

PSYCHOMETRIC PROPERTIES OF THE NURSE MANAGER COMPETENCY INSTRUMENT FOR RESEARCH

Christine Pabico, PhD, RN, NE-BC, FAAN

ANCC Pathway to Excellence, American Nurses Credentialing Center, Manassas, VA

Nora E. Warshawsky, PhD, RN, FAAN

University of Central Florida, Orlando, FL

Shin Hye Park, PhD, RN

University of Kansas School of Nursing, Kansas City, KS

Background and Purpose: Competent nurse managers (NM) are essential to create safe and healthy work environments and support frontline nurses. Measuring NM competence with a valid and reliable instrument is critical in research. We assessed the psychometric properties of the Nurse Manager Competency Instrument for Research (NMCIR). **Methods:** Item analysis, internal consistency analysis, and confirmatory factor analysis were performed with a sample of 594 NMs. **Results:** The NMCIR showed high internal consistency. The 26 items were loaded on ten factors with a good overall fit, supporting the hypothesized factor structure. However, the findings showed poor discriminant validity. **Conclusion:** The NMCIR demonstrates sound psychometric properties for use in studies of NM competence. Further evaluation of the NMCIR is recommended to improve discriminant validity.

Keywords: nurse manager competency; validity; reliability; Nurse Manager Competency Instrument for Research

As frontline leaders responsible for the 24-hour operation in hospitals, nurse managers (NMs) set the tone for the local culture and are responsible for creating safe, healthy environments that support the work of the healthcare team and contribute to patient engagement (American Organization of Nurse Leaders [AONL], 2015). They are also central to achieving organizational goals by ensuring that nurses at the point of care are aligned with the administrative strategic plan. NMs' effectiveness in their role and the ability to create positive practice environments that support the frontline nurses is influenced by their leadership knowledge, skills, and abilities (AONL, 2015). However, the long-awaited retirement of the baby boomer generation is underway, creating a significant loss of nursing leadership wisdom. The most negative effects are found at the unit level as nurse manager (NM) positions are replaced by novice frontline leaders.

The NM role is the first step on the leadership career ladder and the least experienced group of the leadership hierarchy. A recent study showed that almost 40% of NMs had less than 2 years of experience, resulting in a significant competency deficit (Warshawsky & Cramer, 2019). Knowing that NMs need leadership development, a critical question is how to assess competencies for NMs. The AONL's NM competency assessment tool has been recognized as the standard for providing guidance on relevant competencies and assessing NM competencies. AONL's tool is useful for assessing NMs' competencies in clinical practice; however, the number of tool items contributes to respondent burden in survey research. A modified instrument was developed based on AONL's comprehensive tool for use in research. The purpose of this study was to assess the psychometric properties of the Nurse Manager Competency Instrument for Research (NMCIR).

BACKGROUND AND CONCEPTUAL FRAMEWORK

NM competencies are defined as the skills, knowledge, and abilities that guide the practice of these nurse leaders (AONL, 2015). According to the NM Learning Domain Framework, NMs must gain competencies in three leadership domains: *Leader Within*, *Science of Leadership*, and *Art of Leadership* (AONL 2015). The *Leader Within: Creating the Leader in Yourself* domain is focused on NM's plans for professional growth and development. The *Science of Leadership: Managing the Business* domain recognizes skills essential for NMs to effectively run the operations on the unit and contribute to the financial viability of the organizations. These competencies include systems thinking, performance improvement, financial management, strategic thinking, human resources management, technology, and clinical practice (AONL, 2015). It is vital for NMs to understand key performance indicators, maximize care efficiency and throughput, effectively facilitate change, and advocate for resources needed to successfully lead their units. On the other hand, the *Art of Leadership: Leading the People* domain encompasses the skill of managing relationships and the ability to influence others' behaviors. These competencies include relationship management, influencing behaviors, human resources leadership, diversity management, and shared decision making (AONL, 2015). Guiding team members to function as a high-performance work team is critical, especially in healthcare environments where team synergy and collaboration are essential for delivering high quality patient care.

