Development and Psychometric Evaluation of the Thai Clinical Nurses' Change Agent Competency Scale

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Abstract: Change agent competency is necessary for clinical nurses to manage and lead change by improving the quality of care in nursing practices. It is crucial to assess the competency of clinical nurses as change agents. However, change agent competency is specific to the country context, and there is no tool to assess it among Thai clinical nurses. Thus, this study aimed to develop and evaluate the psychometric properties of the Thai Clinical Nurses' Change Agent Competency Scale following DeVellis and Thorpe's seven-step guideline across two phases. Phase I involved synthesizing change theory, findings from a prior qualitative study on nurses' perceptions of change agent competency, and results from a comprehensive literature review. This process resulted in a preliminary framework comprising seven domains and 90 items. In Phase II, five experts conducted content review and pretesting of the initial instrument, resulting in an 81-item scale that demonstrated acceptable content validity and internal consistency. For the field test, psychometric evaluation, and assessment of social desirability bias, a sample of 234 clinical nurses from eight university hospitals across four regions of Thailand was used to establish construct validity and reliability.

Exploratory factor analysis revealed seven factors with 50 items: collaboration, communication, assessment and opportunity recognition, information management, improving quality of work, planning and evaluation, and goal-directed persistence, and explaining 65.84% of the total variance. No social desirability bias was detected. Contrasted-group analysis also supported construct validity. The overall internal consistency (Cronbach's alpha) and the test-retest reliability were acceptable. In conclusion, the Thai Clinical Nurses' Change Agent Competency Scale demonstrated acceptable validity and reliability. This instrument can be used to assess the change agent competency of clinical nurses in Thailand and may also apply to nurses working in similar contexts.

Keywords: Change agent, Clinical nurses, Competency, Instrument development, Psychometric testing

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Introduction

The global healthcare system, including that of Thailand, is continuously and rapidly evolving to meet the changing needs of the population. These changes are driven by factors such as shifting lifestyles and demographic structures, the rise of innovative and evidence-based policies, technological advancements, changing patterns of disease epidemiology, the emergence and re-emergence of infectious diseases, and the growing complexity of health conditions.[1-3] Consequently, Thailand has implemented several key healthcare

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policies, including the 20-Year National Strategic Plan, the 13th National Economic and Social Development Plan, and the Thailand 4.0 Agenda, which emphasize strategic development to effectively respond to these rapid transformations. All of these initiatives aim to establish a sustainable healthcare system that aligns with the Sustainable Development Goals (SDGs).[1] In line with these national strategies, clinical nurses play a crucial role in driving transformation within the healthcare system. As frontline healthcare professionals, they are directly involved in implementing policy initiatives, improving the quality of care, and adapting evidence-based practices to meet evolving health demands. Their ability to function as effective change agents is therefore essential to ensure the successful translation of national health goals into clinical practice. Nurses who possess strong change agent competencies can lead innovations, foster collaboration across disciplines, and promote continuous quality improvement within healthcare organizations.[4] To enhance such competencies, several critical factors need to be considered.[5]

Influencing factors of change in the Thai healthcare system are the transformation of population structure into an aging society, the multiple complexities of diseases, the increasing demand for accessing the healthcare system, the shortage of healthcare providers, and cultural diversity.[6] Previous literature showed that the competency of Thai clinical nurses to create change was a significant factor in successful change in the nursing profession and organizations.[7,8]

Only one study conducted in Thailand reported nurses' perceptions of change agent competency; this was based on interviews with 12 clinical nurses working in a super-tertiary university hospital, highlighting essential abilities required to improve the quality of care, including effective communication, resource seeking, and implementing appropriate improvements.[9] However, nurses' change agent competencies need to be systematically assessed, and currently, no valid instrument is available for such assessment within the Thai context. Developing a reliable and contextually appropriate tool to measure this competency is essential to support professional development, strengthen leadership capacity, and ultimately enhance the effectiveness and sustainability of healthcare delivery in Thailand.

Hence, an identification and validation of change agent competency is considered necessary and appropriate for clinical nurses to change the implementation of nursing practice in Thailand adequately. Thus, it is essential to develop a new scale to measure the change agent competency of clinical nurses based on the concept of change involving the role of change agents, which is suitable for the Thai context.

