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Research article

A modified Delphi study on establishing a curriculum content structure for the leadership and management competency cultivation for future nurse managers in China

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ABSTRACT

Background: It is critical to train future nursing managers in advance for the prospective development of healthcare organizations, but a widely recognized curriculum content structure for leadership and management competency development for nurturing future nurse managers was lacking in China.

Objective: To establish a curriculum content structure for the leadership and management competency cultivation for future nurse managers in Chinese healthcare setting.

Methods: A modified Delphi study was conducted. 22 experts who have in-depth knowledge of nursing leadership and management from 4 main geographical regions in China were included. The initial curriculum content structure was constructed based on a previous qualitative study and two team meetings. Subsequently, a two-round Delphi survey was conducted with 22 panelists in the first round and 19 in the second round. Scores of importance and textual comments were collected and used to judge the achievement of consensus.

Results: After the two-round Delphi process, consensus was reached, as each item was rated $\geq$4 by 84.21–100% of the experts and each one had a coefficient of variance (CV) $\leq$ 0.174. The finalized curriculum content contains 9 modules and 27 items.

Conclusions: This study formed a curriculum content structure for leadership and management competency training for nurses preparing for managerial roles, which contribute to the establishment of a nursing management talent pipeline to meet the needs of healthcare institutions for contemporary nurse managers.

1. Introduction

As the direct leader in clinical practice, the advocate for nursing staff, and the promoter of clinical care innovation, first-line nurse managers always make a significant difference in the operation of a healthcare organization. Thus, it is important to consider both clinical expertise and leadership and management skills when the appointment of first-line nurse managers happens [1]. However, due to the lagging development of the nursing discipline in China, the promotion from clinical nursing positions to management positions usually focused more on clinical expertise [2]. In recent years, as Chinese nursing discipline continues to evolve, the selection of managerial roles has begun to gradually shift toward a competency-based orientation, nearly all the major healthcare organizations in China are formalizing competency development for nurses who have the potential to take the managerial role, preparing for a pool of talents for nursing management [3, 4]. Since joining the Nursing Now Challenge movement launched by the International Nursing Council in 2020 [5], our institution has been committed to working on approaches to nurture management talents among frontline nurses. As one of a series of researches to put this initiative into practice, this study aims to establish a curriculum content structure for the leadership and management competency cultivation for future nurse managers through Delphi technique, to facilitate the development of the next generation of nursing management talents in China.

2. Background

In the Chinese clinical setting, candidates for future nurse managers refer to front-line nurses in all kinds of healthcare facilities who have both excellent performance and management potential, because of these

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characteristics, they have a high probability of becoming front-line nurse managers [6]. As the nursing management reserve personnel, being provided with leadership and management competency training in advance will help them quickly adapt to the managerial role once they take over [7]. Leadership in nursing generally refers to the ability to gain support, influence others, and promote change to impact the standards of care [8, 9]. While healthcare management was defined as the process of working through technical and interpersonal activities to plan, organize, staff, control, direct and make decision, in order to achieve desired healthcare of the healthcare organization [10]. The process of leading and managing were largely overlapped, in which the knowledge and skills are needed jointly constitute the key components of the core competencies for a nurse manager [11].

However, in current Chinese clinical setting, most nurses preparing for first-line managerial roles had rarely received formal training in leadership and management skills before taking the position, most of them only have chance to learn some experience when being mentored by the former manager for a short period of time. As such, new nurse managers who take over vacant positions may be overwhelmed by the new role due to the lack of the knowledge and skills needed to meet organizational metrics [12]. In such circumstances, negative consequences may happen in clinical care. According to previous studies, leadership and management competency of nurse managers were significantly associated with patient outcomes and nursing workforce outcomes, the lack of required competencies for nurse managers might reduce job satisfaction and increase turnover among nursing staff [13, 14, 15], which may lead to reduced quality of care, decreased patient satisfaction, and threaten patient health outcomes [16, 17]. Meanwhile, incompetency of nurse manager also increased the likelihood of high level of role stress and burnout for manager themselves [18]. Thus, advanced competency training may be the best solution to help them face the challenge of transition. Moreover, all candidates of future nurse mangers can also be assessed in the training program to test whether they are competent enough to take the position.

Regarding the leadership and management competency development program for nurturing healthcare managers, being equipped with population-specific training content is the key to successful program implementation [19]. In a leadership development program for training leaders of radiology service conducted by Smith et al [20], five major curriculum modules were designed, including: leadership theory and concepts, self-awareness and management, leading teams and developing others, leading an organization, business concepts, and communication skills, since the training was launched, better patient satisfaction and employee perceptions of more positive work environment were presented. In another program [21] for training tomorrow's physician leaders, fourteen topics containing leadership competency, strategic planning and vision, financial management, etc. were included in the training curriculum. At the end of the project, improved leadership skills, negotiation skills, more confidence in leadership roles and collaboration techniques were reported. Both of the above studies from the United States demonstrated effective training curriculum content for the development of leadership and management competency for nurturing talents in healthcare management. However, studies on the development of future healthcare manager in Chinese healthcare setting are lacking currently according to our literature search. So far, although some organizations in China have conducted training for future healthcare managers [22], the curriculum content varies greatly among different organizations, and no consensus had been reached within the nursing profession regarding the core content.