The Nurse Manager Competency Instrument for Research

AONL's NM Competency Assessment tool evaluates NM's current knowledge, skills, and abilities, that is, competencies, regarding three leadership domains and identifies strengths and areas for development (AONL, 2015). This tool consists of 55 items that were developed based on the NM Learning Domain Framework as well as studies on NMs' role delineation (AONL, 2015). Although AONL's tool is useful to comprehensively evaluate competencies of NMs, the tool consisting of 55 items may raise an issue of participant burden in survey research. To reduce participant burden and increase the likelihood of participants completing the survey for research, Warshawsky modified the AONL's NM Competencies Assessment tool in 2017 and developed the Nurse Manager Competency Instrument for Research (NMCIR), reducing the number of items from 55 to 26. Warshawsky used content analysis to reduce the number of items and to modify items by eliminating similar or related competency skills. For example, ten items for financial management competencies described in the AONL NM Competency Assessment tool were collapsed into two items: (1) knowledge of the unit and departmental budgeting processes—both capital and operational; and (2) knowledge of healthcare economics and its application to the delivery of patient care (Warshawsky & Cramer, 2019). To affirm the content validity of the NMCIR, an expert PhD-prepared nurse researcher with administrative experience reviewed the items.

The 26-item tool of NMCIR measures 10 NM competencies from two leadership domains of the NM Learning Domain Framework: (1) *Science of Leadership*, which includes financial management (2 items), human resource management (2 items), performance improvement (4 items), foundational thinking (3 items), technology (1 item), strategic management (5 items), and clinical practice knowledge (1 item); and (2) *Art of Leadership*, which includes human resource leadership (4 items); relationship management (2 items), and diversity (3 items) (see Table 1). The item response categories for each of the 26 items indicate the NM's self-assessed knowledge, skills, and abilities of the different leadership competencies. Response choices are as follows: novice (1), advanced beginner (2), competent (3), proficient (4), and expert (5). A high score suggests a high degree of competence and confidence in the leadership skill and vice versa. Items to assess professional growth and development in the *Leader Within* domain of the NM Learning Domain Framework was not included in the instrument. Instead, demographic items about NM's education, leadership workshops attended, and professional certifications were used to assess this domain.

METHODS

Establishing the psychometric properties of an instrument is essential prior to utilization of the instrument in clinical practice or research. This study performed psychometric evaluation of the NMCIR while assessing: (1) item analysis, (2) dimensionality, (3) reliability, and (4) validity.

TABLE 1. Nurse Manager Competency Items by Domain

DOMAIN	ESSENTIAL LEADERSHIP SKILL
Science of leadership	Financial management skills
	Knowledge of healthcare economics and application to the delivery of patient care.
	Knowledge of the unit and departmental budgeting processes—both capital and operational.
	Human resource management skills
	Knowledge of the process to procure new employees. This includes recruitment, interviewing, labor laws, hiring policies and new hire orientation.
	Implements effective recruitment and retention strategies.
	Performance improvement skills
	Knowledge of performance improvement tools. Tools includes work flow analysis, cause and effect diagrams, root cause analysis, run charts and control charts.
	Knowledge of quality improvement strategies such as continuous quality improvement, Total Quality Management, Six Sigma, and Balanced Scorecards.
	Knowledge of and role models patient safety behaviors.
	Knowledge of fundamental principles and regulations related to workplace safety.
	Foundational thinking skills
	Knowledge of principles of systems thinking and complex adaptive systems.
	Knowledge of organizational behavior such as planning, organizing, leading.
	Demonstrates effective decision-making and problem-solving skills.
	Technology skills
	Knowledge of the effect of technology on patient care delivery and safety.
Understands the organizations electronic medical record system.	
Strategic management skills	
Demonstrates project management skills. This includes managing timelines, budgets, and resources.	
Knowledge of basic business skills such as developing a business case and the project planning process.	
Demonstrates effective written and oral presentation skills.	
Develops strategic and operational plans.	
Knowledge of and implements shared governance in department(s).	
Clinical practice knowledge	
Demonstrates knowledge of evidence-based nursing practice needed to lead the clinical services.	
Art of leadership	Human resource leadership skills
	Knowledge of the staff development process. This includes ongoing competency assessment and staff development.
	Knowledge of how to manage performance of employees. This includes performance appraisals, goal setting, motivation, and the disciplinary process.
	Demonstrates effective coaching and mentoring skills for employees.
	Knowledge of how to develop a succession plan.
	Relationship management and influencing behaviors
	Demonstrates effective communication skills to include negation, persuasion, mediation, and conflict management.
	Displays effective interpersonal leadership skills such as team building, emotional intelligence, self-awareness, and collaborative practice.
	Diversity management skills
	Role models cultural competence.
	Adheres to principles of social justice by creating an environment of fairness.
Able to lead multi-generational work teams.	