Conceptual Framework and Literature Review

The conceptual framework of this tool development was guided by the Change Theory of Lippitt et al.,[10] our previous qualitative study on Nurses' Perceptions of Change Agents,[9] and a literature review. The Change Theory outlines seven sequential steps in the change process:1) diagnosing the problem, 2) assessing motivation and capacity for change, 3) evaluating the resources and readiness of the change agents, 4) identifying progressive change objectives, 5) determining the appropriate role of the change agents within the change process, 6) sustaining the implemented change, and 7) gradually concluding the helping relationship.[10]

The existing tools of change agents are not targeted at clinical nurses and may not be able to capture the change agent competency of clinical nurses (**Appendix A1**). All tools were developed from other disciplines, which consisted of education and business. The domains comprise technical assistance skills, dissemination skills, interprofessional assistance skills, and long planning and evaluation skills,

willingness to initiate change, problem-solving expertise skills, and content knowledge.[11-14] Change agent competency in other disciplines cannot be applied to measure change agent competency of clinical nurses. The role of a change agent is context-bound, so it depends upon specific context and is not a static difference in the nursing discipline. As change agents, clinical nurses have different competencies from other disciplines because they are required to deal with different human responses from people having various problems, new trends about emerging and re-emerging infectious diseases, communicable and non-communicable diseases, and the scarcity of resources.[15]

Our study[7] in Thai context revealed seven core domains contributing to the conceptual structure of change agent competency in nursing practice: 1) improving the quality of care, 2) demonstrating commitment to achieving change, 3) applying clinical ability to support change efforts, 4) enhancing engagement in improvement activities, 5) utilizing information efficiently, 6) seeking and mobilizing useful resources, and 7) improving performance in response to feedback.

Furthermore, our literature review identified four domains relevant to nurses' change agent competency: 1) desire to change,[16-19] 2) commitment to achieving goals,[19,20] 3) clinical ability,[20,21] and 4) engagement in interdisciplinary collaboration,[7,21,22] These domains provide empirical support for the conceptualization of essential competencies that enable nurses to initiate and sustain improvements in clinical practice. Additionally, the domains of most instruments have emerged from literature reviews and from the conceptual framework of research related to the change agent's role. There is a lack of empirical studies on the change agent's role from the perspective of the change agent who demonstrates the competency in order to achieve the expected goal in the actual situation. Thus, there is a need to develop an instrument that encompasses the domains of clinical nurses' change agent competency in Thailand.

Study Aim

This study aimed to develop the Thai Clinical Nurses' Change Agent Competency Scale (Thai CN-CACS) and to examine the psychometric properties of this newly developed instrument.

Methods

Study Design: This instrument development and psychometric testing used a cross-sectional study. This report followed the STROBE Statement checklist for cross-sectional studies.[23]

Ethical Considerations: Prior to commencing the research, ethical approval was sought from the Institutional Review Board (IRB) of Social and Behavioral Science, Prince of Songkla University, Thailand, (Approval no. PSU IRB 2021-St-Nur021 (Internal), dated August 9, 2021). Moreover, the Human Research Ethics Committee of the eight selected hospitals granted approval. The principal investigator (PI) informed the participants that their information would be published anonymously. Participants were notified immediately should any change to the methodology be implemented. All data were kept for two years upon completion of the study, then their data were destroyed.

Process of Instrument Development: This study modified the Scale Development Guidelines proposed by DeVellis and Thorpe[24] for developing and testing the psychometric properties of the Thai CN-CACS. There were two phases of scale development comprising eight steps. In the initial phase, the Thai CN-CACS, was developed, and the second phase involved evaluation of its psychometric qualities. Phase I was conducted in a super-tertiary university hospital from October to December 2021, while Phase II was conducted in eight super-tertiary university hospitals between April 2022 and January 2024.

Phase I: The Development of the Thai CN-CACS: This phase included three steps in developing the

pre-specified domains of the Thai CN-CACS, as follows:

Step 1. Determining Domains of Contents: This step aimed to seek and identify clear structures or constructs of the scale. The matrix of the Thai CN-CACS was synthesized by integrating the seven steps of Change Theory,[10] our seven domains of Change Agent Competency from a previous qualitative study,[9] and four domains from a literature review. From this synthesis, the seven domains in the Thai CN-CACS were generated, including: 1) seeking opportunity for quality improvement, 2) persistence to develop new nursing practice, 3) clinical knowledge in their particular area, 4) engagement of teamwork, 5) information management, 6) building networks, and 7) monitoring and evaluation.

Step 2: Generating an Item Pool: Ninety items were generated into the Thai CN-CACS: 1) seeking opportunity for quality improvement (17 items), 2) persistence to develop new nursing practice (17 items), 3) clinical knowledge in their particular area (9 items), 4) engagement of teamwork (18 items), 5) information management (11 items), 6) building network (9 items), and 7) monitoring and evaluation (9 items).

Step 3: Scale Format Determination: The selection of a 5-point Likert scale allowed measurement of the Thai CN-CACS Version 1 (the range of scores was allocated from 1 = absolutely not true, strongly disagree, never practice to 5 = absolutely true, strongly agree, frequently practice). A summative score was obtained, from which a mean value was calculated. Greater scores were indicative of greater change agent competency.

