


Strategies and criteria targeting the reform and development for the teaching resource of nursing undergraduate

A multi-center cross-sectional study

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Abstract

Teaching resource of nursing students play an important role in improving clinical performance, while there is a little know and dearth of the access and development criteria or guidance of teaching resources for nursing undergraduates.

To develop the admission and development criteria of education resources for nursing undergraduates, and to explore and determine its composition and connotation.

A cross-sectional survey has been used.

A total of 22 Chinese nursing schools and affiliated teaching bases (hospitals and community health centers).

A total of 20 nursing experts were consulted to develop the questionnaire of admission and development criteria of teaching resource for nursing undergraduates in China, and then 285 valid experts from 22 Chinese nursing schools and affiliated teaching bases (hospitals and community health centers) conducted the questionnaire survey to evaluate experts' consensus rate and view on the composition and connotation of the developed criteria.

There were 6 domains and 43 items included in the admission and development criteria of teaching resource for nursing undergraduates, which domains included educational budget and allocation of resources, infrastructure, clinical teaching bases, books and information services, educational experts, and educational exchanges. The experts' consensus rate was more than 90.2%.

The standard is helpful to guide the future admission and development of teaching resource for nursing undergraduates, and favor the education quality improvement of nursing undergraduates.

Abbreviation: none.

Keywords: admission and development criteria, consultants, nursing, undergraduate, teaching resource

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1. Introduction

With the development of economic society and medical education, teaching resource has drawn wide attention in medical educational discussions. Teaching resource is defined as the human, financial or material resources needed to effectively complete the corresponding program objectives and education organizational processes,^[1] which plays an important role in ensuring the effective implementation of education plan, and strengthening the cultivation of students' practical abilities as well as assuring the quality of personnel training.^[2] So, the qualified teaching resource is a safeguard of education quality. Chinese nursing educational quality should move closer to the international level of nursing practitioner, and Chinese nursing talent training standards should be in line with international standards, in order to respond to the health care talent challenge of the global health and nursing development. In the face of the global larger demand of health personnel and the task requirement of the cultivation of high quality nursing talents, optimizing the scale and structure of higher nursing education, improving the nursing personnel training mechanism and standardizing the education quality evaluation and certification system, as well as establishing the unified standard of the teaching resource' admission and development for nursing students in the national level should be warranted.

As to the nursing teaching resource, which is also the carrier of nursing personnel training and education, together with the basic and necessary condition of knowledge internalization and concrete of students, especially in the clinical context.^[3] In 2005, World Health Organization and the International Nurses Honor Society advocated and began to develop and conduct global nursing educational guideline and researches.^[4] And World Health Organization had issued a global standard of professional nurse and midwife primary care education in 2009, which was used as the basic requirement and criteria of the nursing undergraduate education, and it would guide the countries' nursing educational activities and the establishment of educational standard,^[4] which also pointed out that the teaching resource' criteria of nursing worldwide should include classroom, clinical teaching base, information technology, clinical simulation laboratory, books, human resource, fund, student support service system, etc. Moreover, in these countries such as the United States, Britain, Australia, Switzerland also emphasized that the teaching resource should include adequate fund, equipment material (classrooms, laboratories, offices, etc), proper learning environment, education practice, sufficient time, practice base and the clinical teachers' competency.^[4] European Higher Education Quality Assurance standard and guideline emphasized that teaching resource should supply high technology and information resource to ensure teachers and students could collect, analyze and apply relevant information to complete effectively the education and learning activities.^[5] Chinese nursing schools as well as the institutes of nursing personnel training have been developing rapidly in the last decade, and the platforms for education activities are gradually expanding to the network in many colleges and universities.^[6] However, there are some contradictions between the nursing schools' short-term large-scale enrollment and the relative lack of teaching resource in China, such as shortage of the basic equipment and construction fund of hospital nursing practice unit, the basic facilities and teachers of community practice bases are also relatively poor, which could directly influence the comprehensive

practical ability of nursing undergraduates. Relevant institutions at home and abroad have roughly formulated some standards and directions for nursing teaching resource, but as far as we know, little research has probed into the admission and development standards of nursing teaching resource.