TABLE 2. Descriptive Statistics for Unit Characteristics (N = 594)

CONTROL VARIABLE	UNIT LEVEL	
	FREQUENCY	PERCENT
Hospital size		
Small (<100)	24	4.0
Medium (100–299)	258	43.4
Large (≥300)	312	52.5
Hospital location		
Metropolitan area	579	97.5
Micropolitan area	13	2.2
Teaching status		
Teaching	457	76.9
Non-teaching	137	23.1
ANCC credential status		
Magnet	130	21.9
Magnet on the journey	272	46.0
Non-magnet	191	32.1
Pathway to Excellence	18	3.0
Unit type		
Adult critical care	64	10.8
Adult step down	55	9.3
Adult medical	60	10.1
Adult surgical	40	6.7
Adult med-surg combined	47	7.9
Obstetrics/perinatal	41	6.9
Neonatal	24	4.0
Peds general	24	4.0
Peds critical care	14	2.4
Emergency department'	35	5.9
Psychiatric	12	2.0
Perioperative	58	9.8
Rehab	19	3.2
Ambulatory	38	6.4
Interventional	61	10.3
Mixed beds	2	.3

Design, Data Source, and Study Sample

The survey data collected for Warshawsky's 2017 NM study were used for this psychometric testing study. According to a priori power analysis with Monte Carlo simulation, a minimum of 250 NMs in 50 hospitals were needed to achieve 90% of power (Warshawsky & Cramer, 2019). The sample of this study included 594 NMs from 43 U.S. hospitals (see Table 2). More than half of the NM participants worked in hospitals with over 300 beds (53%), and majority of hospitals were in metropolitan areas (98%). Seventy-one percent of the NMs were from units in hospitals that were pursuing or have been designated by the American Nurses Credentialing Center for one of the organizational recognitions:

TABLE 3. Descriptive Statistics for NM Characteristics (N = 594)

	Frequency	Percent
NM highest nursing education		
Diploma, associate, or baccalaureate degrees	396	66.7
Masters or higher degrees	195	32.8
NM leadership-specific certification		
Not certified	281	47.3
Certified	132	22.2
Missing/no response	181	30.4
Race		
Asian/Pacific Islander	13	2.2
African American	19	3.2
Hispanic	21	3.5
White	501	84.3
American Indian	1	.2
Other/mixed	9	1.5
Missing/no response	10	1.7
	<i>Mean</i>	<i>SD</i>
Age	45.21	9.98
Years of experience in management	6.71	7.11

Magnet-designated (21.9%), Pathway-designated (3.0%), or are on the journey to becoming Magnet designated (46.0%). Most NMs worked on adult medical and surgical units (24.7%).

NMs were mostly White (84%) and female (86%). The mean NM age that took part in the study was 45.21 years ($SD = 9.98$), ranging between 24 and 70 years old. The mean years of management experience for NMs was 6.71 ($SD = 7.11$), ranging from less than one to 40 years of experience. A third of the NMs had masters and above in nursing (33%), and the remainder of the sample was prepared at the baccalaureate-degree level (62%), associate (4%), or diploma (0.8%). Thirty percent of the NMs did not provide information about certification and about 47% responded that they did not have any leadership certification (see Table 3).