Phase II: Thai CN-CACS Psychometric Evaluation (Version 1): The psychometric properties of the newly developed Thai CN-CACS underwent evaluation in this phase, which comprised four steps as follows:

Step 4: Expert Review of the Initial Item Pool: An expert panel was established to ensure the content validity of the instrument. The panel consisted of five members selected based on their professional qualifications and expertise. The selection criteria included: 1) a nurse administrator with a comprehensive understanding of the roles, responsibilities, and job descriptions of clinical nurses; 2) a nurse administrator with expertise in instrument development; 3) a nurse lecturer in nursing administration with a minimum of five years of teaching experience; 4) a nurse lecturer in nursing administration with at least five years of teaching experience and demonstrated expertise in instrument development; and 5) a nurse lecturer with recognized expertise in instrument development. The experts were invited to review the instrument for clarity, relevance, and comprehensiveness, and their feedback was incorporated into the final version of the tool. Following the expert review, 25 items were flagged for minor revisions, while it was suggested that eight items be removed. Thus, the Thai CN-CACS Version 2 is composed of seven domains with 81 items. The I-CVI value was 1.00 and the S-CVI/Ave of 0.91.

Step 5: Considering Validation Items Inclusion Through Pre-testing: Version 2 of the scale was evaluated for reliability using a sample of 30 clinical nurses who shared similar characteristics with the participants involved in the psychometric field testing at a super tertiary university hospital. The item-item [I-I] correlation analysis ranged from 0.33-0.80, which indicated were not redundant with the other items.[25] The Cronbach's alpha coefficient for the overall scale was 0.98, with values ranging from 0.81 to 0.95 across the seven domains. These results indicate that the new scale demonstrates excellent internal consistency.[24] The Thai CN-CACS Version 2 comprised 81 items and seven domains: 1) seeking opportunities for quality improvement (17 items), 2) persistence in developing new nursing practices (17 items), 3) clinical knowledge within the nurse's specific area of expertise (9 items), 4) engagement in teamwork (18 items), 5) information

management (11 items), 6) network building (4 items), and 7) monitoring and evaluation (5 items). The items were rated on a Likert-like scale from 1 (absolutely not true, strongly disagree, never practice) to 5 (absolutely true). The Version 2 underwent psychometric testing.

Step 6: Field Testing: This step aimed to evaluate the Thai CN-CACS, psychometric soundness, along with the reliability and validity of the instrument.

Sampling and Setting: Hair et al.[26] recommended using five to ten subjects per item for factor analysis. Initially, 405 participants from four regions were required for 81 items. However, the number of participants was insufficient to meet this criterion. Thus, the sample size justification for the exploratory factor analysis was considered sufficient based on prior studies: Sürücü et al.[27] considered 200 participants adequate, while Beavers et al.[28] suggested 150 participants was appropriate. The inclusion criteria were: 1) clinical nurses providing direct patient care, 2) a minimum of two years of clinical experience, and 3) a bachelor's degree or higher in nursing. The sampling procedure comprised five stages: 1) selecting university hospitals in four regions using stratified random sampling, 2) applying proportionate sampling for each region, 3) randomly selecting hospitals using a random number generator, 4) conducting proportional stratified random sampling within hospitals using the formula: $n_h = (N_h/N) \times n$, and 5) randomly selecting clinical nurses from eight hospitals (30 per site). Thus, the sample was 247 participants from eight super tertiary university hospitals.

To assess **contrast group validity**, 60 clinical nurses employed at a super-tertiary university hospital were recruited, with the sample size determined based on established recommendations for known-groups validity testing in instrument validation studies. According to DeVellis and Thorpe [24] and Polit and Beck,[25] a minimum of 25-30 participants per group is sufficient to detect a moderate effect size with a statistical power of 0.80 at a 0.05 significance level. Accordingly, 60 clinical nurses (30 per group) were purposively recruited to ensure adequate statistical power to compare mean scores between groups with differing levels of work experience. The nurse director of the university hospital selected participants based on the inclusion criteria. Group allocation was as follows: **Group 1**: Clinical nurses with five or more years of work experience; **Group 2**: Clinical nurses with less than one year of work experience. It was hypothesized that Group 1 (more experienced nurses) would exhibit higher change agent competency, whereas Group 2 (less experienced nurses) would demonstrate lower competency. All participants in this phase were distinct from those included in the previous sampling stages.

Instruments: The Thai CN-CACS Version 2 was used, including a Demographic Data Form and the Social Desirability Scale.

A Demographic Data Form: This was developed by the PI and included age, gender, religion, marital status, level of education, monthly income, duration of nursing experience, current job position, clinical unit, and prior nursing training (yes/no; specify).