The teaching resource for nursing undergraduate might differ among geographical areas, as cultures can vary substantially. What constitutes the admission and development criteria of nursing teaching resource? What is its connotation? It is not clear. In order to ensure quality of nursing undergraduate education, an urgent need exists to establish the evaluation standard of teaching resources for nursing undergraduates. Thus, our study aimed to develop the admission and development criteria of teaching resource for nursing undergraduates, and then to investigate and consult experts for exploring and determining its composition and connotation, so as to better evaluate the necessity and feasibility of admission and development criteria of teaching resource in higher nursing education and to disseminate the findings more widely to international nursing educators and researchers. In addition, this research will provide a valuable reference for teaching-learning innovation and for researchers in different education systems and cultural backgrounds who want to assess and develop the admission and development criteria of teaching resource for nursing undergraduates.

2. Methods

2.1. Respondents and procedures

A multi-center cross-sectional survey with questionnaire was performed. This study included two procedures and purposive sampling was used. The first stage was experts consultation aimed to construct the questionnaire of the admission and development criteria of nursing undergraduate teaching resource, which was conducted from May to September 2018. The second stage was questionnaires survey, which recruited the subjects according to geographical location in the schools of nursing and their affiliated teaching bases (hospitals and community teaching bases) nationwide, carried out between September 2018 and March 2019 to identify the consent rate and correcting advice for the composition and connotation of the criteria, the data collection process was conducted by three research assistants.

In the stage of experts' consultation to construct the questionnaire, the number of surveyed nursing experts who were sampled according to the distribution ratio accounted for about 15% of all schools of nursing in China, which from the sampled 22 schools of nursing and their affiliated teaching or practice bases. 25 experts were selected, of which 22 agreed to participate in the consultation and investigation. However, only 20 experts completed the consultation and investigation in the whole process and included it in the final data analysis. Consider the authority of the experts, the 20 nursing educational experts, whose job titles were all associate professors and above or associate chief nurses, and they all have already worked more than 10 years in their professional fields. (Table 1)

And in the survey, the number of surveyed nursing colleges which were sampled according to the distribution ratio accounted for about 15% of all schools of nursing in China. Each investigated institutional unit contained 16 participants in three areas (school, the supporting teaching hospital and community practice base). Specifically, a total of 7 participants from school including 1 dean or teaching assistant dean, and

Table 1
Demographic characteristics of the consulted experts (N=20).

Characteristics	Value
Age, mean (standard deviation, SD), in yr	45.8 (5.1)
Years of practice, mean (SD)	19.2 (8.2)
Education background, n (%)	
college diploma	2 (10.0)
university diploma	11 (55.0)
Master degree	4 (20.0)
Doctor degree	3 (15.0)
Professional Designation, n (%)	
Associate professor	5 (25.0)
Professor	15 (75.0)
Primary working field, n (%)	
Nursing education & Nursing management	12 (60.0)
Nursing management & Clinical nursing	5 (25.0)
Clinical nursing	3 (15.0)
Region, n (%)	
Southwest, CHN	5 (25.0)
East, CHN	2 (10.0)
North, CHN	4 (20.0)
Northwest, CHN	3 (15.0)
South, CHN	4 (20.0)
Middle, CHN	2 (10.0)

CHN=China, N=number, SD=standard deviation.

respective 1 teacher major in medical nursing, surgical nursing, obstetrics nursing, pediatric nursing, community nursing, psychological nursing; And also 7 participants from the affiliated teaching hospital including 1 nursing director or deputy director in charge of the nursing undergraduate teaching, respective 1 clinical instructor of the internal medicine, surgery, obstetrics and gynecology, pediatrics, emergency, mental health center; And other 2 participants from community practice base including 1 of nursing teaching directors and 1 community clinical instructor (Table 2). In the questionnaires survey process, the constructed questionnaires in the electronic or paper form were sent to the sampled 22 schools of nursing and their affiliated teaching and practice bases. During the survey, the participants discussed the feasibility, instructive, innovation, developmental and correcting

Table 2
Demographic characteristics of participants in the questionnaires survey (N=285).