Data Analysis

Item Analysis. Item-total correlations were assessed to determine how strongly each item in the scale is associated with the overall scale. Each item's contribution to the overall Cronbach's alpha was determined by looking at changes in alpha when items are deleted (Field, 2005). Pearson correlations were assessed between each item's scores and the average of the scores for all items. Descriptive statistics and frequency and pattern of missing responses were also examined.

Dimensionality. Confirmatory Factor Analysis (CFA) was conducted with Mplus version 8 (Muthén & Muthén, Los Angeles, CA, USA) to confirm the underlying structure of the items in the instrument, to identify the nature of relationships among unique variances of the items in the instrument, and to determine if covariation is due to reasons other than the shared influence of the latent variable or common factor (Brown, 2015). Based on the NM Learning Domain Framework, it was hypothesized that the 26 items would be loaded into ten factors (representing ten essential leadership competencies).

CFA was also used to assess how to best score the NMCIR (using the subscales only, or also the composite score of all items) based on the pattern of factor loadings. The CFA solution were evaluated based on the following fit indices recommended by Hoyle (2000): Chi-square, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMSR).

Reliability Testing. Reliability indicates the precision or consistency of measurement. This study was the first to assess the NMCIR's reliability. Internal consistency of items was evaluated by assessing the Cronbach's alpha and performing CFA. The factor loadings, error variances, and error covariances estimated from the CFA solution were used to obtain point estimates and 90% confidence intervals (CIs) to assess the overall proportion of true-score variance to total observed variance of the measure (Brown, 2015). In addition, each item was evaluated by looking at the magnitude, direction, and significance of the factor loadings from the CFA.

Validity Testing. AONL's periodic job analysis and role delineation studies helped establish content validity of the items in the original 55-item tool (AONL, 2015). Preliminary modifications to AONL's NM Competency Assessment tool were tested in a prior study of NMs working in two hospitals (Baxter & Warhowsky, 2014). Two versions of the AONL tool were compared. One version included all 55 items. A second version asked nurse managers to assess competence for each AONL competency domains presented with detailed descriptions. Similar results were obtained but it was unclear if the similar performance was adequately captured by the instruments. In the current study, CFA was performed to assess the validity of the instrument. CFA model was constructed to include the competency skills from the following latent and observed factors: (1) *Science of Leadership* included financial management, human resource management skills, performance improvement skills, foundational thinking skills, technology skills, strategic management skills, and clinical practice knowledge; and (2) *Art of Leadership* included human resource leadership skills, relationship management and influencing behaviors, and diversity management skills. Additionally, a second-order CFA was conducted to distinguish between the domains of *Science of Leadership* and *Art of Leadership*. Correlations between factors were evaluated for both models. Finally, Cronbach's alpha coefficients were computed for each of the subscales to assess the level of internal consistency.

RESULTS

Item Analysis

Descriptive summary with the central tendency (mean) and dispersion (standard deviation, skewness, and kurtosis) for the subscales is displayed in Table 4. The mean composite score of NM competency was 3.41 ($SD = 0.73$). Relating to its subscales, NMs reported greatest competence in their diversity management skills ($M = 3.82$, $SD = 0.72$), technology skills ($M = 3.71$, $SD = .080$), and clinical practice knowledge ($M = 3.67$, $SD = 0.82$). Conversely, NMs reported least competence in their financial management ($M = 2.99$, $SD = 1.01$), strategic management ($M = 3.14$, $SD = 0.86$), and performance improvement skills ($M = 3.28$, $SD = 0.81$).

Dimensionality

The results of the CFA showed that the chi-square statistic of the model fit was significant, $\chi^2(281, N = 593) = 1038.33$, $p < .001$, which is indicative of an imperfect fit. However, chi-square is sensitive to the sample size; hence, the CFI, SRMSR, and RMSEA were also considered to evaluate model fit. The CFI was .94 and SRMSR was .04, both indicative of a well-fitting model. The RMSEA, which represents the differences between the observed and model-implied covariances, was .07 (90% CI = [.067, .072]), slightly higher than .06; RMSEA values less than .06 in the lower bound of the 90% confidence interval (CI) indicate a good fit.

