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RESEARCH ARTICLE

Development and Psychometric Evaluation of Registered Nurses' Clinical Leadership Scale (RN-CLS) in Bangladesh

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ABSTRACT

As the largest front-line healthcare workforce, active clinical leadership among nurses is vital for ensuring high-quality patient care and an effective response to the growing needs of healthcare. A number of Clinical Nurse Leadership scales were found in current literature, but none of them were suitable or consistent with the current study context. Hence, the aim of this study was to develop a context specific Registered Nurses' Clinical Leadership Scale for Bangladesh and evaluate its psychometric properties. An inductive mixed-methods design used in this study as well the specific factor structure of the Scale. The development and psychometric evaluation of the Clinical Nurse Leadership Scale involved a two-phase, eight-step process, beginning with an extensive literature review and culminating in the examination of content validity, face validity, a pilot evaluation, and construct validity using exploratory factor analysis. Internal consistency was confirmed by Cronbach's α coefficient, using data from 627 clinical registered nurses. Contrasted group analysis was performed for known-group validity testing, and test-retest reliability was assessed for stability.

The Registered Nurses Clinical Leadership Scale demonstrated an acceptable level of construct validity and excellent internal consistency. Factor analysis identified 9 components for 92 items, accounting for a total variance of 52.06%. The overall Cronbach's alpha was 0.96 and ranged from 0.84 to 0.92, across 9 components. These were: assessment and evaluation, patient-centered intervention, imply quality and safety, caring relationship, interdisciplinary collaboration, skills of communication, professional values in caring, decision making or problem-solving and professional development. There was statistically significant difference between low and high-performance contrasted group's result ($p<.01$). The test-retest result also found significantly high correlation between the test one and two on the scores of the scale ($r = 0.92$; $p<.001$). Thus, the final version of the Registered Nurse Clinical Leadership Scale (RN-CLS), consisting of 92 items across nine factors demonstrated high validity and reliability.

Keywords: Clinical Nurse Leadership, Registered Nurse, Scale Development, and Psychometric Evaluation

1. Introduction

Globalization and advances in medical technology are impacting healthcare in Bangladesh by increasing access to quality care, but also posing challenges to meet the growing demands for such care. These changes affect not only the structure of healthcare but also the knowledge and skills of healthcare professionals including nurses in clinical care[1]. As in other countries, nurses in Bangladesh's public hospitals are the second largest workforce, responsible for providing direct patient care. According to the Directorate of Nursing and Midwifery, more than 95% of nurses are working in different public hospitals as bedside nurse[2]. However, the quality of nursing care in public hospitals is a major concern and is relatively low compared to non-government hospitals or neighboring countries[3]. According to In-depth Country Assessment on Nursing and Midwifery, the issue of this poor-quality nursing care was reported as a direct link to the low reputation and poor image of nursing in Bangladesh[4,5].

Regardless few controversies about the factors associated with the quality of patient care, number of studies claimed that, the poor-quality patient care is largely associated with ineffective role performance and skills of clinical nurses[4-6]. Yeh et al. identified three major challenges contributing to the lack of access to quality nursing care in Bangladesh: a scarcity of nurses in clinical care, a lack of appropriately skilled nurses, and a lack of professional leadership[5]. Consequently, nursing suffers from poor recognition and receives inadequate priority as an important member of the healthcare team[4]. In addition, due to a lack of updated knowledge, skills, and leadership confidence, nurses are frequently excluded from active participation in clinical care decision-making or clinical change management[4,7]. Thus, nurses are usually reliant on physician's order and instruction in managing patient care or taking clinical decisions[4,8].

Although it is true that the problem of nursing leadership in Bangladesh is not only on the clinical side, but this problem exists at every nursing administrative level[6,5]. However, problems associated with clinical nursing leadership (CNL) are more acute because they are directly related to patient outcomes and satisfaction[1,8,9]. Moreover, the quality of clinical nursing care is the mirrors of the quality of nurses and the standard of healthcare services[10]. Thus, given that nurses are the largest frontline workforce, strong clinical leadership is essential for an effective response to the growing needs and reforms that call for innovations to meet patient satisfaction and address evolving healthcare challenges[1,11]. But unfortunately, nurses in Bangladesh were inadequately prepared with the expected skills to perform their active role as effective clinical leaders and response to the growing needs in healthcare[4,6,7]. In the health care of Bangladesh, ineffective professional leadership was reported as a major challenge for advancing the nursing profession[5]. Based on the existing situation, there was a lack of study in Bangladesh to address the issue of clinical leadership, particularly demonstrating identical leadership quality by nurses when they are involved in direct patient care.

At the same time, it was also unknown to what extent existing nurses in Bangladesh were prepared in terms of required clinical skills to meet growing demands in healthcare. Although some related instruments exist in the literature, they have several limitations regarding their validity and reliability within the clinical nursing context of Bangladesh. This is because most of them were not specifically designed for clinical nurses[12,13], were developed in Western healthcare contexts[14,15], and have demonstrated inadequate psychometric evaluations. Therefore, the researcher in present study focused on the importance of clinical nurse leadership scale development in the context of nursing and healthcare in Bangladesh. Therefore, this study explored the components of clinical nurse leadership skills to create a context-specific, culturally valid, and reliable measure that would specifically focus on clinical nurses' leadership knowledge and skills within their scope of practice.

2. Study Aim

This study aimed to develop and evaluate the psychometric properties of Clinical Leadership Scale for the Registered Nurses in Bangladesh (RN-CLS) to measure the clinical nurse's leadership skills.

3. Methods:

Study design: This study used an inductive mixed-methods research design for the development and psychometric evaluation of the of the Clinical Leadership Scale of Registered Nurses in Bangladesh (RN-CLS). De Vellis's guidelines for scale development and evaluation was followed in this study, which consist of two phases with eight steps: Phase 1 (5 steps) and Phase 2 (3 steps)[16].