The Social Desirability Scale was considered important to assess how strongly individual items might be influenced by social desirability. The Social Desirability Scale-16 (SDS-16), originally developed in English by Stöber,[29] was used to assess the tendency of respondents to provide socially desirable answers. The Thai version of the SDS-16 consists of 16 items rated on a binary response format, with options of "True" (scored 1) or "False" (scored 0) (e.g., "I sometimes litter"). The scale was translated into Thai from the original English version using a back-translation procedure conducted by Worrasirinara and colleagues[30] to ensure linguistic and conceptual equivalence. In this study, the reliability of the Thai version was re-examined to check for response bias and ensure data accuracy. The results showed that the Cronbach's alpha coefficient was 0.97, indicating excellent internal consistency.

Data Collection: The nurse director or assistant nurse director at each hospital selected eligible participants using purposive sampling according to the inclusion criteria and distributed the questionnaires to 247 participants across eight super-tertiary university hospitals. All questionnaires were returned, as research assistants at each site were responsible for monitoring the completeness of responses and ensuring adherence to the data collection schedule.

Data Analysis: Prior to performing exploratory factor analysis (EFA), the assumptions for factor analysis were examined. Box plots were used to reveal univariate outliers. Of the initial 247 participants, 13 were identified as outliers using the Mahalanobis distance test and subsequently removed from the analysis. Therefore, factor analysis was performed using data from 234 participants. Sampling adequacy was evaluated using the Kaiser-Meyer-Olkin (KMO) test, while multivariate normality, necessary for factor analysis was measured using Bartlett's test of sphericity. Kaiser-Meyer-Olkin (KMO) was 0.94, while Bartlett's test of sphericity produced a significant result at 0.00 (Chi-square = 15962.662, df = 3081). Thus, the sample was adequate for factor analysis.

Component Analysis (PCA) with Varimax rotation was performed to generate factors. Factor rotation was performed using orthogonal rotation with Varimax. This approach was effective in generating the optimal simple factor structure, where a variable load was allocated to a small number of factors, while maximizing the high loadings upon each item.[24] The forced extraction of 5-8 factors where the factor loading cutoff point exceeded 0.30 was carried out since such criteria could lead to difficulties in interpretation.

Results

The participants had a mean age of 33.48 years (SD = 9.45), ranging from 24 to 57 years. Most of them had a bachelor's degree (74.36%). The duration of nursing experience had a mode of three years with a range of 1-36. The majority of respondents (69.30%) currently held positions as senior clinical nurses or clinical nurses, and worked as registered nurses in different wards. A smaller number (18.30%) held the position of ward nurse in-charge, and 12.40% had been working as advanced nurse practitioners. Participants' characteristics are shown in **Table 1.**

Table 1. Number and percentage of participants by characteristics in field-testing (N = 234)

Characteristics	Mean	SD	Frequency	Percentage
Age (years)	33.48	9.45		
Gender				
Female			215	91.90
Male			19	8.10
Age ranged from 22 to 58 years				
Religion				
Buddhist			224	95.70
Muslim			6	2.60
Christian			3	1.30
Others			1	0.40
Marital status				
Single			156	66.70
Married			74	31.60
Widowed			1	0.40
Divorced			2	0.90
Separated			1	0.40

Table 1. Number and percentage of participants by characteristics in field-testing (N = 234) (Cont.)

Characteristics	Mean	SD	Frequency	Percentage
Education				
Bachelor's degree			174	74.36
Master's degree			59	25.21
Doctoral degree			1	0.43
Monthly income				
15,001-20,000 Baht (> 462.53-616.71 USD)			11	4.70
20,001-25,000 Baht (> 616.71-770.89 USD)			44	18.80
25,001-30,000 Baht (> 770.89-925.06 USD)			62	26.50
> 30,000 Baht (> 925.06 USD)			117	50.00
Duration of nursing experience	Mode = 3 years (Range 1-36)			
Job position				
In-charge nurse			43	18.30
Clinical nurse			162	69.30
Advanced practice nurse			29	12.40
Unit				
Surgical/Orthopedic			46	19.70
Medical			15	6.41
Gynae/Obstetrics			12	5.12
Pediatrics			34	14.52
Psychiatric			4	1.71
Intensive care			12	5.12
Emergency room			45	19.23
Outpatient			66	28.20
Nursing training				
Completed			190	81.20
None			44	18.80