Characteristics	Value
Gender	
Male, n (%)	8 (2.8)
Female, n (%)	277 (97.2)
Age, mean (SD) (range), in years	41.32 (7.37) [25, 64]
Years of clinical nursing practice, mean (SD)	16.64 (10.77)
Years of teaching work, mean (SD)	13.22 (8.02)
Education background, n (%)	
college diploma	18 (6.3)
university diploma	141 (49.5)
Master degree	100 (35.1)
Doctor degree	26 (9.1)
Professional Designation, n (%)	
Senior nurse / assistant	13 (4.6)
Supervisor nurse/ instructor	114 (40.0)
Deputy director of nurse / Associate professor	116 (40.7)
Chief superintendent nurse / professor	42 (14.7)

N=number, SD=standard deviation.

advice for the composition and connotation of the criteria. The researchers collected the questionnaires, analyzed and synthesized the questions and suggestions given by the participants, and finally the admission and development criteria of the nursing undergraduate teaching resource was established.

The inclusion criteria are: 1) Schools of nursing owned affiliated teaching and practice bases, 2) The experts had been working more than 10 years in their own posts, and 3) The schools and their affiliated teaching and practice bases and the participants were all informed consent to participate in this study. The exclusion criteria is that the repossessed questionnaires had missing answers and could not to check them with the corresponding experts.

2.2. Instrument

The questionnaire of the admission and development of teaching resource for nursing undergraduates in the study included 6 domains and 43 items. All items of the questionnaire were designed in reference to former studies and were evaluated and modified by 20 scholars and practitioners with relevant expertise (experts' consultation), and which combined with the characteristics of schools of nursing and based on the existing educational standards of nursing profession and the content of teaching resource were developed by the Chinese Ministry of Education in 2010.

2.3. Statistical analyses

Descriptive data (eg, means, standard deviation, frequencies), the response rates of experts were calculated. The experts' amending opinions on the criteria were summarized and described in words. Data exclusion criteria were defined as more than 20% of the response entries were missing. For the missing data, which can be confirmed and supplemented by the consulting experts or survey participants. The relevant data will be eliminated if the participants cannot be contacted for the supplement and the miss rate is greater than 20%. If the missing data fail to supplement but the miss rate is less than 20%, the rest data used to reference for analysis.

2.4. Ethical considerations

Ethical approval was obtained from our institutional ethics committee (No. 238). Consulted experts were provided with an explanation of the research aims and assured that their anonymity would be maintained. Furthermore, the participants were assured that the findings would only be used for research purposes.

3. Results

3.1. The demographic characteristics of consulted experts and questionnaires surveyed participants

There was a 100% response rate of 20 experts in the consultation of the questionnaire's construction. The demographic characteristics of consulted experts were showed in Table 1. A total of 22 nursing colleges and their affiliated teaching bases nationwide with 352 participants' survey questionnaires were included, excluding 19 invalid questionnaires and 48 had not recycled, finally, 285 valid questionnaires were analyzed, the effective recovery rate of questionnaires was 80.97% (Table 2).

3.2. Revision opinions of experts on the developed criteria

After nursing experts' consultation and questionnaires survey, we have developed the admission and development criteria of nursing undergraduate teaching resource (Table 3). The opinions on the criteria were recycled among the responders, and the participants' consensus rate was much more than 90.2%. The developed admission and development criteria of nursing undergraduate teaching resource including 43 items or problem statements of 6 domains, which were educational budget and allocation of resource, infrastructure, clinical teaching bases, books and information service, educational experts, educational exchange.

