

# Practice Environments of Nurses Employed in Ambulatory Oncology Settings: Measure Refinement

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**T**he urgent need to improve the quality of cancer care coincides with a looming shortage of providers to deliver that health care. In 1999, the National Cancer Policy Board of the Institute of Medicine identified a “wide gulf” between the gold standard of cancer care and the quality of care delivered to many patients (Hewitt & Simone, 1999, p. 211), and gaps in quality of care persist today. An estimated 1.6 million new cases of invasive cancer will be diagnosed in 2012 (American Cancer Society, 2012). The National Cancer Institute estimated that the number of patients living with cancer will increase by 50% from 2005 to 2020 (Yabroff, Lawrence, Clauser, Davis, & Brown, 2004). The explosive growth in cancer care demand is coupled with only a meager increase in the number of oncology healthcare providers. The American Society of Clinical Oncology predicted a shortage of 2,550–4,080 medical oncologists by 2020 (Association of American Medical Colleges, 2007). Although not specific to oncology nursing, nurse workforce researchers predicted a shortage of 500,000 RNs by 2025 (Buerhaus, Auerbach, & Staiger, 2009).

The gaps in cancer care quality and the cancer workforce necessitate a remedy, and the Institute of Medicine (2009) convened a workshop to address those issues. Workshop attendees endorsed two related strategies to mitigate the shortage of providers and the potential impact on quality of care. The first was to encourage oncology providers, including nurses, to postpone retirement. Strongly related to that recommendation was to create favorable environments to practice clinical care. A favorable environment for clinical practice, defined as the characteristics of a healthcare organization that support the highest functioning of nurses, is likely to reduce turnover and premature retirement (Lake, 2007).

Nursing practice environments have received increased attention as a mechanism to improve care quality. From a conceptual perspective, nursing practice environments are features of settings where nurses are

**Purpose/Objectives:** To examine the reliability and validity of modified items from the Practice Environment Scale of the Nursing Work Index (PES-NWI) for use in the understudied ambulatory oncology setting.

**Design:** Cross-sectional mailed survey using a modified Dillman method.

**Setting:** Southeastern United States.

**Sample:** Population-based statewide sample of 1,339 oncology nurses who reported employment outside of hospital inpatient units.

**Methods:** After examining for nonresponse bias, confirmatory factor analysis using structural equation modeling and Cronbach coefficient alphas were employed to examine construct validity and internal consistency, respectively. After calculating revised subscale means for each nurse, the researchers used t tests to compare subscale means between nurses who reported their practice environment as favorable versus those who reported it as mixed or unfavorable.

**Main Research Variables:** Reliability and validity of items on the adapted version of the PES-NWI.

**Findings:** Despite a response rate of 31%, no differences in demographic characteristics were observed between the analytic sample and nonresponders. After reducing the number of items to 23, acceptable model fit was achieved with a comparative fit index of 0.95 and a root mean square error of approximation of 0.057. All five existing PES-NWI subscales, plus the new medical assistant support subscale, were significantly higher for nurses who reported favorable practice environments versus those who reported mixed or unfavorable environments.

**Conclusions:** A revised set of items derived from the PES-NWI has acceptable reliability and validity to measure the quality of nursing practice environments in ambulatory oncology settings. Medical assistant support is a new contribution to the item pool.

**Implications for Nursing:** Additional testing of this revised measure in diverse samples of nurses, including studies that correlate with patient outcomes, is a necessary next step.

employed that promote job satisfaction, quality of care, or patient safety (Lake, 2007). Organizational sociologists postulate that practice environments with professional,

as opposed to bureaucratic, orientations are more likely to result in positive employee, customer, or organizational outcomes (Flood & Scott, 1987). Several studies have identified significant relationships between positive nursing practice environments and improved patient outcomes (Aiken, Smith, & Lake, 1994; Friese, Lake, Aiken, Silber, & Sochalski, 2008; Van Bogaert, Clarke, Roelant, Meulemans, & Van de Heyning, 2010). An Institute of Medicine panel affirmed the necessity and feasibility of improving work environments to improve patient safety (Page, 2004). However, no reliable and valid measures of that phenomenon exist for the ambulatory setting. Most of the reviewed studies occurred in the inpatient setting. Increased attention to measuring and improving the practice environments of ambulatory oncology settings is warranted, as the overwhelming majority of chemotherapy treatments occur outside of inpatient units. This article reports on a study to examine the feasibility of a measure designed originally for the inpatient setting to assess the practice environment of nurses in ambulatory oncology settings.

