Hands touch	Hands vibration	Feet touch	Feet vibration	Upper strength	Lower strength	Tendon reflexes
FACT-G total score							
Physical well-being	–	–	–	–	–	–	–
Social/family well-being					–	–	–
Emotional well-being	–	–	–	–	−0.21*	−0.21*	–
Functional well-being	–	–	–	–	–	–	–
Neurotoxicity subscale							
Sensory							
Numbness or tingling in hands	–	–	−0.23*	−0.23*	–	–	–
Numbness or tingling in feet	–	–	−0.23*	−0.37*	–	–	−0.32*
Discomfort in hands	–	–	−0.21*	–	–	–	–
Discomfort in feet	–	–	–	−0.33*	–	–	−0.31*
Hearing							
Trouble hearing	–	–	–	–	–	–	–
Ringing or buzzing in ears	–	–	–	–	–	–	–
Motor							
Joint pain or muscle cramps	–	–	–	–	–	–	–
Weak all over	–	–	–	–	−0.20*	–	–
Trouble walking	–	–	−0.20*	−0.24*	–	–	−0.29*
Dysfunction							
Trouble buttoning buttons	–	−0.27*	−0.23*	–	–	–	–
Trouble feeling the shape of small objects	–	–	–	–	–	–	–

Note. FACT-G = Functional Assessment of Cancer Therapy–General.
*$p < .05$.
[a] Values are Spearman rank correlation coefficient (r) and "–" indicates no statistically significant correlation means.

reporting that sensory impairments occur more frequently and are more severe than motor impairments, and that the lower extremities usually show symptoms earlier than the upper extremities. Hausheer, Schilsky, Bain, Berghorn, and Lieberman (2006) hypothesized that the relative sparing of motor neurons occurs because these neurons are more heavily myelinated, and the upper and lower motor neuron cell bodies are protected in the spinal cord. The longer axons are the first ones to be affected. Thus, the sensory changes affect the tips of the toes, followed by the fingers, and progresses proximally to the ankles and wrists in a "stocking-glove" manner.

Motor-related symptoms are uncommon compared to sensory-related symptoms. However, loss of sensation and weakness in the muscles of the lower extremities are common symptoms of peripheral neuropathy, regardless of etiology (Tofthagen, Overcash, & Kip, 2012). Loss of flexibility and strength can cause further impairments and disability. Here, muscle weakening in the lower and upper extremities was similar. Based on the patient-reported QOL results, weakening of the hand muscles made delicate movements, such as buttoning buttons, difficult, and weakening of the feet muscles led to feeling "weak all over" or "trouble walking," thereby negatively affecting QOL.

Loss of tendon reflexes, especially ankle jerks can appear as the first sign of CIPN (Kaley & Deangelis, 2009). Reduction in tendon reflexes is caused by impairment of the afferent or efferent limbs of the reflex arc. The tendon reflex represents the function of not only the motor system, but also deep sensation (Ohsumi & Sunada, 2004). Lavoie Smith et al. (2011) reported that tendon reflexes should be assessed, but inclusion in the reduced version of total neuropathy score is not recommended because tendon reflex scores differ by chemotherapy dosage, whereas pin sensibility and strength scores do not. However, it is not easy for an inexperienced nurse to observe the tendon reflex response even in patients without neurologic disorders. Education and experience are required to test tendon reflexes, which can be achieved through time and practice (Ohsumi & Sunada).

In this study, the level of emotional well-being subscale of the FACT-G was also lower with weaker upper/lower extremity muscle strength. This likely occurred because weak upper extremity muscle strength makes everyday activities difficult, while weak lower extremity muscle strength can limit movement. Thus, weak extremity muscle strength may cause difficulties in maintaining an independent lifestyle and lead to low self-esteem and stress. The neurotoxicity subscale scores also mildly correlated with scores from the bedside symptom assessment (e.g., hands vibration perception). Additionally, we found the muscle strength test was effective in assessing and evaluating the impact that damages to the upper extremities have on QOL, while the touch/vibration perception and tendon reflex tests were effective for the lower extremities. Additionally, we verified that among the nurse-led bedside examinations, feet vibration sensibility, followed by tendon reflexes, had the highest predictive power for QOL, and among the

Table 4 *Predicting Quality of Life from Nurse-led Bedside Examinations Using Canonical Correlation Analysis*

Variables	CF1
	CL
Independent variables	
Nurse-led bedside examination	
Feet vibration sensibility	.364*
Tendon reflexes	.349*
Hands vibration sensibility	.266
Hands touch sensibility	.263
Feet touch sensibility	.251
Lower extremity muscle strength	.047
Upper extremity muscle strength	.030
Dependent variables	
Quality of life	
Neurotoxicity subscale	.425*
Functional well-being	.275
Physical well-being	.189
Social/family well-being	.127
Emotional well-being	.117
Canonical correlation = .472	
Canonical root (R2) = .231	
Redundancy Index = .066	
Wilks's lambda = .670	
$p < .001$	

Note. CF = canonical function; CL = canonical loading.
*CL ≥ .30.

QOL subscales, the neurotoxicity subscale had the highest predictive power.

This study had several limitations. Since this was a cross-sectional study, we were not able to confirm the sensitivity of changes in CIPN otherwise possible in longitudinal studies. Moreover, we were unable to distinguish symptoms from aging and those from illnesses other than cancer, or accurately control for the effect of accumulation of chemotherapeutic agents. Further research is necessary to determine barriers to nurses conducting bedside examinations and their proficiency. Identifying the association between nurse-led bedside examination and advanced examination (e.g., laboratory tests, nerve conduction studies) is also necessary.

Conclusion

The self-reported FACT/Gynecologic Oncology Group–Neurotoxicity scores mildly correlated with the scores from the nurse-led bedside examination (feet touch sensibility, feet vibration sensibility, and tendon reflex), although the validity of the nurse-led bedside examination could not be verified.

The nurse-led bedside examination for CIPN assessment and evaluation is feasible and can be easily performed in the clinical setting. Bedside examination measurements should be carefully selected based on the available evidence to ensure high validity and could potentially become the primary tool for CIPN symptom assessment in the clinical setting. Standardization of clinical assessment and development of structured recording checklist procedures to enhance accuracy will also be essential to ensure greater precision in these bedside measurements.

Conflict of interest

The authors declare no conflict of interest.

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