4. Research Process

4.1. Phase 1: Instrument Development

Step 1: Determining the Content Domains: The aim of this step was to clarify the concept, determine a related theory, and explore the critical elements of the scale as predetermined components. This step began with an extensive review of related theories, concepts, and existing tools, and included two focus group discussions with 14 nurses from nursing administration, nursing education, and clinical care. In this study, Katz's three skills leadership theory was used as theoretical foundation including, Technical Skills, Conceptual Skills, and Human Skills[17]. Finally, based on an integration of Katz's three-skill leadership approach[17], the American Association of Colleges of Nursing's concept of the Clinical Nurse Leader (CNL)[18], and the results of focus group discussions (FGDs), 11 predetermined scale components were selected to represent the clinical leadership skills of Registered Nurses (RNs) in Bangladesh. These were: 1) diagnose the genuine problems and needs of the patients, 2) develop patient-centered intervention, 3) imply quality and safety in patient care, 4) monitor and evaluate clinical effectiveness, 5) optimize patient care with the competence in medical technology, 6) establish caring relationship with patients and families, 7) encourage interdisciplinary collaboration, 8) demonstrate understandable communication skills, 9) practice with professional values of nursing, 10) problem-solving and decision –making skills, and 11) participate in enhancing professional advancement

Step 2: Defining the Target Constructs and Generating the Items: This step involved specifying a clear objective for each construct, providing operational definitions, and generating the item pool[16]. An explicit operational definition was provided for each of the identified skill categories based on the literature review and the focus group suggestions. Next, grounded on operational definitions and objectives of each skill component of the RN-CLS, total 122 items were generated.

Step 3: Determining the Format for the Measurement: The response format of the RN-CLS was designed as a 5-point Likert-type with a summated rating scale ranged from 1=never perform/practice this skill, to 5= always perform/practice this skill. A norm reference framework was used to guide the design and interpretation of the scale[19].

Step 4: Examining the Content Validity: The initial item pool was reviewed by five content experts in nursing and nursing leadership to determine the Content Validity Index (CVI). Experts independently rated each item for clarity and relevance using a four-point scale (1 = not relevant/clear to 4 = very relevant/clear). Ratings of 3 or 4 were used to calculate the Content Validity Index (CVI). The overall Scale Content Validity (S-CVI) was 0.85 and Item Content Validity (I-CVI) ranged from .80 to 1.00 for 122 items. Two items were added based on experts' suggestions and 10 items were revised for more clarity, resulting in a total of 124 items after the CVI process.

Step 5: Pre-Testing the Items: After assessing content validity, formatted questionnaires were sent to five clinical RNs to examine clarity, comprehensiveness, time to answer, and

administrative feasibility in a subsequent trial. Next, the RN-CLS was applied for pretesting among 30 clinical RNs in the conditions similar to anticipated study settings and subjects. The Cronbach's alpha coefficient for overall RN-CLS was0.96; and for sub-scales ranged from0.68 to 0.86. Only 2 items were deleted due to the item-total correlation of <.30. Finally, 122 item pools were used in final field test of the RN-CLS.

4.2: Phase 2: Evaluation of the Psychometric Properties

This phase consists of three steps. Step-6, a field test was conducted to evaluate the reliability and validity; step-7, to estimate the test-retest reliability; and step-8, to examine the contrast group validity for the final version of the RN-CLS.

Step 6: Administering the Items for Field Test: After necessary revisions based on the pilot study, the RN-CLS was employed for field test to determine the psychometric properties with a large group of study samples as empirical evidence[16]. This step was performed through employed the RN-CLS in a large sample of clinical registered nurses in two medical college hospitals in Bangladesh. The data were used to evaluate the internal consistency reliability, scale length, and different types of validity.

4.3 Study participants: This study was carried out in two tertiary level medical college hospitals. These were Dhaka Medical College Hospital (a 2500-bed hospital and the largest in the capital) and Mymensingh Medical College Hospital (a 1000-bed hospital and the largest divisional hospital) in Bangladesh. Of the 890 clinical RNs included in this study, 689 returned the questionnaire, yielding a 76.4% return rate. Sixty-two incomplete datasets (with >10% missing data) were excluded, resulting in a final sample of 627 complete datasets for factor analysis.

4.4 Ethical consideration: Data collection began after receiving approval from the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University, Thailand, and obtaining permission from the selected study settings. Written consent was obtained from study participants after explaining the purpose of the study and emphasizing their voluntary participation. The data were collected and handled anonymously. Because this was a risk-free study, the return of the questionnaire was considered implied consent to participate.

4.5 Data Analysis: The statistical analysis was performed in two stages using SPSS 16.00 software: first, the data screening using descriptive statistics including the completeness or missing and assumption tests; and the secondly performed descriptive analysis for demographic data and factor analysis. The participant's demographic data were summarized using descriptive statistics (mean, SD and percentage). Psychometric tests, including construct validity, were examined by Exploratory Factor Analysis (EFA) and the Contrasted Group Technique. Reliability was assessed via internal consistency (Cronbach's alpha coefficients) and test-retest methods for stability. To extract the number of factors, an eigenvalue ≥ 1 was used as the extracting criterion with varimax and oblique rotation to examine which factors were comprised of coherent groups of items in the scale. The overall score on clinical leadership skills of RN-CLS was calculated by averaging the values of the skills-related items. The item-total correlation matrix also examined by correlation coefficients (r), in which, the items for (r) less than 0.3 were excluded after initial analysis.

5. Results

5.1 Participant's Demographic Characteristics

Among the 627 study participants, 50% were between 30 and 45 years old (mean = 35.6 ± 9.2 years). The majority of subjects were female (88%), and almost two-thirds (75%) held a diploma as their highest professional nursing qualification. The average job experience was 12.3 ± 8.6 years in the public hospitals, in which nearly 60% were between 21years and over of the job experiences

as clinical nurse. In terms of current job positions, around 88% participants were senior staff nurse (as general RNs and nearly 12% of them were working as staff nurse in-charge from the different units of the hospitals.

5.2 Scale Evaluations

The final evaluation of the RN-CLS included examinations of construct validity and assessments of the scale's reliability. The construct validity of the RN-CLS was assessed using EFA with orthogonal varimax rotation. Following the assessment of construct validity by EFA and internal consistency using Cronbach's alpha, further construct validity was examined using the Contrasted Group Technique with two additional groups of study participants. The details of each validity and reliability tests are given below:

Initial item performance: Inter-item and item-total correlation statistics were used to examine the reliability of each item. Based on these results, 22 items with low item-total correlations (<0.30) were excluded from the EFA[16,20]. The average item-total correlation for the 92 items ranged from 0.30 to 0.64. Because deleting items with low values did not improve reliability, the 92-item scale was retained. The details of the scale reliability results are shown in the Table 1.