## Background

Since the 1980s, researchers have examined the practice environments of nurses in attempts to identify factors that contribute to high job retention, low turnover, high job satisfaction, and favorable patient outcomes. A review of prior studies in the field yielded 203 articles and seven multidimensional measures (Lake, 2007). Kramer and Hafner's (1989) seminal work developed scales to reflect the presence or absence of characteristics found in the original set of Magnet® hospitals designated by the American Academy of Nursing Expert Panel (McClure, Poulin, Sovie, & Wandelt, 1983). The Nursing Work Index (NWI) (Kramer & Hafner, 1989) consisted originally of 65 items, whereas Aiken and Patrician's (2000) Nursing Work Index-Revised (NWI-R) has 55 items across three conceptually-based subscales. Lake's (2002) Practice Environment Scale of the Nursing Work Index (PES-NWI) has a total of 31 items across five empirically derived subscales. Other investigators have used the NWI items to develop conceptually or empirically derived subscales (Choi, Bakken, Larson, Du, & Stone, 2004; Erickson, Duffy, Ditomassi, & Jones, 2009; Erickson et al., 2004; Estabrooks et al., 2002). Investigators have used other instruments to measure the nursing practice environment (Adams, Bond, & Arber, 1995; Moos & Insel, 1994; Nolan, Grant, Brown, & Nolan, 1998; Sims, Szilagyi, & Keller, 1976; Whitley & Putzier, 1994). However, Lake's (2007) review identified the PES-NWI and NWI-R scales as most useful to researchers studying nursing practice environments.

Challenges persist with nursing practice environment measurement, although the NWI-R and the PES-NWI

have documented convergent validity, discriminant validity, and reference scores in several populations. Cummings, Hayduk, and Estabrooks (2006) compared three sets of scales derived from NWI items to measure nursing practice environments in 1998 survey data from 12,780 Canadian nurses. Using structural equation modeling (SEM), Cummings et al. (2006) concluded those three measurement approaches failed model fit parameters routinely used in SEM and argued for theory-driven measurement approaches. Critics point to the age of the items (Lake, 2007); the original NWI items date to the 1980s. A third concern is the specificity of the items to the inpatient setting.

Interest in the organizational context in which most cancer care is delivered, coupled with the measurement challenges highlighted previously, motivated the author's research team to explore the practice environments of nurses employed in ambulatory oncology settings. First, the researchers conducted focus groups with nurses employed in those settings to generate potential areas of inquiry for empirical measurement and to affirm or negate dimensions of the nursing practice environment previously studied in the inpatient context (Kamimura, Schneider, Lee, Crawford, & Friese, 2012). The researchers used the dimensions from Lake's (2002) PES-NWI subscales: nurse participation in (practice) affairs; nursing foundations for quality of care; nurse manager ability, leadership, and support of nurses; staffing and resource adequacy; and collegial nurse-physician relationships. Lake's (2002) dimensions were chosen given that prior research findings used those measures in inpatient oncology nurses. Ambulatory oncology nurses generally affirmed the previously studied concepts and strongly voiced the importance of favorable relationships with and support from medical assistants to deliver high-quality patient care and maintain job satisfaction (Kamimura et al., 2012). That work led the author's team to a series of revisions to the PES-NWI items to make them more suitable for the ambulatory oncology context.

This article reports the research team's experience with administering an instrument to measure the practice environment of ambulatory oncology nurses, using a modified set of PES-NWI items. Descriptive statistics and measures of validity and reliability are provided, with the intent of informing future research in measuring the nursing practice environment in ambulatory oncology settings.

## Methods

### Settings and Participants

The research team previously reported their survey sampling procedures (Friese, Lee, O'Brien, & Crawford, 2010). Briefly summarized, they conducted a survey of nurses licensed to practice in one large state in the

southeastern United States that collects the clinical specialty and practice setting of nurses with biannual licensure renewal. The team identified 1,339 RNs and licensed practical nurses who identified their clinical specialty as oncology nursing and their practice setting as outside an inpatient unit. Survey activities began on April 19, 2010, and data collection ended on June 3, 2010.