Given the importance of competency training for future nursing managers and the current lack of standardized content in training programs, a leadership and management competency curriculum that is widely recognized by nursing scholars and applicable to most Chinese clinical contexts needs to be developed. To achieve this goal, a modified Delphi study will be conducted. As an efficient way of combining the expertise of a geographically dispersed group, the Delphi technique avoids group domination and provides controlled feedback for reaching final decisions, which is now a widely used method in nursing education research [23, 24]. Through the use of the Delphi method, a curriculum content framework that is recognized by high-impact experts nationwide will be constructed to guide subsequent leadership and management competency training programs for nurturing talents in front-line nursing management in all kinds of healthcare facilities.

3. Methods

3.1. Design

A modified Delphi technique was used in this study. The initial version of curriculum content was drafted through a qualitative study and group discussion. Starting with the initial version, a Delphi process was performed by consulting 22 experts. Consent was reached after a two-round Delphi survey. This study followed the recommendations for the Conducting and Reporting of Delphi Studies (CREDES) [25]. The procedure of the study is presented in Figure 1.

3.2. Initial drafting of curriculum content

To provide a theoretical rationale for curriculum content design, a qualitative study was conducted to develop a nursing leadership and management competency framework. Frontline nurse managers were included from six large-scale tertiary grade A hospitals in Shanghai, China during the period from March 2021 to September 2021. Semi-structured, face-to-face interviews centered on the question “what are the competencies needed for nurses with the potential to be a manager?” were performed with informed consent. After interviewing 27 nurse managers, saturation of information was achieved. Following the thematic content analysis of the interview data, a leadership and management competency framework for nurses preparing for the managerial roles was generated, containing three major categories and fourteen subordinate themes, specific details were presented in another paper [26]. The perceptions of nurse managers from multiple health organizations about the competencies necessary for future nurse managers were synthesized in this framework, which offered an integrated reference for curriculum content development. Based on this framework, the research team conducted two internal meetings, each lasting about 90 min, with the task of concretizing the competencies to form course content suitable for practical delivery, and categorizing them into course modules. Eventually, the initial curriculum content structure with 10 modules and 29 items was constructed.

3.3. Delphi process

3.3.1. Expert panel

The Experts in this study refer to professionals who have in-depth knowledge of nursing leadership and management. The inclusion criteria were as follows: (a) Currently working as a nurse manager in a hospital or other healthcare facility, or as a nursing scholar in an academic institution, (b) currently working in clinical care management, or in research or education related to frontline nursing management, (c) have worked for more than 10 years in the above fields, (d) with associate senior professional title or above, (e) have an undergraduate degree or higher, (f) have interests in this study. The selection of experts began with those who are closely associated with the research team, experts who met the criteria were informed of the purpose and significance of the study via telephone and email, any of them who demonstrate interest in this study will be encouraged to participate. To include more experts, anyone who had been included were also asked to recommend other potential experts. Eventually, twenty-two panel members were recruited and the sample size was determined according to the recommendation of literature [27]. In consideration of the geographic heterogeneity, they were selected from four main regions (including: North, South, East and West) of China.