Construct validity: The construct validity of RN-CLS was examined by exploratory factor analysis (EFA) using Principal Component Analysis (PCA) with varimax rotation of factor loadings that indicated Barlett's test of sphericity was significant (χ^2 = 42961.42, p = 0.000), and the Kaiser-Meyer-Olkin (KMO) value was 0.92 with 102 items. The initial EFA showed 20 factor solutions with eigenvalues of > 1.0 and factor loadings cutoff point at least 0.30. The inspection of the scree plot revealed that an 8 to 10 factor solution was appropriate (Figure 1). After sequential analysis, 9 factor structures were found to be the best factor solution which together accounted for 52.06% variance explained for 92 items with factor loadings cutoff point was at least 0.40 (Table 4), and eigenvalues ranging from 4.01 to 10.25. The results of factor analysis with extracted 9 (nine) factors were showed in Table 1. The results of internal consistency reliability for the scale, overall Cronbach's alpha coefficient of RN-CLS was 0.96 for 92 items, and across the 09 sub-scales Cronbach's alphas were from 0.84 to 0.92.

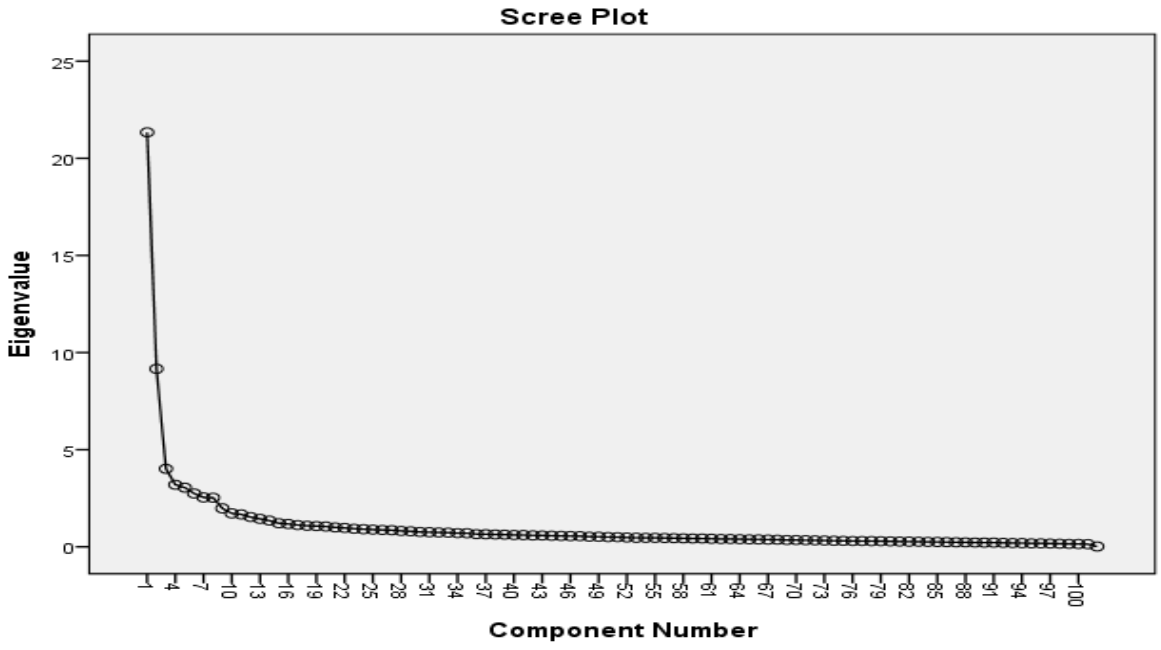

Figure 1. Feature of the Scree Plot for 102 Items of RN-CLS with the Eigenvalue >1 (Breaking Occurred Between the 8th to 10th Factors)

Table 1. The Number of Extracted Factors Including Items, Factor Loadings, Total Variance and Eigenvalue, Cronbach's Alpha, and Item-total correlations of Extracted 09 Factors of RN-CLS (N=627).

Factor's Name	Eigen-values	Total variance	Number of items	Cronbach's alpha levels	Item-total correlations
1. Assessment and evaluation	8.76	7.45	14	.89	.46-.73
2. Patient-centered intervention	3.16	6.53	12	.90	.43-.70
3. Imply quality and safety	3.95	6.88	10	.91	.60-.75
4. Caring relationship	2.60	4.20	9	.84	.41-.68
5. Interdisciplinary collaboration	2.43	4.07	8	.85	.42-.78
6. Skills of communication	3.01	4.54	7	.86	.45-.77
7. Professional values in caring	1.94	4.01	5	.90	.68-.85
8. Decision-making	20.04	10.25	20	.92	.47-.71
9. Professional development	2.51	4.12	7	.86	.56-.74
RN-CLS overall scale level	20.04	52.06	92	.96	.41-.85

Step: 7 Examine Stability Reliability: The test-retest for stability reliability of the RN-CLS was tested by administering the scale among 30 clinical registered nurses in two time points with 10 days intervals, who were purposively selected. The participants were also asked to mention how long it took them to answer the entire questionnaire including the demographic data form. The results of Pearson's correlation coefficient (r) found a significantly high correlation between two tests scores over time, the total scale's r was r = 0.92, and across 9 subscales (r) ranged from 0.73 and 0.91, indicating an acceptable stability between the test sessions The average duration for answering the whole questionnaires was 30 min (Table 2).

Table 2: Test-Retest Reliability of the RN-CLS, BD for overall and subscales for Pearson's correlations (N=30).