Measures

The PES-NWI served as the basis for the measure. Thirteen nurses in two focus groups completed the original PES-NWI and provided suggestions for modifications using a semistructured moderator guide (Kamimura et al., 2012). The research team shared the modified measure with experts in oncology and nursing systems research, who provided additional suggestions and improved face validity. To strengthen content validity, ensure acceptability, and assess comprehension of the revised items, the research team performed three one-hour cognitive interviews with nurses employed in ambulatory oncology settings (Knafl et al., 2007; Willis, 2004). The tested measure contained 53 items with the following instruction: “Please rate the extent to which you agree that the characteristics below are present in your current job.” Each item was scored on a five-point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree,

and 5 = strongly agree). The addition of a neutral scoring value departed from the original PES-NWI measure, which used a four-point Likert-type scale (strongly disagree, disagree, agree, and strongly agree) (Lake, 2002). Three of the 53 items that assessed collaborations between nurses and nurse practitioners, pharmacists, and physician assistants had a sixth option, “does not apply,” based on feedback from focus group participants. Finally, to assess the PES-NWI items against a global measure of practice environment, respondents were asked, “Please describe the current practice environment for you as a nurse to delivery of high-quality care.” Respondents could indicate a favorable, mixed, or unfavorable nursing practice environment. That question was asked in a separate section from the PES-NWI items. The entire questionnaire is available from the author by request.

Study Procedures

The University of Michigan Institutional Review Board–Medicine granted human subjects approval for all study activities. The research team modified established survey methodology with slightly shorter mailing time frames (Dillman, Smyth, & Christian, 2009) and conducted a four-arm experiment comparing paper to Web questionnaire completion. The paper and Web questionnaires had identical content and order, and the team observed no significant response differences by mode of questionnaire completion (Frieze et al., 2010). They contacted all nurses by first-class mail with a prenotification letter, a primary mailing with a \$2 cash incentive, a letter describing the study, the paper questionnaire (or Web invitation), and a reminder letter. Nonresponders also were sent one additional cover letter with the paper questionnaire and a Web invitation, followed by one final reminder letter. Participants who completed the questionnaire via the Internet entered data securely to a DatStat™ platform. Study staff manually entered returned paper questionnaires into SPSS®, version 16.0. Survey managers performed quality control audits on 10% of the sample.

Data Analysis

After comparing the demographics of the analytic sample with those provided by the state board of nursing for the sampling frame, the research team calculated descriptive statistics of the revised PES-NWI items. They examined the correlation matrix of all items for evidence of acceptable intercorrelation (DeVellis, 2003). For multicollinearity assessment, the team used linear regression and calculated variance inflation factor (VIF) and tolerance values. They employed two procedures to assess construct validity. First, the

Table 1. Characteristics of the Analytic Sample and Nonresponders in the Sampling Frame					
Characteristic	Analytic Sample (N = 292)		Nonresponders (N = 910)		p
	n	%	n	%	
Employed					0.09
Full-time	249	85	810	89	
Part-time	43	15	100	11	
Race					0.59
Caucasian	265	91	829	91	
Non-Caucasian	27	9	81	9	
Gender					0.32
Female	283	97	877	96	
Male	6	2	29	3	
Missing	3	1	4	< 1	
Practice setting					0.11
Hospital outpatient	167	57	505	56	
Physician practice	99	34	286	31	
Other	26	9	119	13	
Education					0.45
Diploma	43	15	134	15	
Associate's degree	103	35	327	36	
Bachelor's degree or higher	146	50	449	49	
Type of nurse					0.56
RN	278	95	856	94	
Licensed practice nurse	14	5	54	6	

Note. No demographic information was available from one participant in the analytic sample and 136 nonresponders in the sampling frame.  
Note. Because of rounding, not all percentages total 100.