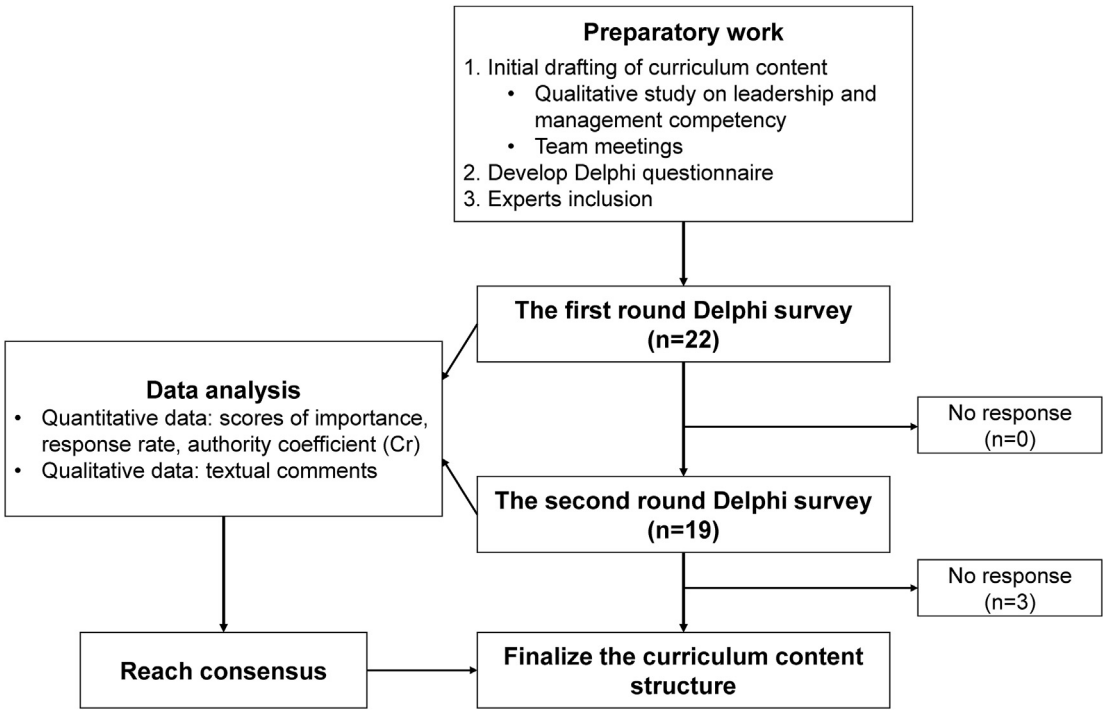

Figure 1. The procedure of the Delphi process.

3.3.2. Round one

The initial curriculum content was incorporated into a questionnaire (see supplementary files), in which, 9 curriculum modules and 29 items represented specific content followed with interpretations were included. The questionnaires were sent via email and the experts were asked to rate each module and subordinate item using a 5-point likert scale ("1 = not important at all", "2 = slightly important", "3 = neutral", "4 = moderately important", "5 = very important"). Meanwhile, a blank area was left after each entry for experts to make additional comments. In addition, each panel member was also required to fill in the form containing demographic information, familiarity with the content of the consultation ("0.2 = not familiar at all", "0.4 = slightly familiar", "0.6 = somewhat familiar", "0.8 = moderately familiar", "1.0 = very familiar"), and the basis for making judgements (multiple choice with "0.5 = practical experience", "0.3 = theoretical analysis", "0.1 = learn from peers", "0.1 = intuition"). To ensure timely completion of the study, the experts were asked to return the questionnaires within 2 weeks, and if not, they would receive a reminder by phone.

3.3.3. Round two

In the second round, a revised version of curriculum content was sent to experts for further review. The modifications were based on the experts' feedbacks from the first-round consultation, including: adding new entries proposed by the experts, revising entries where experts have raised questions and comments, and removing entries with mean scores less than 3.5 and coefficients of variation (CV) greater than 0.35. All items in this version were evaluated like the first-round survey. The revision marks and a summary of comments from the first round were also contained in the questionnaire to facilitate the experts' judgement. The rating scores and comments were collected and analyzed to determine the achievement of consensus as well as to finalize the curriculum content structure for leadership and management training for nurturing future nurse managers.

3.4. Data analysis

Both quantitative and qualitative data from Delphi survey were analyzed. For quantitative analysis, SPSS version 20.0 (IBM Corporation, Armonk, NY, USA) was used. The mean score, percentage of each rating, and the CV of each item were described to determine the achievement of consensus. In this study, consensus was reached if the entry simultaneously met the following criteria developed based on a systematic review [28]: at least 80% of panel members rated 4 point or above, with a CV less than 0.3. To present the validity of the Delphi process, the response rate of the questionnaire was calculated to indicate the enthusiasm of the experts; the authority coefficient (Cr) of the experts was obtained using the formula $Cr = (Cs + Ca)/2$, in which, Ca means their familiarity with the content of the consultation and Cs refers to the basis for them to make judgements; moreover, Kendall's coefficient was computed to represent the overall degree of coordination of expert opinions. Qualitative data refers to textual comments from experts and was consolidated in a document by two researchers. All qualitative data was understood and discussed by the whole research team during internal meetings to guide the revision of curriculum content.

3.5. Ethical considerations

The study was approved by the Ethical Committee of Zhongshan Hospital, Fudan University (approval number: B2021-372R). Before joining in the study, each participant needed to sign an informed consent form. The researchers had guaranteed every participant the confidentiality of their personal information and the anonymity of the data presented, as well as the right to withdraw from the study at any time.