RN-CLS with 9 Subscales	Test-1	Test-2	(r)
	Mean (SD)	Mean (SD)	
Assessment and evaluation	56.0(6.0)	58.9(8.3)	.88**
Patient-centered intervention	49.9(6.1)	52.4(6.5)	.83**
Imply quality and safety	42.1(3.5)	38.4(4.6)	.91**
Caring relationship	35.9(5.3)	40.5(5.3)	.73**
Interdisciplinary collaboration	34.9(3.6)	37.0(3.7)	.78**
Skills of communication	28.93(3.78)	30.60(3.95)	.78**
Professional values in caring	22.46(2.30)	26.86(2.93)	.86**
Decision-making	83.13(8.70)	89.26(9.74)	.85**
Professional development	28.40(4.57)	29.60(3.17)	.85**
Overall RN-CLS	381.8(31.5)	403.6(39.5)	.92**

**p<.001

Step:8 Contrasted Known Groups Analysis: To assess the evidence of construct group validity, the final version of the RN-CLS was administered to two contrasting familiar groups. of 60 clinical registered nurses: the high-performance group (n=30) and low-performance (n=30) group. The subjects in the two groups were selected with different known clinical performance and job experiences (≤ 5years, and ≥10 years), which were ensured by the Nursing Supervisor of the hospital. The results of an independent samples t-test indicated a significant difference between the two groups' mean scores on the RN-CLS ($t = 3.872$, $p < 0.001$) (Table 3)."

Table 3: Compression of two contrasted known group's mean scores on RN-CLS (N=60).

Groups	Score of RN-CLS		t-test	p-value
	Mean	SD		
High-performance group	418.23	41.71	3.872	.000
Low- performance group	363.33	58.32		

Table 4: The Item Loadings and level of Commonalities of the RN-CLS BD Scale by Items and Factors (N= 627):

RN-CLS Scale and subscale with item.		Loadings	h^2
1. Assessment and Evaluation			
1.	Conduct an in-depth assessment of each patient (physical, mental, social, and functional status) using different techniques.	0.46	0.44
2.	Collect subjective and objective data of each patient to formulate differential nursing diagnosis.	0.58	0.45
3.	Response sensitively to any clinical changes of the patients, needed to modify the intervention.	0.52	0.45
4.	Foresee potential risk of each patient with appropriate remedies.	0.56	0.56
5.	Use creative assessment technique to diagnose the critical health problems of patient.	0.63	0.52
6.	Verify patient's health/disease related essential information that is pertinent to nursing intervention.	0.48	0.58
7.	Draw conclusion on patients' problem with an etiological amenable to nursing intervention.	0.50	0.51
8.	Evaluate patient's prognosis based on the physical assessment and illness perception.	0.55	0.40
9.	Perform routine and subsequent follow-up of each patient to evaluate the clinical progress.	0.68	0.52
10.	Use certain data analysis technique relevant to specific clinical outcomes.	0.63	0.44
11.	Use specific tools (clinical index, checklist, report) to evaluate clinical progress of a patient.	0.61	0.46
12.	Identify patient's needs for any changes in patient care require to further improvement.	0.63	0.48
13.	Consider patient's feedback and recommendation to satisfy them and effectiveness of care.	0.71	0.61
14.	Evaluate existing care procedures/guidelines to find gaps in improving current practice.	0.73	0.62

RN-CLS Scale and subscale with item.		Loadings	h^2
2. Patient-Centered Intervention			
15.	Identify special needs of a patient, requiring a specific nursing intervention.	0.46	0.51
16.	Utilize a critical inquiry/follow-up of each patient to evaluate the effectiveness of patient care.	0.56	0.60
17.	Prioritize nursing intervention as appropriate to patient's feeling of needs	0.54	0.51
18.	Deal for the patients/families with respect to their values and beliefs.	0.45	0.30
19.	Facilitate patients/family's involvement in planning and implementing patient care.	0.47	0.47
20.	Support patients/family's decisions on patients' care.	0.70	0.60
21.	Share complete information to the patients/families in time to facilitate their choice of decisions.	0.63	0.65
22.	Assess patients' knowledge, skill or ability in managing their specific health problems.	0.58	0.53
23.	Respond promptly and appropriately to patients' needs.	0.57	0.46
24.	Update patient care with altered condition or additional intervention as needed.	0.56	0.61
25.	Collaborate with health care team and patients' families for the benefit of patients.	0.55	0.60
26.	Follow commitment to patients for making you trustworthy and dependable to the patients.	0.43	0.35
3. Imply Quality and Safety			
27.	Design specific nursing care plan based on patient's sign-symptoms and clinical evidence.	0.72	0.60
28.	Apply valid and relevant information to make a clinical decision on a patient condition.	0.65	0.50
29.	Apply updated knowledge and skills to ensure quality patient care.	0.65	0.55
30.	Use the specific measures/safety procedures to ensure patient safety- such as clinical guidelines, checklist or diagnosis devices.	0.69	0.55
31.	Strictly use patient safety rights/devices that promote safety or prevent potential risk.	0.73	0.57
32.	Make clinical judgment based on evidence.	0.74	0.65
33.	Discuss with other nurses to be aware of patient safety.	0.75	0.68
34.	Appraise carefully all patient-related data to make an authentic decision.	0.60	0.44
35.	Provide nursing care with patient safety awareness.	0.73	0.59
36.	Maintain early risk detection screening to prevent the anticipated risk of patients/staff.	0.66	0.55
4. Caring Relationship			
37.	Demonstrate empathetic listening to patients' problems.	0.68	0.59
38.	Respect human values of each patient.	0.62	0.51
39.	Develop a good rapport with the patients to understand their mind.	0.64	0.52
40.	Accept patients' negative reaction to illness perception and treatment concern.	0.62	0.55
41.	Respond positively to patient/family's negative reactions in using verbal and non-verbal approaches.	0.44	0.34