Reliability

Standardized item loadings of the latent factors are presented in Table 5. All 26 items significantly loaded onto their respective factors (all p -values $< .001$), with standardized item loadings ranging from 0.68 to 0.91. Furthermore, all these items correlated well with the average, with item-total correlations ranging from 0.63 to 0.84, indicating good reliability of measures (Field, 2005). The standardized estimates of covariance between the factors demonstrated that all possible bivariate relationships between the competencies were significantly correlated at $p < .001$. No modifications were made to the factor structure of the instrument based on the model fit, item loadings, and covariances. Internal consistency reliability coefficients are presented in Table 6. Cronbach's alphas ranged from .84 to .91, indicating

TABLE 4. Descriptive Statistics for NM's Self-Assessed Competency (N = 594)

COMPETENCY	MEAN	SD	SKEWNESS	KURTOSIS
NM competency subscale				
Financial management	2.99	1.01	-0.21	-0.70
Human resource management skills [*]	3.58	0.95	-0.66	0.23
Human resource leadership skills ^b	3.45	0.87	-0.48	-0.10
Performance improvement skills ^b	3.28	0.80	-0.17	-0.32
Foundational thinking skills ^b	3.40	0.83	-0.23	-0.36
Technology skills ^a	3.71	0.80	-0.42	0.32
Relationship management and influencing behaviors ^c	3.57	0.83	-0.37	0.11
Diversity management skills ^c	3.82	0.72	-0.56	0.81
Strategic management skills ^b	3.14	0.86	-0.05	-0.66
Clinical practice knowledge ^a	3.67	0.82	-0.33	-0.02
Overall (composite mean score of the NM Competency Scale) ^b	3.41	0.73	-0.30	-0.19

Note. SD = standard deviation.

^{*}n = 590,

^an = 591,

^bn = 593,

^cn = 592.

high correlations with the items in each competence factor and affirming that these items measured the same construct (Kline, 2000). As all the factors showed high internal consistency, no items were recommended for removal.

Validity

Table 7 shows that correlations with some factors were high, especially between human resource leadership skills and human resource management skills ($r = .92$), performance improvement skills and human resource leadership skills ($r = .90$), and foundational thinking skills and performance improvement skills ($r = .93$). These findings indicate poor discriminant validity; thus, the items should be evaluated further. The second-order CFA that was conducted to distinguish between the domains of *Science of Leadership* and *Art of Leadership* also demonstrated poor discriminant validity. The second-order model demonstrated worse fit than the previous one that did not contain second-order factors, $\chi^2(316, N = 593) = 1479.47, p < .001, CFI = .90, SRMR = .07, RMSEA = .08$ (90% CI = [.075, .083]). The standardized loadings of the competencies on the science domain ranged from 0.64 to 0.96 (all p -values $< .001$), while those for the art domain ranged from 0.84 to 0.95 (all p -values $< .001$), indicating that each competency was strongly associated with other items (or measures) in its respective domain. Furthermore, the correlation between both domains was .98 ($p < .001$), which also suggests items under the two domains being closely related.

DISCUSSION

Our findings from CFA and Cronbach's alpha test supported the reliability of Warshawsky's NMCIR instrument. The results demonstrated a high internal consistency reliability, indicating high correlations with the items in each subscale. Furthermore, items in the subscales measured the same constructs. Item-total correlation coefficients ranged from 0.63 to 0.84, indicating that the items correlated well with the scale overall (Field, 2005). Cronbach alphas ranged from 0.84 to 0.91, further indicating high intercorrelations among the items (Kline, 2000). High correlations between certain competencies were found, especially between human resource leadership skills and human resource management skills,

TABLE 5. Standardized Items Loadings and Item Total Correlations for Latent Factors (N = 594)