3.6. Rigour

The approaches to ensure the credibility and dependability of Delphi studies highlighted by Hasson and Keeney [29] were used. To ensure that the initial curriculum content was comprehensive and appropriate for training nurses preparing for managerial roles, a qualitative study was conducted prior to the Delphi process to identify the leadership and management competencies required for them. Further, experts from different geographic regions in China were selected so that the expert opinions could be as representative as possible of nursing management talents development needs throughout China. On the revised draft, specific revision details and a summary of previous comments were presented to help experts make objective judgments.

4. Results

4.1. Demographic information of experts

In the first round and the second round, there were 22 (100%) and 19 (86.4%) experts responding to the Delphi survey respectively. Of the total 22 experts, 7 were from North China, 4 from South China, 8 from East China and 3 from West China. The participants had an average of 26.16 (±8.35) years of working experience and were mainly employed as nurse managers in healthcare facilities (18, 81.82%). Specific demographic information is shown in Table 1.

4.2. Trustworthiness of experts

The average Ca (familiarity with the content) in the two rounds was 0.85 and 0.89, and the average Cs (basis of judgment) was 0.88 and 0.86, respectively. Thus, the average Cr (authority coefficients of experts) in the two rounds was calculated to be 0.87 and 0.88, respectively, from the formula Cr = (Cs + Ca)/2. In addition, the Kendall's coefficients in the two surveys were 0.478 and 0.516, respectively, which were both statistically significant.

4.3. Round one

The initial curriculum content presented to the experts is shown in Table 2. In the first round, all members of expert panel had rated the course content items and textual comments were provided by 16 experts.

Table 1. Demographic information of experts.

Characteristics	Round 1 (n = 22)		Round 2 (n = 19)	
	Frequency	Percentage	Frequency	Percentage
Age in years				
<50	7	31.82	6	31.58
50–59	12	54.55	10	52.63
≥60	3	13.63	3	15.79
Gender				
Male	3	13.63	3	15.79
Female	19	86.36	16	84.21
Work years				
10–19	3	13.63	2	10.53
20–29	7	31.82	7	36.84
≥30	12	54.55	10	52.63
Education				
Undergraduate	4	18.18	3	15.79
Master's	9	40.91	9	47.37
Doctorate	9	40.91	7	36.84
Job title				
Associate senior title	5	22.73	4	21.05
Senior title	17	77.27	15	78.95
Region				
North China	7	31.82	7	36.84
South China	4	18.18	3	15.79
East China	8	36.36	6	31.58
West China	3	13.64	3	15.79
Work place				
Hospital	12	63.64	10	63.16
Other healthcare facility[a]	6	18.18	6	21.05
Academic institution[b]	4	18.18	3	15.79

[a] Other healthcare facilities contains two nursing home, two hospice care center and two community health service center.

[b] Academic institution contain three medical colleges and one healthcare research center.

Among the 10 curriculum modules, "6. Quality of care and patient safety" got the highest importance rating. Although all modules were rated 4 or higher by more than 80% of experts, the module "2. Organization operation" was considered to be deficient in specific content and should be integrated with other modules to better demonstrate its significance in the training, so the item "2.1. Role of nurse managers in organizational development" in this module was transferred to the module "1. Basic knowledge of nursing leadership and management" and the item "2.2. Function of each department in a healthcare organization" was moved to the module "3. Teamwork" according to the experts' suggestions.

As for other specific curriculum content, three items were deleted according to the previously established criteria, namely "4.1. Influence the development of healthcare policies", "7.1. Theories of evidence-based practice", and "8.1. Role of nurse managers in hospital cost management". Items 4.1. and item 8.1. were considered by most of experts to be inapplicable to the current work of care managers in the Chinese healthcare setting. For item 7.1, four experts pointed out that the evidence-based practice theory involved in this item should be taught in the context of practical steps, otherwise it is obscure and difficult to understand.

Meanwhile, four items were changed. Course content related to the item "3.3 Interpersonal communication" was considered necessary to highlight Chinese culture characteristics and was therefore changed to "Interpersonal communication in Chinese context". "5.1. Shift scheduling" was deemed to lack the theoretical basis teaching of staffing, and was changed to "nursing positions and staffing" to explain how to schedule nursing manpower at both theoretical and practical levels. The item "8.3. Implementation of value-based care" was thought to cover too much aspects of healthcare rather than nursing, thus it was changed to "Implementation of cost-effective care". The item "10.1. Collaboration with other professions in public health emergency" was considered to place too much emphasis on interprofessional collaboration rather than on nurses' own tasks, and since interprofessional collaboration had been presented in module 3, so the item was revised to "Nurses' role in emergency response".

Moreover, three items were added, namely "Role of nurse leaders in Global Health" to Module 1, "Cooperation with the administrative superiors in Chinese context" to module 2 and "Training an emergency response team" to Module 10, to enhance the integrity of these three modules.

In addition, the suggestion of adding items from two experts were rejected, because the items proposed did not belong to the scope of leadership and management competency training for nurturing future nurse managers.