The highest agreement rate of consulted items was 99.6% (Table 3), including item 2, item 6, item 16, item 31. The first three lowest agreement rates of items were item 1 (90.2%), item 11 (90.5%), item 13 (93.7%) and item 34 (93.7%), respectively (Table 3). For the item 1, the experts focused on the financial support's providers and recipients, suggesting that the support channels should be made clearly, and the education funds should be provided according to the need of nursing educational program, reform and development. Besides, the criteria should also be amended once 5 years; For the item 11, the consulted advice of experts were mainly that it should build the teaching training rooms with characteristics of nursing subspecialty; For the item 13, some experts suggested that the ratio of the number of beds in the teaching hospitals and the internship students should enlarge to a suitable ratio, for instance, 2 to 3:1, so as to ensure the quality of nursing undergraduates' internships; For the item 34, the experts' advice were mainly that this expression should be changed into "strengthening communication with educational experts in order to full play their roles in teacher training and nursing education", other suggestions were that it need to determine the experts' criteria in advance, and then to create an effective communication way.

4. Discussion

The constant challenges in nursing education are the effective teaching competencies of schools and allowing students to safely practice essential nursing skills. Faculty need develop sound methods of instruction to achieve program outcomes, which then ensure education program effectiveness, assure professional readiness and meet accreditation standard.^[7] Therefore, establishing Chinese criteria of teaching resource for nursing undergraduate is important. In our study, the findings showed that the experts highly agreed with the established admission and development criteria of nursing undergraduate teaching resource (The agreement level was more than 90.2%). Minutely, the criteria included educational budget and allocation of resource, infrastructure, clinical teaching bases, books and information service, educational experts, educational exchange.

4.1. Educational budget and allocation of resource

With the development of nursing education, schools of nursing (departments) should be provided adequate financial support and a stable source of funding in accordance with the scale of education, and the teaching bases should be given the supporting teaching resource and funds according to the teaching task undertaken. Besides, the learning resources should be comprehensive, up-to-date, developing, and available to teachers and students.^[8] The budget should support the development,

implementation, and evaluation of the nursing educational program, ensuring the completion of education programs. Therefore, we should establish a sound financial management system of educational fund and increase its investment according to the relevant laws. In addition, the tuition and fund should be managed and used in accordance with the relevant national provisions. And the education budgets should be made depend on the respective schools of nursing (departments) or each area's budgetary practice, and its annual growth rate should be no less than national or local financial growth rate to ensure the nursing educational development.

4.2. Infrastructure

Infrastructure should include all types of classrooms and multimedia equipment, group discussion (learning) rooms, operation showing classrooms, laboratories and equipment, clinical skills simulation classrooms, training rooms and equipment of nursing skills, education assessment facilities, library, information technology facilities, distance education support, research support, admission and advising services, cultural and sports activities venues, student accommodation, etc.^[9] Schools of nursing should ensure the resources available and adequate for students' learning,^[10] and make sure all students could access similar learning resources, and these resources should be fully accessible to students in different academic and practice learning environments (including information technology and library).^[11] Besides, because teachers are advocated to develop effective methods of teaching essential skills, the use of multimedia teaching is proposed, which is a teaching-learning strategy used to help students develop effective communication, physical assessment, and selected psychomotor skills, of which the videotaping can provide students with a mechanism for detailed instructor feedback to improve performance.^[7]

Schools of nursing (Departments) should be equipped with adequate infrastructure for the teaching activities of teachers and students, and the infrastructure should be regularly updated and added to ensure the completion of education programs. According to the development needs of nursing discipline, schools of nursing should build teaching training rooms with the characteristics of nursing sub-specialty, which should include basic nursing, medical nursing, surgical nursing, obstetrics nursing, pediatric nursing, operating room, emergency, intensive care unit, etc. And it should equip with the appropriate facility, so as to meet the program requirements and goals of nursing professional skills training.