Exploratory Factor Analysis

A total of 5 items had no loading to any factor; thus, they were excluded. Seventy-six items were subjected to PCA with an eigenvalue greater than 1. The findings were presented for 12 factors, with communality ranging from 0.50 to 0.83. The variance could be explained 69.31%, although the scree plot revealed that a number of factor extractions between 5 and 7 required further examination. However, four of the factors contained fewer than five items within the factor, while the factors explained 2.76% of the variance. After the cross-loading items were deleted, the Thai CN-CACS (**Version 3**), which comprised 50 items across seven factors, explained 65.84% of

the variance, with variance explained ranging from 8.08% to 11.49%. Factor loadings of the seven factors were acceptable and highly loaded, ranging from 0.41 to 0.84. The internal consistency analysis revealed that item-total correlations for the 50 items ranged from 0.46 to 0.76. The overall scale demonstrated excellent reliability (Cronbach's $\alpha = 0.97$). The seven factors also exhibited strong internal consistency, with Cronbach's alpha coefficients ranging from 0.842 to 0.932. Seven factors including 1) collaboration (7 items), 2) communication (8 items), 3) assessment and opportunity recognition (9 items), 4) information management (6 items), 5) improving quality of work (7 items), 6) planning and evaluation (7 items), and 7) goal-directed persistence (6 items). The results are shown in **Table 2.** Also, the Thai CN-CACS (**Version 3**) showed no significant correlation with the SDS-16 ($r = 0.03$, $p > 0.05$). Correlations with the seven CN-CACS factors ranged from -0.01 to 0.07 (all $p > 0.05$), indicating no detectable social desirability bias.

Table 2. Factor loadings and commonalities for the Thai CN-CACS (N = 234)

No.	Items statements	Factor loading	Commonalities h^2
Factor 1	**Collaboration (7 items)**		
46	Listen carefully to the opinions of your colleagues	0.84	0.80
47	Appreciate the opinions expressed in developing the work of colleagues	0.82	0.84
45	Respect the individuality of your co-workers	0.81	0.76
48	Allow co-workers the opportunity to play a role in jointly developing the work independently	0.81	0.79
49	Develop a new type of nursing practice requires cooperation from co-workers	0.73	0.71
44	Create a warm working atmosphere and act friendly with your co-workers	0.69	0.65
50	Know the importance of motivating co-workers to support work development	0.58	0.62
Factor 2	**Communication (8 items)**		
59	Clearly explain the roles of those involved in developing the new nursing practice model	0.74	0.76
60	Continuously provide information on developing new nursing practice models to those involved	0.71	0.74
57	Explain to those involved the guidelines for developing new nursing practices	0.70	0.75
55	Provide complete information on developing a new nursing practice model to team members	0.67	0.72
58	Feel happy to answer questions from those involved regarding development guidelines	0.58	0.72
56	Choose communication methods that are consistent with the objectives of the work and those involved	0.56	0.58
54	Know the importance of communication in developing a new nursing practice model	0.54	0.63
51	Artfully communicate the need for developing new nursing practices to co-workers	0.47	0.64

Table 2. Factor loadings and commonalities for the Thai CN-CACS (N = 234) (Cont.)

No.	Items statements	Factor loading	Commonalities h^2
Factor 3	**Assessment and Opportunity Recognition (9 items)**		
6	Ask co-workers about nursing problems will give you in-depth information	0.69	0.59
8	A comprehensive analysis of the causes of work problems helps set goals	0.67	0.63
3	Review the nursing practice process is to find the cause of problems in patient care	0.67	0.60
4	Analyze the report on the incidence of the problem and find the cause of the problem	0.60	0.59
5	Pay attention to following up on problems related to patient care, both directly and indirectly	0.60	0.58
7	Identify nursing practices that need to be improved in line with the problem	0.59	0.53
1	Identify risks in nursing practice helps to improve	0.58	0.49
10	Develop new nursing practices can be done even if there are no clinical problems yet	0.53	0.62
11	Believe there are other ways to increase good results at work	0.41	0.45
Factor 4	**Information management (6 items)**		
63	Use information technology to search for information and empirical evidence	0.71	0.70
64	Use empirical evidence to develop new nursing practices	0.69	0.77
62	Have knowledge and understanding in searching for information and empirical evidence	0.67	0.66
65	Eager to help and support colleagues in bringing empirical evidence	0.59	0.75
67	Choose methods for collecting each data type that are consistent with the objectives of the work	0.59	0.74
66	Recognize that there must be several m ethods of collecting data to obtain information for work development	0.59	0.67
Factor 5	**Improving quality of work (7 items)**		
15	Continually design new nursing practices to develop the profession	0.74	0.72
12	Be eager to find ways to develop a new nursing practice model that is consistent with the context or health situation	0.69	0.66
16	Value professional development by improving new nursing practices	0.66	0.65
13	Constantly change your ways of working for good results	0.64	0.63
21	Design thinking must be encouraged to develop in new ways that have never been done before	0.57	0.53

Table 2. Factor loadings and commonalities for the Thai CN-CACS (N = 234) (Cont.)