4.4. Round 2

According to the rating scoring of the 19 experts in the second round survey, consensus was reached as each item was rated ≥4 by 84.21–100% of the experts and each one had a CV ≤ 0.174. However, there are still textual comments from experts, all of which are suggestions for enhancing the accuracy of the text expression. Based on the experts' recommendations, a few changes were made, including changing Module 2 from "Teamwork" to "Intra- and interprofessional teamwork", adding "Contemporary" to the beginning of the item "3.1. Healthcare policies related to nursing activities", and changing the item "5.2. Approaches for nursing care improvement" to "5.2. Approaches for quality improvement". The final curriculum content structure with 9 modules and 27 items is presented in Table 3.

5. Discussion

Combining the competency framework generated from the preliminary qualitative study and 2 rounds of Delphi surveys, a curriculum content structure for leadership and management competency training

Table 2. The results of the first round Delphi survey (N = 22).

Items	Interpretations	Mean	SD	CV	Proportion of scores ≥4
1. Fundamentals of nursing leadership and management		4.91	0.29	0.059	100.00%
1.1. Overview of nursing leadership and management	Key concepts related to nursing leadership and management, competencies and professional values expected of nurse managers	4.91	0.29	0.059	100.00%
1.2. Leadership and management theories	The connotations of common nursing leadership and management theories (e.g. Herbert Simon's decision making theory, Kurt Lewin's change theory, transforming leadership theory) and their guidance for practical management	4.41	0.80	0.181	81.82%
1.3. Role of nurse managers in global health	Enumerate the responsibilities of nurse managers to promote global health, and citing examples	4.50	0.86	0.191	86.36%
2. Organization operation		4.50	0.80	0.178	81.82%
2.1. Role of nurse managers in organizational development	Enumerate the responsibilities of nurse managers to promote organizational development, and citing examples	4.68	0.72	0.153	86.36%
2.2. Function of each department in a healthcare organization	List the functions of each department and describe how the nursing team interfaces with them	4.50	0.67	0.149	90.91%
3. Teamwork		4.91	0.29	0.059	100.00%
3.1. Build an efficient team	About enhancing teamwork by controlling, motivating, and supplying various resources to build an efficient nursing team	4.81	0.59	0.122	90.91%
3.2. Inter-disciplinary collaboration	The role of nurse managers in multidisciplinary collaboration, challenges and coping strategies	4.77	0.53	0.111	95.45%
3.3. Interpersonal communication	Methods and techniques of communication for nurse managers	4.91	0.29	0.059	100.00%
3.4. Conflict management	Common conflicts in clinical setting (including those within nurses, between nurses and other professions, and between nurses and clients) and solutions thereto	4.73	0.55	0.116	95.45%
4. Healthcare policy and law		4.59	0.73	0.160	86.36%
4.1. Influence the development of healthcare policies	How nurse managers influence health policy development from the perspective of patients and first-line nursing staff	3.19	1.14	0.358	31.82%
4.2. Healthcare policies related to nursing activities	Interpret healthcare policies related to nursing activities, clarify their impact on nurses' daily work, and make recommendations for changing work systems in line with the policies	4.32	0.78	0.181	81.82%
4.3. Potential legal issues confronting nurse managers and ways to response	Present the legal issues often encountered during patient care (such as nurse-patient conflicts, privacy breaches, medical disputes, etc.) and provide the measures to deal with these issues	4.45	0.80	0.180	81.82%
5. Human resources and position management		4.86	0.35	0.072	100.00%
5.1. Shift scheduling	How to arrange workforce for each shift	4.59	0.73	0.160	86.36%
5.2. Performance and salary	Methods of measuring work performance and determining salary based on work performance	4.73	0.55	0.116	95.45%
5.3. Competency requirements of nurses at different hierarchies	How to categorize clinical nurses based on their healthcare competency levels and develop a rank advancement plan	4.86	0.35	0.072	100.00%
6. Quality of care and patient safety		4.95	0.21	0.043	100.00%
6.1. Evaluation of quality care and patient safety	Standards and tools for evaluating quality of care and patient safety	4.91	0.29	0.059	100.00%
6.2. Approaches for nursing care improvement	Methods for care quality improvement (including but not limited to: PDCA cycle, QCC, 6-σ, etc.)	4.95	0.21	0.042	100.00%
6.3. Strategies for patient safety management	Focus on building a culture of patient safety and system-level improvement strategies	4.91	0.29	0.059	100.00%
7. Evidence-based practice		4.91	0.29	0.060	100.00%
7.1. Theories of evidence-based practice	Commonly used evidence-based practice theories (such as the Knowledge to action framework, JBI evidence-based health care model, Ottawa knowledge translation model, etc.)	3.32	1.21	0.364	40.91%