4.3. Clinical teaching bases

Clinical practice is a substantial part of nursing education, and nurses are expected to as preceptors for nursing undergraduates, consequently, they should be able to create learning opportunities to meet the requirements of academic education.^[12] Clinical credibility in classroom teaching was identified by nurse lecturers as an area that could be enhanced via a clinical practice role. In our study, it presented that the nursing undergraduate institutions should have at least one of the tertiary comprehensive affiliated hospitals, total number of beds should meet the needs of students in internships process. Since community nursing is an important aspect of adaptation required for future development of nursing discipline, it is recommended that the schools should

Table 3**The established admission and development criteria of teaching resources for nursing undergraduates.**

Serial number	Item description	The agreement level
Domain I	Educational budget and allocation of resource	98.2%
	Admission criteria	98.6%
Criteria 1.1	Schools of nursing (departments) must be provided adequate financial support and a stable source of funding in accordance with the scale of education. For the teaching bases, it should be offered by the corresponding teaching fund in accordance with the mission they undertaken. With the development of nursing education, the teaching fund input should be increased gradually to ensure effective accomplishment of the teaching plan.	98.2%
Item 1	The description of the above criteria was clear and easy to understand.	90.2%
Item 2	The above criteria was a basic criteria to ensure the quality of teaching, which should be effectively implemented.	99.6%
Criteria 1.2	Establishing and perfecting the system of financial management in accordance with the specific laws, clearing the purpose of education budget and resource allocation, and strictly managing the education funds to improve its use efficiency.	98.3%
Item 3	The description of the above criteria was clear and easy to understand.	99.3%
Item 4	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	98.3%
Domain II	Infrastructure	98.3%
	Admission criteria	99.3%
Criteria 2.1	Schools of nursing (departments) must be equipped with adequate infrastructures for the teaching activities, the infrastructures should be regularly updated and added to ensure the accomplishment of teaching plans.	99.3%
Item 5	The description of the above criteria was clear and easy to understand.	98.3%
Item 6	The above criteria was a basic criteria to ensure the quality of teaching, which must be carried out effectively.	99.6%
Criteria 2.2	Schools of nursing (departments) should be equipped with laboratory and experimental teaching equipment to meet nursing teaching requirements, and to ensure the quality of experimental teaching.	98.3%
Item 7	The description of the above criteria was clear and easy to understand.	98.3%
Item 8	The above criteria was a basic criteria to ensure the quality of teaching, which must be carried out effectively.	98.3%
Criteria 2.3	Schools of nursing (departments) should have the nursing professional teaching practice rooms (Basic nursing, medical nursing, surgical nursing, gynecology and obstetrics nursing, pediatric nursing, operating room, emergency, etc.), and have appropriate training equipment and teaching models to ensure the implementation of nursing professional skill training.	97.5%
Item 9	The description of the above criteria was clear and easy to understand.	98.3%
Item 10	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	96.8%
	Development criteria	98.3%
Criteria 2.4	Schools of nursing (departments) should construct the teaching practice rooms with the characteristic of nursing according to the need of disciplinary development.	99.3%
Item 11	The description of the above criteria was clear and easy to understand.	90.5%
Item 12	The above criteria provided the developmental space for undergraduate educational resources characteristics in schools of nursing.	98.6%
Domain III	Clinical teaching bases	98.3%
	Admission criteria	98.3%
Criteria 3.1	Schools of nursing (departments) must have no less than one of the tertiary comprehensive hospitals as their stable teaching bases. The ratio of the number of nursing specialty students and the actual total number of hospital beds in internship hospitals for students to use should reach 1:1, and the departments should be set up completely, which could satisfy the need of clinical teaching.	94.7%
Item 13	The description of the above criteria was clear and easy to understand.	93.7%
Item 14	The above criteria was a basic criteria to ensure the quality of teaching, which must be carried out effectively.	95.8%
Criteria 3.2	It should establish a steady management system and coordination mechanism for clinical teaching bases to meet the requirements of clinical teaching and practice.	94.7%
Item 15	The description of the above criteria was clear and easy to understand.	94.7%
Item 16	The above criteria was a basic criteria to ensure the quality of teaching, which should be effectively implemented.	99.6%
Criteria 3.3	Schools of nursing (departments) should strengthen the construction of infrastructures and nursing skills training rooms in clinical teaching bases to ensure the effective implementation of clinical teaching and internship program.	94.7%
Item 17	The description of the above criteria was clear and easy to understand.	96.1%

(continued)

Table 3
(continued).