No.	Items statements	Factor loading	Commonalities h^2
20	Using your experience caring for patients to set development goals	0.54	0.62
14	Creating new nursing practices creates value for the nursing profession	0.47	0.53
Factor 6	**Planning and evaluation (7 items)**		
76	Build good relationships with experts to support work development	0.72	0.75
75	Search for specialists from within and outside the agency to develop	0.68	0.76
77	Following up on work development results is beneficial to improving work	0.67	0.76
78	Follow up on the results and problems of implementing new nursing practices at every step	0.60	0.75
74	Can coordinate with experts according to the specific work and objectives	0.58	0.66
69	Analyze data to help understand problems and ways to develop or improve operations	0.54	0.65
72	Use the results of data analysis to plan the development of new nursing practices	0.53	0.70
Factor 7	**Goal-Directed Persistence (6 items)**		
30	Set the time and goals for developing each work step	0.74	0.73
31	Be patient in successfully developing new nursing practices, even though it takes time to make changes	0.71	0.78
29	Never give up searching for ways to solve problems or obstacles in development	0.70	0.74
32	Be confident that you will take action to change the way you work to achieve your goals	0.70	0.79
28	Change the method for developing new nursing practices if the results do not reach the goals	0.63	0.66
25	Compare existing problem-solving options to design a new working method	0.42	0.58

Step 7: Final Testing to Confirm Construct Validity and Stability Reliability: It was necessary to conduct at least two types of validity and reliability testing to evaluate the psychometric domains of the final scale (**Version 3**).

The results revealed that group 1 had higher mean scores (mean = 4.36, SD = 0.21) on the Thai CN-CACS than group 2 (mean = 3.23, SD = 0.10) ($t = 26.24$, $p < 0.001$). This indicates that the Thai CN-CACS is a valid instrument for assessing the construct validity of change agent competency among clinical nurses in Thailand, as it can discriminate between different groups.

Test-retest reliability was examined using data obtained from an additional sample of 30 clinical nurses representing the three groups identified in the pre-testing

phase. The scale was administered twice at a 2-week interval to evaluate the temporal stability of the scale. Participants in a super tertiary university hospital were purposively selected by the nurse director according to the inclusion criteria. Pearson correlation was used to determine the extent of the correlation between the scores. The results showed a highly acceptable level of overall correlation between the two times of the CN-CACS, Thai ($r = 0.94$, $p < 0.001$). The results of consistency indicated that the stability of this scale was accepted because the correlation of test-retest reliability was more than 0.70.[24]

Discussion

The 50-item Thai CN-CACS was developed and psychometrically evaluated, demonstrating evidence of acceptable validity and reliability. Factor analysis identified seven key domains: collaboration, communication, assessment and opportunity recognition, information management, improvement of work quality, planning and evaluation, and adherence to achievement of work goals. Detailed descriptions of these factors are provided below.

Factor 1: Collaboration (7 items): A previous study indicated that successful changes in clinical practice require collaboration within the healthcare arena to facilitate the discovery of new approaches to clinical care.[7,17,31-33] As change agents, clinical nurses should motivate their colleagues to build confidence in initiating change and collaborate with interdisciplinary teams and stakeholders to develop and implement new projects.[1,34-36] Clinical nurses can employ several interpersonal skills to foster team participation, including open-minded listening, calmness, collaboration to find common ground, and effective communication to address and overcome resistance.[7,21,22] Moreover, motivation plays a key role in change agent competency, helping clinical nurses inspire others to create and implement new strategies and practices.[7] As change agents, clinical nurses should understand that their key role is to motivate colleagues to increase awareness, understanding, and commitment toward change.[37]

Factor 2: Communication (8 items): Communication plays a key role in facilitating practice change by increasing engagement and reducing resistance among team members.[7,22,38] Clinical nurses with change agent competency use communication skills to share information and foster recognition of the need for change.[31,34-36] The change agents also used communication to increase the awareness of change and new ideas, and the need for change among other members.[7]

Factor 3: Assessment and opportunity recognition (9 items): Clinical nurses always assess gaps or problems in working conditions to improve overall nursing care. The clinical nurses are required to demonstrate critical thinking and reasoning for assessing the need for change based on a variety of information, such as current evidence, organizational vision, mission, values, and goals, and health policy.[7,17-18,22,31,37-38] They also have to continuously detect problems to define or diagnose them as the first step to making a change.[7,22] Clinical nurses as change agents have to possess the competency to recognize the need for change, seek, and utilize evidence based on research results, which is one quality indicator of clinical practice.[18] They should assess existing care and reliable methods by integrating information. This leads to the initiation of new knowledge and nursing practices for improving the quality of care and safety.[7] Additionally, seeking the opportunity is important to identify relevant problems and initiate appropriate changes.[38]

Factor 4: Information management (6 items): Clinical nurses as change agents have to possess the competency to seek and utilize evidence-based research, which is a quality indicator of clinical practice.[18] Evidence-based practice is important for clinical nurses as change agents, which can be applied to develop nursing practice.[38] They should assess existing care and reliable methods by integrating information, analyzing the problems, and making clinical decisions regarding the change to improve operations for higher quality of care.[22]