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Table 2 (*continued*)

Items	Interpretations	Mean	SD	CV	Proportion of scores ≥4
7.2. Process of evidence-based practice	Methodologies for evidence generation, implementation, effect assessment, and maintaining under the guidance of evidence-based practice theory, accompanied by examples of evidence-based practice	4.91	0.43	0.088	95.45%
7.3. Leadership promotes evidence-based practice	Leadership skills for a nurse manager to facilitate evidence-based practice	4.91	0.29	0.059	100.00%
8. Healthcare cost management		4.69	0.65	0.138	90.91%
8.1. Role of nurse managers in hospital cost management	List what nursing managers can do to manage expenditures at the hospital level	3.41	1.25	0.369	45.45%
8.2. Healthcare insurance regulations related to nursing activity	Interpret state-level healthcare insurance regulations related to nursing activities and clarify their impact on healthcare cost	4.50	0.74	0.164	86.36%
8.3. Implementation of value-based care	How to provide patient-centered prevention, disease care and rehabilitation to reduce medical expenditures	4.59	0.67	0.145	90.91%
9. Informatics		4.77	0.53	0.111	95.45%
9.1. Information management in clinical care	Application of electronic information systems for clinical data collection, storage and sorting	4.86	0.47	0.097	95.45%
9.2. Artificial intelligence in clinical decision making	Current status and potential applications of AI technology in clinical nursing	4.68	0.72	0.153	86.36%
10. Public health emergency response		4.86	0.35	0.072	100.00%
10.1 Collaboration with other professions in public health emergency	Skills to collaborate with other professions during public health events	4.73	0.63	0.133	90.91%
10.2 Developing an emergency rescue plan	Methods for developing ward-level emergency response plans to respond to public health events	4.82	0.50	0.104	95.45%
10.3 Training an emergency response team	Process for training emergency response teams at the ward-level	4.86	0.35	0.072	100.00%

SD = standard deviation. CV = coeffcient of variation.

that is applicable to nurses preparing for managerial roles in China was generated in this study. With 9 modules and 27 specific items, the curriculum is comprehensive in content coverage and recognized by experts as a clear reference for cultivating future nurse managers. To our knowledge, this is the first publicly published curriculum content structure for competency training for future nursing management roles from China.

Table 3. The results of the second round Delphi survey (n = 19).

Items	Interpretation	Mean	SD	CV	Proportion of scores ≥4
1. Fundamentals of nursing leadership and management		4.89	0.32	0.064	100.00%
1.1. Overview of nursing leadership and management	Key concepts related to nursing leadership and management, competencies and professional values expected of nurse managers	4.89	0.31	0.064	100.00%
1.2. Leadership and management theories	The connotations of common nursing leadership and management theories (e.g. Herbert Simon's decision making theory, Kurt Lewin's change theory, transforming leadership theory) and their guidance for practical management	4.42	0.77	0.174	84.21%
1.3. Role of nurse managers in global health	Enumerate the responsibilities of nurse managers to promote global health, and citing examples	4.47	0.70	0.155	89.47%
1.4. Role of nurse managers in organizational development	Enumerate the responsibilities of nurse managers to promote organizational development, and citing examples	4.68	0.58	0.124	94.74%
2. Intra- and interprofessional teamwork		4.89	0.32	0.064	100.00%
2.1. Build an efficient team	About enhancing teamwork by controlling, motivating, and supplying various resources to build an efficient nursing team	4.84	0.50	0.104	94.74%
2.2. Cooperation with the administrative superiors in Chinese context	Principles and methods for effective cooperation with superiors in the context of Chinese officialdom	4.79	0.54	0.112	94.74%
2.3. Function of each department in a healthcare organization	List the functions of each department and describe how the nursing team interfaces with them	4.68	0.67	0.143	89.47%
2.4. Inter-disciplinary collaboration	The role of nurse managers in multidisciplinary collaboration, challenges and coping strategies	4.79	0.54	0.112	94.74%
2.5. Interpersonal communication in Chinese context	Principles and methods of communication related to the hierarchy of superiority and inferiority in Chinese clinical care setting	4.89	0.32	0.064	100.00%
2.6. Conflict management	Common conflicts in clinical setting (including those within nurses,	4.74	0.56	0.119	94.74%

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Table 3 (*continued*)