Serial number	Item description	The agreement level
Item 18	The above criteria was a basic criteria to ensure the quality of teaching, which should be effectively implemented.	94.7%
Criteria 3.4	Nursing clinical teaching bases should set up the specialized agencies equipped with full-time personnel to take charge the management of clinical teaching, establishing the system of teaching archives, and enhancing the supervision of teaching quality.	98.7%
Item 19	The description of the above criteria was clear and easy to understand.	96.1%
Item 20	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	94.7%
Item 21	The qualification requirements of clinical teachers should be put forward to ensure the quality of clinical teaching.	98.7%
Criteria 3.5	Schools of nursing (departments) should have a stable community health service center as the practice base to ensure the completion of teaching tasks.	96.7%
Item 22	The description of the above criteria was clear and easy to understand.	97.5%
Item 23	The above criteria was a basic criteria to ensure the quality of teaching, which should be effectively implemented.	96.8%
Criteria 3.6	Schools of nursing (departments) should have a stable psychiatric mental health center or department of psychiatry as the teaching base to ensure the completion of teaching tasks.	96.8%
Item 24	The description of the above criteria was clear and easy to understand.	99.2%
Item 25	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	94.0%
Criteria 3.7	Development criteria Schools of nursing should set up and perfect the long-term mechanism of teaching faculty's cultivation and construction in the bases, and it should be effectively implemented. Besides, it should gradually increase the proportion of double type of teachers and improve the teaching quality.	98.2% 99.0%
Item 26	The description of the above criteria was clear and easy to understand.	97.5%
Item 27	The above criteria provided the development space for the undergraduate educational resources characteristics in schools of nursing.	97.5%
Domain IV	Books and information service	97.5%
Criteria 4.1	Admission criteria Schools of nursing (departments) must have and maintain a good library and information network facilities, and should establish the corresponding policy and system, making modern information and communication technology can be effectively used in teaching to facilitate the self-study, admission to information and carry out nursing services and health care work of teachers and students.	97.5% 99.0%
Item 28	The description of the above criteria was clear and easy to understand.	97.2%
Item 29	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	97.5%
Criteria 4.2	Schools of nursing (departments) should possess Chinese and foreign professional books, journals and network information resources, and add and update according to the need meeting teaching reform, development and scientific research.	99.3%
Item 30	The description of the above criteria was clear and easy to understand.	98.3%
Item 31	The above criteria was a basic criteria to ensure the quality of teaching, which must be effectively implemented.	99.6%
Domain V	Educational experts	97.5%
Criteria 5.1	Admission criteria Schools of nursing (departments) own the education experts to make and carry out the teaching plans and educational reform.	99.3% 99.3%
Item 32	The description of the above criteria was clear and easy to understand.	98.6%
Item 33	The above criteria was a basic criteria to ensure the quality of teaching, which should be carried out effectively.	99.3%
Criteria 5.2	An effective way of contact with the educational experts should be established, and would confirm the roles of educational experts in teacher training and nursing education.	96.5%
Item 34	The description of the above criteria was clear and easy to understand.	93.7%
Item 35	The above criteria was a basic criteria to ensure the quality of teaching, which should be effectively implemented.	94.4%
Criteria 5.3	Development criteria Schools of nursing should gradually establish and perfect the experts' team with reasonable structure and clear responsibilities to ensure the quality of teaching.	94.4% 96.5%
Item 36	The description of the above criteria was clear and easy to understand.	98.3%
Item 37	The above criteria provided the development space for the undergraduate educational resources characteristics in schools of nursing.	96.1%

(continued)

Table 3
(continued).