Factor 5: Improving quality of work (7 items): Clinical nurses recognize the significance of change and it is a management factor of change, which is related to competency of clinical nurses to transform a new facility with a new care delivery model.[32,39] Clinical nurses as change agents need to develop innovation and nursing system in order to provide quality of care to patients continuously. They must create projects for specific diseases to improve quality assurance.[40]

Factor 6: Planning and evaluation (7 items): Clinical nurses must plan the process of nursing service for specific diseases by applying new strategies. This assists clinical nurses as change agents to develop nursing practice for specific diseases.[40] They collect data on the results and suggestions from co-workers for adjusting the new nursing practice.[7] Co-workers are requested to try out new nursing practice many times to obtain the most appreciated new nursing practice for developing better care and work.[7,40]

Factor 7: Goal-directed persistence (7 items): Clinical nurses as change agents must have persistence during change as they need to deal with difficult situations and other barriers. They should hold a strong belief that changes yield many benefits for their work and patient care.[20] A previous study in Thailand showed that clinical nurses who believed in positive outcomes of change also had high confidence to initiate new nursing practices.[7] Therefore, clinical nurses attempted to initiate and develop new treatments, models of care, innovations, technology, and new units to achieve excellent practice and improve the quality of care and health outcomes.[7,41]

Limitations

The results of this study may not be representative of different populations other than the nurses working in the university hospitals. Additionally, the actual number of participants in exploratory factor analysis was lower than expected, which might be a limitation of this scale.

Conclusion

The Thai CN-CACS, developed to measure nurses' change agent competency, consists of 50 items grouped into seven subscales: collaboration, communication, assessment and opportunity recognition, information management, improving quality of work, planning and evaluation, and goal-directed persistence. The overall Thai CN-CACS demonstrated acceptable validity and reliability. This instrument can be used to assess the change agent competency of clinical nurses in Thailand and may also be applicable to nurses working in similar healthcare contexts.

Implications for Nursing Practice and Research

Despite its limitations, the 50-item Thai CN-CACS demonstrated acceptable reliability and validity, indicating its suitability for assessing and developing change agent competency among clinical nurses for improvement nursing practices. However, further studies should be conducted across other hospital settings, including primary, secondary, and tertiary hospitals, with larger and more diverse samples. Additionally, confirmatory factor analysis should be performed before the instrument can be widely applied in research and clinical practice.

Author Contributions

Conceptualization, Method and design: K.R., S.P., N.B.
Developing tools, Data collection, analysis, and interpretation, Draft manuscript preparation, Assisting with revisions, Approval of the final version: K.R.
Validating tools, Assisting in data analysis and interpretation, Responding to the editor, Approval of the final version: S.P.
Revising the manuscript: S.P., N.B.

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AI Generation

We used ChatGPT to improve and clarify English writing.

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Appendix 1

Existing tools related to change agent competency

Tools and Authors	Aim	Concept	Dimension
1. Change Agent Role Questionnaire; Smalley (1985); USA.	- To determine the most important change agent roles of teacher - To measure several work-related variables that appear to have change agent role	- Nine change agent' roles of Brown (1980) that consist of teach problem solving skills, alternative delivery systems, interest in issues, involve volunteers, good program development, remain flexible to meet needs, access resources of total university, self-development plan, and educational "risk" taker	- Problem solving skills is the most important and educational "risk" taker's role is the least change agent role of teacher - There were three dimensions of change agent role 1. Setting my goals (alternative delivery's role, (interest in issues' role, and access total resources of the university's role) 2. My feelings about work (problem solving skills, involve volunteers' role, program development' s role, and flexible to meet needs' role) 3. Feelings about self and others (self-development plan's role, and educational "risk" taker's role)
2. Change Agent Competencies Questionnaire (CACQ); Howard (1978); USA.	- To identify and validate a set of competencies	- Literature reviews based on change agent's role in the field of change theory and practices in education (expository writings, training programs, and training manuals and instructional guides)	1. Technical assistance skills 2. Dissemination skills 3. Interprofessional assistance skills 4. Long planning/evaluation skills
3. Teacher Change Agent Scale (CAS); Lukacs (2009); USA.	- To develop and validate a reliable scale for measuring teachers' willingness to initiate change efforts in schools	- The concept of content/pedagogical knowledge about the role of a teacher as a change agent (ownership, self-efficacy and empowerment, motivation and risk-taking, micropolitical expertise and community membership)	1. Content/pedagogical knowledge 2. Professional community membership 3. Collaborative expertise
4. Change Agent Identification Assessment Tool; Van der Linde-de Klerk, Martins & de Beer (2015); South Africa	- To develop a change agent identification framework - To identify change agents more effectively	- Literature of change management, change agent role and responsibility	1. Willingness 2. Level of commitment 3. Personality traits 4. Availability