Items	Interpretation	Mean	SD	CV	Proportion of scores ≥4
	between nurses and other professions, and between nurses and clients) and solutions thereto				
3. Healthcare policy and law		4.47	0.77	0.173	84.21%
3.1. Contemporary healthcare policies related to nursing activities	Interpret healthcare policies related to nursing activities, clarify their impact on nurses' daily work, and make recommendations for changing work systems in line with the policies	4.47	0.77	0.173	84.21%
3.2. Potential legal issues confronting nurse managers and ways to response	Present the legal issues often encountered during patient care (such as nurse-patient conflicts, privacy breaches, medical disputes, etc.) and provide the measures to deal with these issues	4.52	0.77	0.171	84.21%
4. Human resources and position management		4.84	0.37	0.077	100.00%
4.1. Nursing positions and staffing	Describe each position in clinical nursing, including its responsibilities and manpower requirements, from both the theoretical and practical perspectives	4.79	0.54	0.112	94.74%
4.2. Performance and salary	Methods of measuring work performance and determining salary based on work performance	4.68	0.67	0.143	89.47%
4.3. Competency requirements of nurses at different hierarchies	How to categorize clinical nurses based on their healthcare competency levels and develop a rank advancement plan	4.84	0.37	0.077	100.00%
5. Quality of care and patient safety		5.00	0.00	0.000	100.00%
5.1. Evaluation of quality care and patient safety	Standards and tools for evaluating quality of care and patient safety	4.94	0.23	0.046	100.00%
5.2. Approaches for quality improvement	Methods for care quality improvement (including but not limited to: PDCA cycle, QCC, 6-σ, etc.)	4.94	0.23	0.046	100.00%
5.3. Strategies for patient safety management	Focus on building a culture of patient safety and system-level improvement strategies	5.00	0.00	0.000	100.00%
6. Evidence-based practice		4.94	0.23	0.046	100.00%
6.1. Process of evidence-based practice	Methodologies for evidence generation, implementation, effect assessment, and maintaining under the guidance of evidence-based practice theory, accompanied by examples of evidence-based practice	4.89	0.32	0.064	100.00%
6.2. Leadership promotes evidence-based practice	Leadership skills for a nurse manager to facilitate evidence-based practice	4.94	0.23	0.046	100.00%
7. Healthcare cost management		4.63	0.60	0.129	94.74%
7.1. Healthcare insurance regulations related to nursing activity	Interpret state-level healthcare insurance regulations related to nursing activities and clarify their impact on healthcare cost	4.53	0.70	0.154	89.47%
7.2. Implementation of cost-effective care	How to provide clients with cost -effective care, especially for those who are financially vulnerable, with case analysis	4.63	0.60	0.129	94.74%
8. Informatics		4.73	0.56	0.118	94.74%
8.1. Information management in clinical care	Application of electronic information systems for clinical data collection, storage and sorting	4.84	0.50	0.104	94.74%
8.2. Artificial intelligence in clinical decision making	Current status and potential applications of AI technology in clinical nursing	4.63	0.68	0.148	89.47%
9. Public health emergency response		4.89	0.32	0.064	100.00%
9.1. Nurses' role in emergency response	List the responsibilities of nurses in public health events and how they work with other professions involved in the response	4.73	0.56	0.119	94.74%
9.2. Developing an emergency rescue plan	Methods for developing ward-level emergency response plans to respond to public health events	4.84	0.37	0.077	100.00%
9.3. Training an emergency response team	Process for training emergency response teams at the ward-level	4.89	0.32	0.064	100.00%

SD = standard deviation. CV = coefficient of variation.

5.1. Analysis of experts' trustworthiness

In this study, a high level of enthusiasm and professionalism was demonstrated by the panelists, based on which, the curriculum content could be evaluated appropriately and effectively. As described in the results section, the response rates of 100% and 86.4% for the two rounds showed that the experts were able to actively participate in each survey, and the reason for the high engagement may be related to the selection of those with interests at the inclusion stage. As for the professionalism of the experts, the authority coefficient was 0.87 and 0.88 in the two rounds respectively, given that other studies had mostly used 0.7 as the threshold [30, 31], the results in this study showed a higher level of experts' authority in the perspective of self-assessment; moreover, the panelists have an average of 26.16 years' experience in the field of nursing leadership and management, and all of whom have associate senior titles or above, thus showing their unquestionable professionalism in the field being consulted. In addition, to meet the need for a heterogeneous sample in the Delphi process [32], the included experts

contained nurse managers from hospitals, scholars from healthcare management research institutions and officials from healthcare administrative agencies, in consideration of geographical variations, experts were from different geographic regions, thus ensuring that the entire spectrum of opinion was determined.

5.2. Analysis of curriculum content

The module "1. Fundamentals of nursing leadership and management" acts as the introductory section covering key concepts and theories of nursing leadership and management, and interpretations of the managerial role, which was designed to motivate trainees to move from a "blackout" status to an "arousal" status in preparation for practical skills learning. Similarly, in some training programs for novice managers [33, 34], the basic knowledge for clinical management were also taught as the first part of the curriculum, leading the trainee into subsequent learning. As suggested by Hansten [35], the first step in becoming a nurse manager is to arouse awareness of the role, the basic knowledge and theories of healthcare management will map out the profile of a managerial role and provide future nurse managers important guidance for their subsequent management work.