Serial number	Item description	The agreement level
Domain VI	Educational exchange	96.1%
	Admission criteria	95.8%
Criteria 6.1	Schools of nursing (departments) must provide the appropriate approach and resource to promote the regional and national communication of teachers and students.	95.8%
Item 38	The description of the above criteria was clear and easy to understand.	97.5%
Item 39	It was feasible to implement the above criteria.	96.1%
	Development criteria	97.5%
Criteria 6.2	Schools of nursing (departments) should establish the mechanism of cooperation with other institutions of higher education both at home and abroad and the mutual recognition of credits.	94.0%
Item 40	The description of the above criteria was clear and easy to understand.	97.5%
Item 41	The above criteria provided the development space for the undergraduate educational resources characteristics in schools of nursing.	94.0%
Criteria 6.3	Schools of nursing (departments) should actively use the foreign high-quality educational resources to promote the development of their nursing science.	98.3%
Item 42	The description of the above criteria was clear and easy to understand.	94.4%
Item 43	The above criteria provided the development space for the undergraduate educational resources characteristics in schools of nursing.	97.2%

establish the relationships with the urban community health service centers and the rural hospitals or the township health centers.^[13,14] It should also have stable mental health centers or psychiatric as the practice or teaching bases to ensure the completion of students' study task, which expected to promote the integrated development of clinical nursing teaching in practice bases.

Besides, it was suggested that schools of nursing (departments) should strengthen the construction of the nursing skills training rooms in clinical teaching bases to ensure the effective implementation of the internship programs. And nursing clinical teaching bases should set up special agencies with full-time staff to take charge of the management of clinical teaching, and establish a sound long-term mechanism of teaching faculty training and building in the bases and effectively implement that.

4.4. Books and information services

Nowadays, it is the era of network services and high information-oriented education, which is an inevitable choice for international nursing education. Education materials of nursing education are available online for students could proactively to learn and develop their self-learning abilities, and the network distance education has been effectively established and used in the United States.^[6] In Britain, under the guide of student-centered education philosophy, a lot of public basic courses are set for students' learning ability, including the use of information technology, information retrieval, library and variety of learning resources, etc.^[15] which also aimed to improve the comprehensive quality of the students.

The advances in information and communications technology have contributed to the transformation of learning environments. For example, the e-learning has many advantages, including increased accessibility to educational materials (at a time and place chosen by learners), personalized instruction (to tailor teaching to individual learners' needs), and standardization of content.^[11,16,17] With e-learning, the delivery and receipt of course content may be asynchronous, shifting the educational model from a passive, teacher-centered to one that is active and

learner-oriented.^[17] The flipped classroom approach in virtue of e-learning and combined with traditional classroom teaching has been broadly applied to nursing undergraduates teaching in China, and received a good results,^[18] which was a good example of information services used.

Online teaching and distance learning have become a common practice in most academic institutions, the nursing faculty are also encouraged to provide the online and distance learning opportunities for the students.^[19,20] Appropriately using multimedia to assist teaching, and using specific graphic image to create teaching scene, for instance, filmed simulated nursing clinical scenario, which can greatly improve the students' interest in learning and receive the amazing teaching-learning results.^[21,22] Full use of network technology, carrying out online teaching and tutoring to achieve interactive mode of teaching and learning, which can cancel the time and space constraints of students' online learning. Improving diverse teaching resource include online and offline, text, audio video, preschool prep resources and review resources after school. All electronic teaching plan and courseware of nursing professional curriculum might be uploaded to the Internet and share these resources so as to offer students flexible and relaxed learning data and environment. Establishing the learning classrooms on internet, thus teachers can teach in the classroom regularly and answer via voice and video forms. Constructing students' offline learning platform, namely teachers and students could teaching-learning and communicate with each other in real-time and non-real-time manner, including E-mail, QQ, personal page, blog network, chat, file transfer, network survey, Internet search and browsing, real-time questions and remarks,^[23,24] online group and panel discussions, bulletin board, filmed simulated clinical scenario, etc.^[3,21,25] The implementation of interactive learning technology mentioned above, so that the students can get close to exchange with teachers and accept counseling timely, which can greatly improve the students' learning initiative and enthusiasm.^[26] Therefore, Schools of nursing (Departments) should have and maintain a good library and network information facilities, and should establish the appropriate policies and institutions that modern information and communication technology can be

effectively used in education, so that teachers and students could get them conveniently for the independent studies and carry out health services. Furthermore, schools of nursing should also have Chinese and foreign language professional books, periodicals and network informational resources, and should purchase and add them annually to meet the needs of education reform, scientific research and nursing professional development.