RN-CLS Scale and subscale with item.		Loadings	h^2
42.	Accept honestly own mistake towards patients/ family members for any error.	0.55	0.43
43.	Accept accountability of own responsibility within the legal scope of nursing practice.	0.43	0.41
44.	Protect patients from being violations of their rights.	0.50	0.44
45.	Maintain patient's privacy/confidentiality.	0.43	0.41
5. Interdisciplinary Collaboration			
46.	Accept uniqueness of other group members in terms of values, responsibilities, and expertise.	0.42	0.44
47.	Work together with commitment to achieve common goals/interests of the team.	0.51	0.54
48.	Encourage individual and collective opinions of other group members.	0.62	0.56
49.	Accept the differences of working styles of others in the team.	0.54	0.39
50.	Contribute actively to the team activities with a feeling of own responsibility.	0.56	0.39
51.	Accept criticism of team members to modify or reject your ideas.	0.64	0.54
52.	Ask apology for own mistakes without showing any irrelevant argument.	0.63	0.49
53.	Share clinical issue, knowledge or experience to build team efficacy.	0.78	0.71
6. Skills of Communication			
54.	Provide timely and truthful information to patients.	0.72	0.58
55.	Provide sufficient time to talk the patient for better understanding.	0.59	0.43
56.	Understand patients from their own points of view.	0.45	0.38
57.	Speak with genuine understanding to perform confident/clear conversations.	0.74	0.61
58.	Bridge professional and lay language as appropriate to deal with the audience.	0.77	0.71
59.	Use feedback from the patients or group members to avoid any misunderstanding.	0.76	0.66
60.	Negotiate own values/beliefs with the patients/colleagues to find a mutual conclusion.	0.70	0.58
7. Professional Values in Caring			
61.	Provide care to all patients, regardless of background identity (race, religion or social status).	0.68	0.62
62.	Provide care with empathy and alignment of heart, head, and hand.	0.85	0.78
63.	Exhibit highest tolerance in critical situations for the benefit of patients.	0.79	0.72
64.	Advocate for the patients who cannot speak for themselves.	0.81	0.72
65.	Conform to the standard of nursing practice even in difficult situation.	0.73	0.63
8. Decision-Making and Problem-Solving			
66.	Exclusively collect and analyze the subjective and objective data related to the problems needed to be solved.	0.47	0.41
67.	Use evidence for decision-making.	0.60	0.45
68.	Evaluate patient's severity based on patient's symptoms including observation.	0.65	0.48
69.	Don't make any stereotype decision about patient's problems without a clear justification.	0.57	0.35
70.	Listen to opinions of the person involved before making/ validating a decision.	0.57	0.40
71.	Making clinical decision to solve complicate patients' problems.	0.67	0.53

RN-CLS Scale and subscale with item.		Loadings	h^2
72.	Acknowledge urgency in making decision/problem solving to avoid unexpected consequences.	0.67	0.52
73.	Give priority to solve the problems by its acuity, severity or condition.	0.67	0.51
74.	Display creativity through offering new ideas or unique solution of a problem.	0.65	0.47
75.	Take the risk to make a decision in critical condition.	0.60	0.45
76.	Evaluate context/condition that may influence your decision-making.	0.59	0.41
77.	Encourage patient/family to participate in decision-making.	0.64	0.48
78.	Honestly accept accountability for the results of own decision making.	0.70	0.52
79.	Use lesson learned from previous decisions to improve decision-making skills.	0.65	0.47
80.	Identify issues or problems contribute to professional advancement.	0.67	0.56
81.	Provide plans/recommendations on particular areas of nursing practices.	0.60	0.42
82.	Act as collaborator for working with others team members that support to professional interest.	0.60	0.48
83.	Encourage professional relationship within and between the professional teams.	0.71	0.56
84.	Act as role model of other nurses/nursing students.	0.59	0.48
85.	Search the opportunity for personal development to meet future challenges.	0.52	0.32
9. Professional Development			
86.	Support others nurses for professional and individual development.	0.56	0.47
87.	Cooperate with other team members to ensure safety workplace of patients and staffs.	0.60	0.51
88.	Help the teams/colleagues to develop clinical guidelines, consistent with standard nursing practice.	0.66	0.55
89.	Demonstrate nursing competence when working with the multidisciplinary team.	0.69	0.61
90.	Seek opportunity to present new knowledge to the public audience.	0.74	0.66
91.	Develop new knowledge through research/innovation in nursing.	0.74	0.59
92.	Inspire other nurses to be moral agents.	0.63	0.49

6. Discussion:

The discussion of study findings was organized in four main aspects: (1) the development of the RN-CLS, (2) the factors structure and psychometric properties of the RN-CLS, (3) the scope and limitations of the study, (4) conclusions and recommendations.

6.1 The Development of the RN-CLS

This study revealed a lack of scales to assess leadership skills among clinical RNs in Bangladesh. Existing scales in the literature have limitations related to context, cultural variations, comprehensiveness, and psychometric evaluations (including tests of validity and reliability). The RN-CLS was developed as a theory grounded, concept and context-specific self-assessment measure to assess the clinical leadership skills of the RNs in Bangladesh. The contents of the RN-CLS development focused on the leadership roles, clinical nurses' tasks related skills and ability to deal with patients, families, coworkers, and interdisciplinary teams. The CVI results were highly acceptable at both the individual item level (I-CVI = 0.80-1.00) and the scale level (S-CVI average = 0.85) on 122 items. Based on expert feedback and suggestions, two new items were added, and several items were modified, resulting in a 124-item scale. Prior to

administering the RN-CLS for final evaluation, face validity and a pretest study were conducted. This resulted in the modification of 19 items to improve clarity. The modified and finalized draft, now containing 124 items, was then used in a field test to examine the scale's psychometric properties.

6.2 Factors Structure of the RN-CLS

Field test data from the RN-CLS were used to examine the construct validity of the RN-CLS. The construct validity of the scale was determined using Exploratory Factor Analysis (EFA) and Principal Component Analysis (PCA) with orthogonal varimax rotation. All necessary assumptions for factor analysis were tested to ensure data appropriateness, and criteria for construct validity were determined based on pre-set standards. The factor loadings cutoff point needs a value like 0.40, demonstrated the 9-factor structure of the RN-CLS with 92 items as an acceptable psychometric evaluation result. The total percentage of variance accounted by 9 factors for 52.06% and across 9 factors variance ranged from 4.01% to 10.25%. According to Suhr (1984) a proportion of variance for each factor of at least 5% is considered good. Given that item loadings to each factor ranged from 7 to 20 items, the content validity of each factor logically (experts' judgement) and empirically (statistical test) were acceptable in terms of covering the areas of contents of the constructs.