**Table 2. Modified Practice Environment Scale of the Nursing Work Index Subscale Scores**

Subscale	Analytic Sample (N = 293)		Practice Favorable (N = 213)		Environment Mixed or Unfavorable (N = 80)		p
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	
Staffing and resource adequacy	3.52	0.96	3.81	0.78	2.75	1	< 0.001
Nursing foundations for quality of care	4.12	0.64	4.27	0.59	3.77	0.61	< 0.001
Nurse participation in practice affairs	3.16	0.83	3.37	0.75	2.62	0.83	< 0.001
Nurse manager leadership, ability, and support of nurses	3.55	0.94	3.79	0.79	2.93	1.03	< 0.001
Collegial nurse-physician relations	4.02	0.77	4.17	0.68	3.64	0.85	< 0.001
Medical assistant support	3.55	1.03	3.65	0.99	3.26	1.16	< 0.01
Composite (all items)	3.59	0.64	3.78	0.55	3.09	0.62	< 0.001

Note. In contrast with a prior publication (Lake, 2002), items were scaled and a neutral category was added (1 = strongly disagree, 2 = agree, 3 = neutral, 4 = agree, and 5 = strongly agree).

team performed confirmatory factor analysis using SEM with EQS, version 6.1. The confirmatory factor analysis assessed how a structural equation model using the existing PES-NWI subscales with the revised items fit the data of the analytic sample. The team refined the SEM iteratively after examining diagnostic output, including the Lagrange multiplier test. Second, the team compared the mean scores on the revised subscales for two groups: nurses who reported their practice environment as favorable on the one-item global measure, and nurses who reported their practice environment as either mixed or unfavorable. The team then calculated the Cronbach coefficient alpha scores to test the internal consistency of the subscales with the revised items and used a cut point of 0.8 to indicate acceptable reliability (George & Mallery, 2003).

## Results

Using the American Association for Public Opinion Research's (2011) response rate calculation number 2, defined as the number of partial or complete responses divided by (a) the number of received responses, (b) the number of individuals who did not complete the survey, and (c) the number of individuals with unconfirmed eligibility, the research team obtained a 31% percent response rate. Table 1 compares the demographic characteristics of the sample with available data on nonresponders. The research team observed no statistically significant differences in characteristics between the analytic sample and nonresponders.

The highest correlation between variables was 0.71 ("A head nurse or supervisor who backs up the nursing staff in decision making, even if the conflict is with a physician" with "A supervisory staff that is supportive of nurses"). Most item-to-item correlations were positive, ranging from 0.2–0.4 (the correlation and covariance matrices are available from the author by request). No tolerance values were lower than 0.24, and the high-

est VIF obtained was 4.5. Therefore, the team observed no evidence of multicollinearity.

Confirmatory factor analysis performed by structural equation modeling using the preexisting PES-NWI subscales yielded statistics that indicated poor fit between the model and the underlying data structure. The research team then examined results from the multivariate Lagrange multiplier test to identify items that loaded on multiple factors. They reduced items iteratively after assessing the implications of the items' omission on the conceptual framework. After reducing the number of items to 23, the team achieved acceptable model fit, as shown by a comparative fit index of 0.95 and a root mean square error of approximation of 0.057 (95% confidence interval [0.049, 0.064]).

To assess discriminant and criterion validity, the team compared the PES-NWI subscale scores between nurses who reported their practice environment as favorable on a single-item question versus those who reported their practice environment as mixed or unfavorable to the delivery of high-quality care (see Table 2). Nurses who stated in a single-item question that their practice environment was favorable to delivering high-quality care had significantly higher scores on all PES-NWI subscales, compared with the entire sample and the group of nurses who reported their environments as mixed or unfavorable.

Table 3 shows the mean and standard deviation of the revised PES-NWI items organized into the preexisting subscales. On a five-point Likert-type scale, most items were appraised positively by respondents. The items with the highest scores were located in the nursing foundations for quality of care subscale: "Working with nurses who are clinically competent" ( $\bar{X} = 4.36$ ), and "High standards of nursing care are expected by the administration" ( $\bar{X} = 4.24$ ). The lowest-scoring items were located in the nurse participation in practice affairs subscale: "Many opportunities for advancement of nursing personnel" ( $\bar{X} = 2.81$ ), "Staff



**Table 3. Modified Practice Environment Scale of the Nursing Work Index: Descriptive and Internal Consistency Statistics**