As a series of actions for a group to achieve common organizational goals, teamwork affects organizational effectiveness and employee engagement greatly [36]. In clinical setting, nurses have always been worked closely with physicians, laboratorians, logistic worker and personnel from other specialties in a big team, working together to promote the health of the clients. Thus, the module "2. Intra- and interprofessional teamwork" is designed to equip nurses preparing for managerial roles with the ability to foster, motivate, and promote teamwork at both intra- and interprofessional levels in order to enhance the effectiveness of the team. Regarding competencies for facilitating teamwork, interpersonal communication and conflict management have been identified in various studies as essential skills [37, 38]. Since the interpersonal process is culturally specific, in the Chinese environment, there are specific rules for interaction between people of different levels, status and age, especially for interaction with administrative superiors, which will facilitate smooth work and professional development [39, 40], so the curriculum content relates to cooperation with superiors and interpersonal communication in the Chinese cultural context should also be the indispensable parts in this module of learning for future nurse managers.

The two modules "5. Quality of care and patient safety" and "6. Evidence-based practice" are closely interrelated, which gather standardized and evidence-based strategies for improving patient safety and quality of care. The course content was intended to train future nurse manager candidates in management competencies to achieve positive clinical outcomes. By providing standardized quality improvement methods (including but not limited to QCC, PDCA and 6-σ) and evidence-based practice procedure, the trainees will be empowered to improve clinical care by data-driven approach. Given that patient outcomes are a key indicator for measuring the effectiveness of care [41], novice nurse managers will be under considerable pressure to maintain quality of care once they take the position [18]. Thus, the above two modules were considered more integral to preparing for the managerial role compared to other modules, as can be seen from the mean scores of subordinate items. Simultaneously, similar content was also found in previous nursing leadership and management competency training programs and its importance was highly emphasized [42, 43].

For the remaining 5 modules, including "3. Healthcare policy and law", "4. Human resources and position management", "7. Healthcare cost management", "8. Informatics", and "9. Public health emergency response", the course content was developed to equip future nurse manager candidates with the ability to facilitate the operation of ward-level nursing system by integrating human and material resources and optimizing workflow. In a clinical setting, a rational workforce arrangement, a sound role-matching workflow and a mature healthcare information system are considered as the prerequisite for efficient daily healthcare work [44]. As a nurse manager, the mastery of the above skills means that daily nursing activities led by her/him can be carried out smoothly. Meanwhile, as healthcare policies, health insurance system, and healthcare-related laws in China are updated periodically, it is deemed highly necessary to be competent in making proper modifications to nursing norms and procedures in response to these changes, so that clinical healthcare can evolve in a safe, efficient, and cost-effective direction [45]. In addition, the persistence of the COVID-19 epidemic is a constant reminder for every healthcare organization to have a robust capability of public health emergency response [46]. For first-line nurse managers, it is their responsibility to develop micro-system level plans in advance including actions of environmental, personnel and material responses, and to be ready to respond to disaster response needs at any time. Hence, through these five curriculum modules, nurses preparing for the managerial roles can be empowered to effectively lead the teams and drive quality care in their future managerial roles, no matter the daily healthcare setting changes or not.

5.3. Strength and limitation

A significant strength of this study is that opinions of experts from different geographic regions in China were obtained to facilitate the curriculum content to take into account the needs of nursing management talent training nationwide as much as possible. Nevertheless, this study has some limitations as well. Firstly, due to the lack of published research, the curriculum content structure was built based on a qualitative study rather than a widely validated framework, which may adversely affect its completeness and applicability. Secondly, due to time and financial constraints, experts were selected by purposive and snowball sampling, which meant that not all potential experts had the same opportunity to be enrolled, although the research group had tried every effort to include as many experts as possible to allow for multiple perspectives to be obtained. In addition, regardless of whether the curriculum content in this study is considered well-established, the practicality, validity, and feasibility of the curriculum content still need to be verified in future studies to promote its generalizability.

6. Conclusions

This study formed a curriculum content structure for leadership and management competency training for nurses preparing for managerial roles, containing 9 modules and 26 items. The curriculum content covers the basic knowledge and theory outlining nursing management, as well as knowledge and skills to promote teamwork, improve clinical outcomes, and facilitate the functioning of nursing system. The results of this study can serve as an important foundation for core competency training for nurturing future nurse managers in China, and contribute to the establishment of a nursing management talent pipeline to meet the needs of healthcare institutions for contemporary nurse managers.

Declarations

Author contribution statement

Xiaohua Xu: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Yuxia Zhang: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Ping Zhou: Analyzed and interpreted the data.

Wenyan Pan: Performed the experiments.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

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