การพัฒนาและการประเมินคุณสมบัติของเครื่องมือวัดความสามารถในการเป็นผู้นำการเปลี่ยนแปลงของพยาบาลระดับปฏิบัติการในประเทศไทย

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บทคัดย่อ: สมรรถนะของผู้นำการเปลี่ยนแปลง (change agent competency) เป็นสิ่งจำเป็นสำหรับพยาบาลทางคลินิก ในการบริหารจัดการและนำการเปลี่ยนแปลงเพื่อพัฒนาคุณภาพการดูแลทางการพยาบาลให้ดียิ่งขึ้น การประเมินสมรรถนะด้านการเป็นผู้นำการเปลี่ยนแปลงของพยาบาลทางคลินิกจึงมีความสำคัญอย่างยิ่ง อย่างไรก็ตาม สมรรถนะดังกล่าวมีลักษณะเฉพาะตามบริบทของแต่ละประเทศ และในประเทศไทยยังไม่มีเครื่องมือที่ใช้ประเมินสมรรถนะนี้ในพยาบาลทางคลินิก ดังนั้นการวิจัยครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาและประเมินคุณสมบัติของแบบวัดสมรรถนะผู้นำการเปลี่ยนแปลงของพยาบาลทางคลินิกไทย (Thai Clinical Nurses' Change Agent Competency Scale) โดยยึดตามแนวทาง 7 ขั้นตอนของ DeVellis และ Thorpe แบ่งได้เป็น 2 ระยะ ระยะที่ 1 ประกอบด้วยการสังเคราะห์ทฤษฎีการเปลี่ยนแปลง ผลการวิจัยเชิงคุณภาพก่อนหน้านี้เกี่ยวกับการรับรู้ของพยาบาลต่อสมรรถนะของผู้นำการเปลี่ยนแปลง และผลการทบทวนวรรณกรรมอย่างครอบคลุม กระบวนการดังกล่าวส่งผลให้ได้กรอบแนวคิดเบื้องต้นซึ่งประกอบด้วย 7 องค์ประกอบ รวม 90 ข้อ ในระยะที่ 2 ผู้ทรงคุณวุฒิจำนวน 5 ท่านได้ทำการตรวจสอบเนื้อหาและทดสอบเบื้องต้นของเครื่องมือฉบับแรก ผลลัพธ์ที่ได้คือแบบวัดมีจำนวน 81 ข้อ ซึ่งมีค่าความตรงเชิงเนื้อหาและความสอดคล้องภายในอยู่ในระดับที่ยอมรับได้ สำหรับการทดสอบภาคสนาม ได้ดำเนินการประเมินคุณสมบัติและการประเมินอคติจากความต้องการทางสังคม โดยใช้กลุ่มตัวอย่างพยาบาลวิชาชีพจำนวน 234 คน จากโรงพยาบาลมหาวิทยาลัย 8 แห่ง ใน 4 ภูมิภาคในประเทศไทย เพื่อยืนยันความตรงเชิงโครงสร้าง และความเชื่อมั่นของเครื่องมือ

จากการวิเคราะห์องค์ประกอบเชิงสำรวจ พบว่าแบบวัดประกอบด้วย 7 องค์ประกอบ รวมทั้งหมด 50 ข้อ ได้แก่ การทำงานร่วมกัน การสื่อสาร การประเมินและการรับรู้โอกาส การจัดการข้อมูล การปรับปรุงคุณภาพของงาน การวางแผนและการประเมินผล และ ความมุ่งมั่นตามเป้าหมาย ซึ่งสามารถอธิบายความแปรปรวนรวมได้ร้อยละ 65.84 ไม่พบอคติจากความต้องการทางสังคม ผลการวิเคราะห์กลุ่มเปรียบเทียบสนับสนุนความตรงเชิงโครงสร้างของแบบวัด นอกจากนี้ค่าความสอดคล้องภายในโดยรวมและค่าความคงที่จากการทดสอบซ้ำอยู่ในระดับที่ยอมรับได้ สรุปได้ว่า แบบวัดสมรรถนะผู้นำการเปลี่ยนแปลงของพยาบาลทางคลินิกไทย มีความตรงและความเชื่อมั่นในระดับที่ยอมรับได้ ซึ่งเครื่องมือนี้สามารถใช้ประเมินสมรรถนะการเป็นผู้นำการเปลี่ยนแปลงของพยาบาลทางคลินิกในประเทศไทย และอาจสามารถนำไปประยุกต์ใช้กับพยาบาลที่ทำงานในบริบทที่คล้ายคลึงกันได้

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คำสำคัญ : ผู้นำการเปลี่ยนแปลง พยาบาลระดับปฏิบัติการ สมรรถนะการพัฒนาเครื่องมือ การทดสอบคุณสมบัติของเครื่องมือ

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