ITEM	STANDARDIZED ITEM LOADING	S.E.	P	ITEM TOTAL CORRELATION
Financial management (FM; n = 591)				
FM1: Knowledge of healthcare economics and application to the delivery of patient care.	0.83	0.02	< .001	.72
FM2: Knowledge of the unit and departmental budgeting processes—both capital and operational.	0.87	0.02	< .001	.72
Human resource management skills (HRMS; n = 588)				
HRM1: Knowledge of the process to procure new employees. This includes recruitment, interviewing, labor laws, hiring policies and new hire orientation.	0.89	0.01	< .001	.82
HRM2: Implements effective recruitment and retention strategies.	0.91	0.01	< .001	.82
Human resource leadership skills (HRLS; n = 591)				
HRLS1: Knowledge of the staff development process. This includes ongoing competency assessment and staff development.	0.86	0.01	< .001	.80
HRLS2: Knowledge of how to manage performance of employees. This includes performance appraisals, goal setting, motivation, and the disciplinary process.	0.90	0.01	< .001	.84
HRLS3: Demonstrates effective coaching and mentoring skills for employees.	0.88	0.01	< .001	.84
HRLS4: Knowledge of how to develop a succession plan.	0.80	0.02	< .001	.76
Performance improvement skills (PIS; n = 589)				
PIS1: Knowledge of performance improvement tools. Tools include workflow analysis, cause and effect diagrams, root cause analysis, run charts and control charts.	0.78	0.02	< .001	.71
PIS2: Knowledge of quality improvement strategies such as continuous quality improvement, Total Quality Management, Six Sigma, and Balanced Scorecards.	0.74	0.03	< .001	.70
PIS3: Knowledge of and role models patient safety behaviors.	0.73	0.03	< .001	.63
PIS4: Knowledge of fundamental principles and regulations related to workplace safety.	0.79	0.02	< .001	.69

(Continued)

TABLE 5. Standardized Items Loadings and Item Total Correlations for Latent Factors (N = 594) (Continued)

ITEM	STANDARDIZED ITEM LOADING	S.E.	P	ITEM TOTAL CORRELATION
Foundational thinking skills (FTS; n = 589)				
FTS1: Knowledge of principles of systems thinking and complex adaptive systems.	0.82	0.02	< .001	.75
FTS2: Knowledge of organizational behavior such as planning, organizing, leading.	0.87	0.02	< .001	.81
FTS3: Demonstrates effective decision-making and problem-solving skills.	0.86	0.01	< .001	.76
Relationship management and influencing behaviors (RMIB; n = 590)				
RMIB1: Demonstrates effective communication skills to include negation, persuasion, mediation, and conflict management.	0.87	0.02	< .001	.76
RMIB2: Displays effective interpersonal leadership skills such as team building, emotional intelligence, self-awareness, and collaborative practice.	0.87	0.01	< .001	.76
Diversity management skills (DMS; n = 589)				
DMS1: Role models cultural competence	0.87	0.02	< .001	.79
DMS2: Adheres to principles of social justice by creating an environment of fairness.	0.87	0.02	< .001	.81
DMS3: Able to lead multi-generational work teams.	0.84	0.02	< .001	.77
Strategic management skills (SMS; n = 586)				
SMS1: Demonstrates project management skills. This includes managing timelines, budgets, and resources.	0.87	0.01	< .001	.80
SMS2: Knowledge of basic business skills such as developing a business case and the project planning process.	0.84	0.02	< .001	.79
SMS3: Demonstrates effective written and oral presentation skills.	0.68	0.03	< .001	.64
SMS4: Develops strategic and operational plans.	0.85	0.01	< .001	.81
SMS5: Knowledge of and implements shared governance in department(s).	0.72	0.02	< .001	.66

TABLE 6. Cronbach's Alpha Coefficients for the Subscales (N = 594)