Item	$\bar{X}$	SD	$\alpha$
<b>Staffing and resource adequacy</b>			0.89
Enough staff to get the work done	3.46	1	
Enough RNs to provide quality patient care	3.58	1.02	
<b>Nursing foundations for quality care</b>			0.8
High standards of nursing care are expected by the administration.	4.24	0.74	
Working with nurses who are clinically competent	4.36	0.76	
Nursing care is based on a patient-centered approach.	4.15	0.82	
A clear philosophy of nursing that pervades the patient care environment	3.73	0.9	
<b>Nurse participation in practice affairs</b>			0.86
Opportunity for staff nurses to participate in policy decisions	3.41	1.08	
Many opportunities for advancement of nursing personnel	2.81	1.09	
Nurses have the opportunity to serve on committees.	3.7	1.02	
Staff nurses are involved in the management decisions of the facility.	2.92	1.1	
An administration that listens to and responds to employee concerns	3.24	1.15	
A chief nursing officer who is highly visible and accessible to staff	2.92	1.27	
A chief nursing officer equal in power and authority to other top-level executives	3.09	1.21	
<b>Nurse manager leadership, ability, and support of nurses</b>			0.9
A supervisory staff that is supportive of nurses	3.61	1.03	
A head nurse or supervisor who backs up the nursing staff in decision making, even if the conflict is with a physician	3.61	1.22	
Praise and recognition for a job well done	3.5	1.07	
A head nurse who is a good manager and leader	3.49	1.18	
Supervisors use mistakes as learning opportunities, not criticism.	3.54	1.07	
<b>Collegial nurse-physician relations</b>			0.86
A lot of teamwork between nurses and physicians	4	0.88	
Physicians and nurses have good working relationships.	4.16	0.79	
Collaboration (joint practice) between nurses and physicians	3.87	0.93	
<b>Medical assistant support</b>			0.87
Medical assistants who help the care team	3.58	1.14	
Medical assistants contribute to smooth patient flow.	3.53	1.06	

N = 293

Note. In contrast with a prior publication (Lake, 2002), items were scaled and a neutral category was added (1 = strongly disagree, 2 = agree, 3 = neutral, 4 = agree, and 5 = strongly agree).

Note. From "Development of the Practice Environment Scale of the Nursing Work Index," by E.T. Lake, 2002, *Research in Nursing and Health*, 25, p. 181. Copyright 2002 by John Wiley and Sons. Adapted with permission.

nurses are involved in the management decisions of the facility" ( $\bar{X}$  = 2.92), and "A chief nursing officer who is highly visible and accessible to staff" ( $\bar{X}$  = 2.92). The medical assistant support subscale was a new addition with two items: "Medical assistants who help the care team" ( $\bar{X}$  = 3.58) and "Medical assistants contribute to smooth patient flow" ( $\bar{X}$  = 3.53). Cronbach alphas for the five subscales ranged from 0.8–0.9, reflecting acceptable internal consistency of the subscales.

## Discussion

With a sample of nurses employed in ambulatory oncology settings, the current study contributes to the

limited understanding of perceived nursing practice environments. After focus groups, expert review, and cognitive interviews, the research team used data from a mailed survey to examine a modified item set from the only nursing practice environment measure endorsed by the National Quality Forum (2012) as a nursing-sensitive indicator of performance. The findings have important implications for future research efforts in this area.

When evaluating a measure, researchers must examine it from several dimensions, including reliability and validity (DeVellis, 2003). The Cronbach alpha statistics computed for the subscales indicate acceptable internal consistency or homogeneity of items within each scale. That finding is impressive given the reduced number of items in several scales. One important implication is that highly reliable subscales have lower error and, therefore, higher statistical power. In addition, the research team is more confident that subscale items measure the true latent constructs, namely the conceptual dimensions of the PES-NWI. The researchers also were encouraged because they did not detect multicollinearity, which can hamper subsequent modeling efforts.

Three aspects of validity are particularly important in scale development and refinement: content, construct, and criterion validity (DeVellis, 2003). To address content validity, the research team revised items iteratively; employed focus groups with a diverse sample of ambulatory oncology nurses; conducted expert review by clinicians, managers, and researchers; and performed cognitive interviews to enhance item clarity.