4.5. Educational experts

The educational experts, professional personnel, from their schools or at home and abroad, who employ themselves in nursing education or educational research, including management experts, psychology experts and teachers with a wealth of teaching and research experiences and appropriate qualifications in nursing.^[11] A research suggested that the national agreements and guidelines in relation to a specific clinical role for nurse lecturers was required to optimize the educational experiences of the nursing students.^[12] Therefore, schools of nursing (departments) should have educational experts to take part in the nursing teaching and to make the decisions of educational reform, to develop teaching plans and other management systems. Besides, the schools of nursing should establish effective ways to connect with educational experts. The developmental criteria are that the schools of nursing should gradually establish and improve the rational structure, clear responsibilities team of experts to ensure the quality of education.

4.6. Educational exchanges

Schools of nursing should provide appropriate ways and resources to promote the exchange of teachers and students among regions or countries. The developmental criteria is that schools of nursing (departments) should establish the mechanisms of cooperation and mutual recognition of credits at home and abroad, and they should active use the high-quality educational resources to promote their academic development, in which the mechanisms of credits' mutual recognition can be achieved by mutual recognition of courses among institutions. For example, in order to share and intensive development of educational resources, among the schools of Britain, United States, Australia and other countries carried out the mutual recognition of credits and degrees, which required management mechanism and educational level among the respective institutions to reach a recognized and comparable level.^[4]

4.7. Strength and limitations of the study

Our study has distinct strengths, as far as we know, this study is the first time in China to construct an admission and development criteria of teaching resource for nursing undergraduates by means of expert consultation and questionnaire survey. There are some limitations in this study. First, the use of purposive sampling (From 22 schools of nursing and their teaching bases) and the cultural and regional differences might limit the generalization of these findings. Second, during the survey, there was no scope to add suggestions to the recommendations of the initial experts, and the agreement rate of the experts on the criteria question was performed using descriptive statistics, we did not conduct an in-depth hierarchical analysis on the suggestions on revision of experts on the composition and connotation of the criteria. Given the limitations of this study, more robust studies are warranted in a variety of educational settings to confirm and develop our

findings. In the future, it is necessary to conduct longitudinal research to replicate the current study from different regional schools of nursing and affiliated teaching bases to further verify these results.

4.8. Implications for nursing education and future research

Our findings suggest that the developed criteria of admission and development of teaching resource for nursing undergraduates is promising criteria, upon which the agreement rate of consulted experts was high (above 90.2%). The research method and content of the criteria can be a foundation for the future construction and development of teaching resource for nursing undergraduates. Therefore, more actions should be taken to improve teaching resource for nursing undergraduates and promote their development to further improve the education quality of nursing undergraduates, which include increasing education investment, reasonably allocating teaching resource, optimizing nursing education infrastructure, building clinical teaching bases, training nursing educators and promoting academic exchanges of nursing education at home and abroad.

5. Lessons for clinical practice

The developed admission and development criteria of teaching resource for nursing undergraduate could be regarded as the guidance and reference for the development of nursing undergraduate education in China. The promising criteria contribute to future admission and development standard of nursing undergraduate teaching resource. However, using the admission and development criteria of nursing undergraduate teaching resources should be tailored to satisfy the context, such as the grade of students, the location of schools, the economic level and the culture setting of the countries.

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Author contributions

CQ L, Y W and HF R were involved in the design of this study, data collection, analysis and interpretation of data, drafting and revising the manuscript. Q Z, J C, HX G, XL L, Z N and XY C provided help with the data collection, analysis and interpretation. JP L and K L made substantive intellectual contributions to the interpretation of data and draft of the manuscript. The authors had read and approved the final manuscript.

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