The overall communalities of the items of the RN-CLS ranged from 0.30-0.78 which reflected a satisfactory correlation of an item with all other items (Yong & Pearce, 2013). For item loadings of the scale, even though > 0.30 was acceptable, in this study increased to at least 0.40 (ranging from 0.41 to 0.85) thus improving the reliability of individual items and of the scale as a whole. The internal consistency measured by Cronbach's alpha was 0.96 for the overall scale and across factors ranging from 0.84 to 0.91. The level of reliability of the RN-CLS in terms of internal consistency was adequate indicating that the scale is reliable. A discussion of each extracted factor and related findings are described below:

Factor 1. Assessment and Evaluation (AE): The factor consisted of 14 items and was labeled as 'assessment and evaluation' skills which formed by combining two predetermined components of the initial conceptual framework of the study. These were: the 'diagnose problems and needs of patients' and the 'monitor and evaluate clinical effectiveness'. Although the 14 items originated from two separate components, the rotated or loaded items were highly consistent, supporting the new label for this factor. The factor loadings ranged from 0.46 to 0.73, indicating a satisfactory level of correlation between each item and the factor. For example, results revealed that 12 out of 14 items had moderate to high levels of correlation, while 2 items had relatively low levels of correlation with the factor[21]. The percentage of variance accounted for was 7.45%, the second highest of the 9 factors, with eigenvalues of 8.76. The internal consistency reliability of Cronbach's alpha was also acceptable with a value of 0.89. Satisfactory communalities of the items (0.40 to 0.62) demonstrated that each item contributed well to the variance of the factor. The factor of AE in the RN-CLS suggests that clinical registered nurses have the ability to perform an in-depth assessment and follow-up evaluation of each patient to identify critical health problems and promote progress in patient's condition. The loaded items of this factor indicated the key skills contents of RN's ability regarding: in-depth assessment of the health status of patients through collecting subjective and objective data, identify clinical changes and critical health problems with its etiology, evaluate risk, estimate a patient's progress and needs for subsequent follow-up including gaps in existing practices. Thus, all of these key indicators were highly consistent to support the factor's label.

Factor 2. Patient-Centered Intervention (PCI): The second factor was labeled as "patient-centered intervention (PCI)" for which, the factor loadings ranged from 0.43 to 0.70 and comprised of 12 items component of RN-CLS, BD. The

percentage of variance contributed by this factor on the total scale of 6.53%, the eigenvalue of 3.16, while Cronbach's alpha was 0.90. The high Cronbach's alpha coefficient of this factor reflected a higher internal consistency among the items in terms of reliability. The individual factor loadings revealed that most of the item loadings (8 items) were above 0.50 to 0.70 indicating high levels of correlation to the factor[21]. However, 4 item loadings had comparatively low item-factor correlation. As for factor loadings, the communalities of items were satisfactory as the observed variance accounted for by a common factor ranged from 0.30 to 0.65.

The rotated items of the factor 2 were highly consistent measurement the attributes of PCI. The items of this factor emulated the RN's ability to: recognize special needs requiring special intervention; conduct a critical inquiry to evaluate care effectiveness; prioritize patients' feelings and needs; respect patient and family preferences, support patients' involvement, response to changes in patients, share patients' concerns with teams, and being committed to patients' wellbeing. Thus, all of these skill aspects were highly relevant to the PCI factor construct.

Factor 3. Imply Quality and Safety (IQSs): This factor incorporated 10 items with factor loadings ranging from 0.60 to 0.75, illustrating very good strengths in items to factor correlation reflecting a high level of reliability[21]. The total accounted variance for this factor was 6.88%, which was among the highest contributions to accounted total variance in the scale. The eigenvalue of this factor extraction was 3.95 with an internal consistency reliability measured by Cronbach's alpha coefficient at 0.91. The items-subscale correlations in this factor were also high, ranging from 0.59 to 0.77.

The factor IQS was viewed as a clinical nurse's ability to provide care to an individual patient that increases the desired outcomes and are consistent with the current clinical nursing knowledge and practices. The key measuring attributes for this factor were: evidence-based practice and decision-making, current and quality practice, ensure patient safety measures, and measures to prevent anticipated risks. The items for this factor were mostly informed by focus group findings, making the skills reflected in the items very consistent with the nursing care context of Bangladesh. The EFA confirmed the structure of this factor item, in which all items were loaded to this factor with a high loading range; reflecting good content validity. Therefore, it can be inferred that the factor construct was appropriate.

Factor 4. Caring Relationship (CR): The construct of the RN-CLS was labeled as "caring relationship" skills of clinical RNs as leader in clinical care. This factor consisted of 09 items with factor loadings ranging from 0.41-0.68 and an accounted variance of 4.20%. The eigenvalue of this factor was 2.60 and the internal consistency reliability for Cronbach's alpha was .84. The main focus of this factor was the interpersonal skills of the RN clinical leader with patients and families.

The 'caring relationship' skills of the clinical nurses were viewed as a respectful therapeutic relationship with patients and their families. Across the 9 items comprising this factor, key measuring attributes were: empathic listening, respectfulness, building rapport, tolerance and patience, and self-accountability, protecting patient rights and confidentiality. Thus, all of these attributes were very clear in measuring a RN's "caring relationship" skills. The statistical analysis for internal consistency was also satisfactory. The 'caring relationship' the RN-CLS was almost similar to the SALI's "interpersonal relationship" component (Smola, 1998). Although in SALI, there was no specific direction towards the application of these skills. Similarly, in Patrick et al.'s 5-dimension Clinical Leadership Survey (CLS), which assesses clinical leadership of Canadian staff nurses, two concepts/items (i.e., 'develop a cooperative relationship' and 'establish a therapeutic relationship') have similar meanings to the 'CR' factor in the present study[15].

Factor 5. Interdisciplinary Collaboration (IDC): The factor 5 was labeled *as* 'interdisciplinary collaboration (IDC)' that consists of 8 items having a factor loading ranging from .42 to .78 with accounted percentage of variance 4.07%, an eigenvalue of 2.43, and communalities ranged from 0.39 to 0.71. The Cronbach's alpha coefficient of the items for this factor in terms of internal consistency reliability was 0.85. In this study, the clinical nurse leader's IDC skills were viewed as the RN's ability to work in partnership with coworkers and other members of the healthcare team. This factor was important for a clinical RN in Bangladesh to empower them for creating an environment in the workplace that is conducive to sharing knowledge, skills, and experiences within teams and impact the quality of patient care.