Construct validity was supported by the confirmatory analysis using SEM. The results suggest the established PES-NWI subscales required minor modifications to fit the sample's data structure. Those findings have three important considerations. First, the researchers conducted their analyses on 293 participants, violating the generally accepted target of 5–10 respondents per item.

Second, the items removed that resulted in improved model fit may reflect characteristics observed less frequently in the ambulatory oncology setting. Those items included professional development programs, such as preceptorships for newly hired nurses, onsite continuing education offerings, and career development or clinical ladder programs. Although inpatient settings routinely offer those programs, ambulatory settings may provide other opportunities or rely on externally funded programs (i.e., continuing education conferences). However, reconsideration of the focus group data did not identify other professional development features to include.

Third, in the researchers' review of item theory, they recognized that the underlying PES-NWI items are more appropriately considered formative indicators, as opposed to reflective indicators (Bollen & Lennox, 1991; Diamantopoulos & Siguaw, 2006; Diamantopoulos & Winklhofer, 2001). Reflective indicators are items that are manifestations of the underlying concept. Changes in formative indicators affect the value of the latent variable; reflective indicators behave in the opposite direction. Although the problem of formative indicators was identified more than 20 years ago, it rarely is discussed by researchers (Bollen & Lennox, 1991). Formative indicators do not perform well in classic psychometric or structural equation modeling approaches (Diamantopoulos & Siguaw, 2006). One approach is to include formative and reflective indicators in future measures and to incorporate both in structural equation models. Future research strategies should include additional item development with reflective indicators. Another strategy is to augment questionnaires with existing measures for important, yet omitted concepts, such as safety orientation (Vogus & Sutcliffe, 2007) or teamwork (Kalisch & Lee, 2010).

Criterion validity is best assessed by comparing the candidate measure with a gold standard measure. In this case, no gold standard measure of ambulatory oncology nursing practice environment exists. The next best approach was to consider a single-item, global measure that best captured the theoretical construct: assessment of the favorability of the practice environment for nurses to delivery of high-quality patient care. That assessment yielded results in the hypothesized direction: Nurses who reported their practice environments as favorable had significantly higher scores on all PES-NWI subscales, and nurses who reported mixed or unfavorable environments had significantly lower PES-NWI subscale scores. In the current study, the validity is concurrent as opposed to predictive. The research team cannot comment on the ability of this measure to predict future assessments or outcomes.

The current work also identified and validated additional considerations for measuring the practice environments of ambulatory oncology nurses. A subscale entitled "medical assistant support" emerged with two

new items. That is consistent with the team's previously published framework based on focus groups with ambulatory oncology nurses. Those nurses uniformly reported their relationships with medical assistants as critical to high-quality patient care (Kamimura et al., 2012). The quality of nursing-medical assistant relationships and the association with outcomes has yet to be studied with vigor in ambulatory oncology settings.

## Limitations

The research team identified two study limitations that merit additional discussion. First, the response rate, although modest, was within the range of published response rates for nurses. The team employed several principles empirically demonstrated to increase response rates (e.g., introductory letters, upfront monetary incentives, color printing, repeated mailings) (Dillman et al., 2009). However, the research team observed no significant differences in demographic characteristics between responders and nonresponders, minimizing the risk of response bias (Groves, 2002). Nurses in the sampling frame may not practice in the primary area of interest and did not complete the survey. Continued attempts to encourage nurses to respond to surveys, coupled with formal nonresponse assessments, will strengthen survey research with nurses. Second, although the team conducted a large, statewide survey, the findings may have limited generalizability to other geographic areas. The team presents those limitations alongside a report using a substantial number of oncology nurses whose work setting has not been studied previously. To the team's knowledge, the current work is the first to study practice environments with an empirical approach that is focused exclusively on the ambulatory setting.

## Conclusions and Implications for Nursing Practice

A revised and reduced set of PES-NWI items to measure the practice environment of ambulatory oncology nurses demonstrated reliability and validity. The current study demonstrated strong internal consistency, construct validity, and favorable criterion validity in a reduced set of PES-NWI items, coupled with the addition of items to capture the important contributions of medical assistants to high-quality care. Moving forward, augmentation of those items with stand-alone scales for important additional concepts is a crucial strategy for measuring practice environments in this understudied setting.

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