FACTOR	NUMBER OF ITEMS	CRONBACH'S ALPHA
Financial management (<i>n</i> = 591)	2	.84
Human resource management skills (<i>n</i> = 588)	2	.90
Human resource leadership skills (<i>n</i> = 591)	4	.91
Performance improvement skills (<i>n</i> = 589)	4	.84
Foundational thinking skills (<i>n</i> = 589)	3	.88
Relationship management and influencing behaviors (<i>n</i> = 590)	2	.86
Diversity management skills (<i>n</i> = 589)	2	.89
Strategic management skills (<i>n</i> = 586)	5	.89

performance improvement skills and human resource leadership skills, and foundational thinking skills and performance improvement skills ($r > .90$). Findings indicate poor discriminant validity; thus, the items should be evaluated further. For example, given that both human resource management skills in the *Science of Leadership* domain and human resource leadership skills in the *Art of Leadership* domain are similar constructs, the potential for removing items in one of the skills should be considered. In addition, the competencies were strongly associated with one overall factor. The second-order CFA that was conducted to distinguish between the domains of *Science of Leadership* and *Art of Leadership* also demonstrated poor discriminant validity. Items under the two domains might be closely related and should be analyzed further. Again, both human resource management skills and human resource leadership skills are looking at very similar constructs. Assessing whether both human resource-related competencies would be a better fit under the *Art of Leadership* domain can be an approach for future research to improve the discriminant validity of the NMCIR instrument.

Some of the limitations included self-reported NM competency data and potential influence of perceived researcher's expectations on participant responses as well as participant's expectation on the survey, which can pose threats to construct validity of study design. Potential threats to external validity and generalizability of results might also be plausible because our sample obtained from the National Database of Nursing Quality Indicators overrepresented hospitals that achieved or were pursuing the ANCC's Magnet or Pathway to Excellence designations. Continued professional development, succession planning, and leadership development are requirements for both ANCC designations; therefore,

TABLE 7. Correlations Between Factors (N = 594)

FACTOR	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Financial management (<i>n</i> = 591)									
2. Human resource management skills (<i>n</i> = 588)	.84								
3. Human resource leadership skills (<i>n</i> = 591)	.84	.92							
4. Performance improvement skills (<i>n</i> = 589)	.81	.81	.90						
5. Foundational thinking skills (<i>n</i> = 589)	.78	.80	.89	.93					
6. Technology skills (<i>n</i> = 591)	.35	.42	.45	.53	.51				
7. Relationship management and influencing behaviors (<i>n</i> = 590)	.67	.73	.84	.80	.86	.47			
8. Diversity management skills (<i>n</i> = 589)	.58	.70	.76	.78	.78	.55	.88		
9. Strategic management skills (<i>n</i> = 586)	.85	.80	.86	.89	.88	.51	.80	.72	
10. Clinical practice knowledge (<i>n</i> = 591)	.55	.53	.61	.68	.67	.45	.64	.72	.66

Notes. All correlations significant at $p < .001$.

are emphasized in those hospitals (Bates, Hargreaves, McCright, Pabico & Hume, 2020; Pabico, & Graystone, 2018; Pabico, Perkins, Graebe, & Cosme, 2019). The sample of this study also contained a greater proportion of large hospitals which further limits the generalizability of results to similar-sized hospitals. Finally, additional content expert review was not performed, which could also be considered analytical limitations to the psychometric testing.

Relevance to Nursing Research

The credibility of the data analysis relies on the reliability and validity of the instrument being used. The reliability of Warshawsky's NMCIR instrument was supported by the results of CFA and Cronbach's alpha test. The results demonstrated that all items significantly were loaded onto their respective factors. All possible bivariate relationships between the competencies were significantly and strongly correlated. Our findings from CFA supported the construct validity of this NMCIR instrument. Findings from this psychometric evaluation will support the use of the NMCIR instrument for future research on NM competence. Use of a parsimonious, valid and reliable tool to measure NM's competency can help assess the current state of NM competence, identify areas of opportunity to improve leadership practice, and identify valuable correlations between NM's competency and patient, nurse, and organizational outcomes.

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Correspondence regarding this article should be directed to Christine Pabico, PhD, RN, NE-BC, FAAN, Director, ANCC Pathway to Excellence, American Nurses Credentialing Center, 9512 Wigwag Ct., Manassas, VA 20111. E-mail: Christine.pabico@ana.org