The factor 'IDC' skills of the RN-CLS in this study was comparable to the component of 'working with others' in the National Health System Leadership Academy developed a tool for healthcare professionals "Clinical Leadership Competency Tool (CLCT)" that was develop to assess leadership skills of health care professionals in general including nurses[12]. The factor 'IDC' of the RN-CLS in was also analogous with SALI's scale component 'group relationship skills[13]. Therefore, it can be seen that the 'IDC' factor in the present study was an appropriate construct to measure interdisciplinary collaboration leadership skills among RNs in Bangladesh. The key measuring contents of this factor were: accept individual uniqueness; focus on group interest; encourage collective opinions; articulate team responsibility; accepting criticism and mistakes, and team sharing. Hence, these attributes were influential to label this factor as 'IDC' skills in the RN-CLS, BD.

Factor 6. Skills of Communication (SC): The factor 6 consists of 7 items with the factor loadings ranged from .45 to .77 and an eigenvalue of 3.01. The accounted percentage of variance for SC was 4.54% and a Cronbach's alpha coefficient of 0.86 with 7 items. The 'SC' valued as most important skills in any types of leadership and in nursing its important is unparalleled[18]. The role of effective communication in healthcare is always linked to expected patient's outcomes, quality of nursing, and effectiveness of care evaluation[22]. The factor "skills of communication" in the RN-CLS in the present study was consistent with various leadership scales including the general leadership scale as well as earlier scales of CN[12-15]. The key measuring attributes included: provide timely truthful information, spent time to talk to patients, use clear verbal and non-verbal communication skills, understand and consider patient's views, audience-focused skills, use of feedback, and skills in effective negotiation.

Factor 7: Professional Values in Caring (PVC): The EFA resulted in a factor with 7 items only labeled as "professional values in caring (PVC)". Although there were relatively fewer factor items compared to other factors, factor loadings across the five items were very high (≥ 0.40), ranging from 0.68 to 0.85. This demonstrated a very good level of reliability for each item. The total accounted variance for this factor was the lowest (4.01%) among the 9 components of the RN-CLS, with an eigenvalue of 1.94, communalities ranging from 0.62 to 0.78 and an overall internal consistency for this factor of .86 reflecting good reliability. In the present study, the PVC was described as the RN's ability to integrate core professional values of nursing into their clinical practice in dealing with the patients, families, and members of the health team. The measures for this factor include: the principle of equity or human dignity, empathy or morale, tolerance, advocacy, and professional standards (Table 4). A review of related literature did not reveal existing instruments containing this extract construct. However, the holistic nursing competency scale (HNCS) developed by Takase and Teraoka included a "ethical/legal practice" competency[23] was comparable to the factor "PVC" in the present study. In the HNCS, the ethical/legal practice competency dealt with a nurse's attitude and behavior with regards to conforming to professional codes of conduct and laws.

Factor 8: Decision Making or Problem-Solving (DMPS): This factor constituted the largest number of item loadings (20) and the highest percentages of variance (10.25%) with an eigenvalue of 20.04. In EFA, factor loadings of items ranged from 0.47 to 0.71 with 19 items showing moderate to high level of factor loadings (0.52-0.71) and only one item with 0.47 loading. The Cronbach's alpha coefficient level of this factor was also very high (0.92) and represented an excellent level of internal consistency reliability. The communalities of item ranged from 0.32 to 0.56 and reflected a satisfactory observed variance accounted by the common factors.

The DMPS skills of the CNLs in this study were described as, the RNs ability to identify and clarify patients' clinical problems that involve a process of choosing the best option through a comparative evaluation with others in order to make reliable, valid and durable clinical solutions. The key attributes included in this measurement were the ability to define and clarify issues, gather facts and understand causes, consider and compare creative solution options, make logical decisions, take responsibility, and attend to challenging decision-making. Thus, these attributes reflected that the labeling of this factor was appropriate. Although the DMPS component of the present study was not entirely relevant to other earlier CNL scales, it was mostly consistent with a subscale of the Clinical Leadership Competency Tool (CLCT) developed by the National Health System Leadership Academy[12].

Factor 9: Professional Development (PD): The last factor in the RN-CLS was factor 9 labeled "professional development" (PD) skills. This factor consisted with 7 items. Across items, factor loadings ranged from 0.56 to 0.74 with an accounted variance of 4.12% and an eigenvalue of 2.51, while the factor's reliability for internal consistency was 0.86. The key feature reflecting the factor 'PD' can be described as a clinical nurse's ability to demonstrate professional guardianship in making constructive changes that are pertinent to the professional advancements or growths. The key attributes of this factor included supporting individual development, ensuring workplace safety, guiding professional standards, demonstrating multidisciplinary, the ability to attract public interest, promoting professional innovation, and acting as a role model. Both observable and statistical evaluation confirmed factor construction as appropriate. The factor "PD" skills in the RN-CLS were analogous to the component of 'professional leader and mentor' in the 'Self-Efficacy for Clinical Nurses Leadership (SE-CNL)' scale which developed by Gilmartin & Nokes[14]. However, content-wise the SE-CNL did not entirely mirror the RN-CLS in the present study.

6.3 Psychometric Properties of the RN-CLS

The discussion in this section comprises of three main aspects to support the validity and reliability of the RN-CLS, including: (1) content validity, (2) construct validity, and (3) reliability of the Bangladesh RN-CLS.

Content validity: The content validity is one of the most important concerns in scale development and examines the degree to which the content of a tool explicitly represents the content domain[24]. In the present study, a panel of five experts evaluated the RN-CLS items for relevance and clarity in representing the concepts against the selected domains. The overall as well for each individual item, the CVI was well acceptable; in present study for individual items, it was ranging from .80 to 1.00 and overall, at 0.85 on 122 items. The value of 0.80 was acceptable for individual predictor[25].

Construct validity: The construct validity of the RN-CLS was examined by exploratory factor analysis (EFA) and contrasted group approach. Prior to conduct the EFA, an initial item analysis was executed by using item-total correlation to evaluate the item performance to the scale. Based on Nunnally and Bernstein's recommendation[20], 22 items with item-total correlations lower than 0.30 were removed before conducting EFA. Next, to

establish the construct validity of the RN-CLS, factor analysis was performed using Principal Component Analysis (PCA) and Exploratory Factor Analysis (EFA) in a series of steps. EFA using data from 627 subjects, as described previously, established a more parsimonious interpretation with nine factors and 92 items. This was supported by eigenvalue values greater than 1, 52.06% of the variance, and factor loading cutoff points of 0.40 and above. Although EFA was initially performed on 102 items using varimax rotation, increasing the item loading cutoff point to ≥0.40 increased the cumulative percentage of variance from 49.5% to 52.06%, and 10 items did not load (<0.30). Thus, these 10 items were excluded in this step and total 92 items were retained for subsequent psychometric evaluations of the items[26] to find a more parsimonious and interpretable.

Contrasted group approach for construct validity: After EFA, the RN-CLS was used for another form of construct validity by contrasted group methods with the involvement of 2 groups of 60 RNs in Bangladesh. The result of the high and low-performance groups was significantly varied using T-test for the score of the RN-CLS between two groups. The contrasted group approach is another method for testing the construct validity of a measure, used when two known groups are expected to exhibit extremely high and extremely low levels of the characteristics being measured by the scale[19]. The key criteria of the subject selections were: the differences of job experience between group (high-performance ≥10 years and the low-performance ≤ 5 years), and known performance that assured by their direct clinical supervisors. It is well said that a valid tool is able to make different the individuals who are known to be different on the constructed tool[27] which also confirmed by contrasted group results in this study.

Reliability of RN-CLS: The second psychometric test was about the test of the reliability of the RN-CLS. In this study, two reliability tests were examined for the RN-CLD: the internal consistency and the test-retest for stability test of the scale. The internal consistency reliability test was performed using the Cronbach's alpha coefficient in three stages of the scale development. First, 30 clinical RN was involved in a pilot study to foresee the possible problems prior to administering the item pool in a large group of study subjects. At this stage, no items were deleted, but 19 items were revised due to item-total correlations of <.30, and the overall Cronbach's alpha was 0.97. The internal consistency of the RN-CLS was further examined using field test data from 627 subjects, assessing individual item performance via item-total correlation. At this stage, 22 items with item-total correlations below 0.30 were removed before conducting EFA. Following the removal of these items, the Cronbach's α was 0.96 with 102 items. A final assessment of internal consistency, conducted with the remaining 92 items after EFA confirmed the factor structure of the RN-CLS, tested both the overall and subscale reliability of the 9-factor components. Results demonstrated an overall Cronbach's α of 0.96 for the RN-CLS with 92 items, and Cronbach's α values ranging from 0.84 to 0.92 for the 9 factor subscales, confirming good internal consistency across all subscales.

Test-Retest Reliability for Stability: Test-retest reliability was used to assess the stability of the 92-item, 9-factor RN-CLS established by EFA. Test-retest reliability is an important method for assessing the external consistency and stability of a measure over time[19]. In this study, to examine the stability of the RN-CLS, data were collected from a group of 30 clinical RNs on two occasions with a 10-day interval. The study results indicated a highly acceptable level of scale stability, as demonstrated by the overall correlation between the two test administrations of the RN-CLS ($r = 0.92$, $p < 0.001$). Correlations across the nine component levels were also acceptably high ($r = 0.73$ to 0.91). The finding indicated that among different administrations of the RN-CLS, the test result will be consistent for uses overtime in the same group of subjects[25]. Hence, it can be concluded that the RN-CLS had an acceptable level of psychometric

properties in terms of the construct validity, internal consistency reliability and test-retest reliability for stability. Moreover, this context-specific, theory-grounded, and concept-relevant instrument can be used as a valid and reliable tool to assess the clinical leadership skills of clinical Registered Nurses in Bangladesh and potentially in similar contexts in other countries.

7. Scope and Limitations of the Study

The author acknowledges that the study has its limitations in terms of the sampling strategy applied, scale length, and the variance accounted by each factor.

The purposive sampling in this study, limited to clinical nurses from two medical college hospitals, may limit its generalizability. Further studies should include nurses in other clinical settings, such as Upazila and District hospitals, and specialized hospitals, to increase the generalizability of the findings. The final version of RN-CLS consisted of 92 items, could pose a burden for nurses to fully answer. The overall percentage of variance for 9 factors was only 52.06% in the present study, and 5 out of 9 factors with a percentage of variance were between 4.01% and 4.54%, whereas a variance >5% is desirable.

Despite few limitations, it should be noted that this study had several strengths supporting the claim that overall, the developed RN-CLS is valid and reliable. Strengths of the study include its design, theory-grounded framework, contextual validation via focus group analysis, expert review of the item pool for content validity, the use of a Likert scale response format (a common performance assessment measure in clinical practice settings), an acceptable subject-to-item ratio (1:5.06), and Bartlett's test of sphericity ($p = 0.000$), indicating that the statements comprising the scale of each variable actually measured what they were intended to measure. Moreover, all criteria for the factor analysis were tested before performing EFA resulting in sample adequacy; KMO 0.916; Bartlett's test of sphericity 0.000; a variance with 92 items at 52.06%; and the % variance by factor ranging from 4.01 to 10.25. Item rotations to 9 factors also confirmed the structure of the RN-CLS. The internal consistency overall and across the factors was more than 0.80, indicating high reliability. The additional test for construct validity, the contrasted group analysis confirmed that the RN-CLS with 92 items is a valid instrument to measure the clinical leadership skills of the RNs in Bangladesh.

8. Conclusion

The results of this study suggest that the final version of the RN-CLS (Bangladesh) possesses satisfactory psychometric properties for assessing the clinical leadership skills of registered nurses in Bangladesh. Comprehensive psychometric evaluations confirmed the RN-CLS as a valid and reliable measure. Therefore, in developing countries like Bangladesh, this instrument has potential for developing and evaluating nurses' clinical leadership skills, empowering them as future professional leaders. Replication studies involving a larger sample of clinical nurses from diverse hospital settings are recommended to further assess the stability of the instrument across different contexts.

Conflict of Interest:

None

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