Based on Delphi method and Analytic Hierarchy Process to construct the Evaluation Index system of nursing simulation teaching quality☆

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ABSTRACT

Background: Simulation has been widely adopted in nursing education, as is known to all, the quality of simulation could be affected by many factors. Since there is not a comprehensive and scientific evaluation Index system, it is important to construct an evaluation Index system to guide high-quality simulation.
Objectives: To construct the Evaluation Index system of Nursing Simulation teaching Quality and determine the weight of each indicator.
Design: It is a phenomenological research study.
Settings: The study was mainly conducted in one universities in China.
Participants: 27 nursing education experts from China participated in this study.
Methods: This study combines the Delphi method and Analytic Hierarchy Process method.
Results: Evaluation Index system of Nursing Simulation teaching Quality is built using Delphi method, including five first level index (Teacher, Student, Simulation design characteristics, Educational practices and Outcomes), 14 secondary index and 62 tertiary index. It's determined through a two-rounded experts consultation involving 27 experts. The recovery rates of two rounds consultation questionnaire were respectively 96.43% and 100%, and coefficient authority was 0.89. The Kendall's W of second and third level index were respectively 0.515 and 0.589 ($P < 0.001$). And the weighted value of quality index are established at all levels with the consistency ratio (C.R.) < 0.1, demonstrating that Teacher (0.4109) came first among the five first-level index followed by Student (0.2593), the Educational practices (0.1812), Simulation design characteristics (0.096) and Outcomes (0.0527).
Conclusions: The quality index of nursing simulation education is scientific and reliable, so as its weight assignment. It can be a guidance for high-quality simulation teaching, and it is a valid tool to evaluate the quality of simulation teaching in nursing.

1. Introduction

Owing to the shortage of nurses (Mitchel, 2003), it is of great significance to cultivate more qualified nurses domestically and internationally. Consequently, the enrollment of nursing students has been expanding over time (Crow et al., 2008; Leong et al., 2012), whereas, the shortage of clinical resource has been correspondingly aggravating (Ribeiroa et al., 2014). On the other hand, owing to the increasing self-protecting awareness of patients and the unexpected complexity of clinical environment (Ribeiroa et al., 2014), it is much more demanding and challenging for nursing students to get ready for clinical placement.

Thus, many educationist came up with the idea of simulation. Simulation has been defined as "A technique that replaces or amplifies real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner" (Onda, 2012). It has been recognized that the goal of simulation is to recreate a vivid clinical situation to promote students immerse into the learning environment and provide opportunities for students to practice their knowledge, clinical skills, critical thinking as well as clinical decisions. Meanwhile, simulation could provide a realistic yet safe environment for nursing students without any harm to others. Due to its ability to engage students into this vivid clinical situation, it effectively cultivates

students' comprehensive ability and builds up their self-confidence, which promotes the efficiency and effectiveness in clinical work after they become a registered nurse in the long term (Gamble, 2017). Also, a study by the National Council of State Boards of Nursing (NCSBN) shows that situational simulations can effectively save 50% of clinical practice time (Hayden and Alexander, 2014), and it is a great way to relieve the current demanding of nursing schools and corresponding hospitals. As a result, simulation has been developed rapidly in nursing education world-widely. From 2000 to 2010, the number of nursing schools adopting simulation in the United States has risen from 3% to 87% (Okuda et al., 2009). And in China, the number of literature related to simulation has reached > 1000 so far, reflecting the extensive application of nursing simulation to a certain extent (Wang et al., 2014).

Without doubt, simulation is an important teaching method to promote the development of nursing education and lead nursing education reform (Nehring and Lashley, 2009), aiming at improving patient safety at the ultimate level. However, as is known to all, there are plenty of factors impacting the quality of simulation, like the high demanding of teachers. Thus, whether simulation could achieve all the potential benefits or not depends on the quality of simulation. Especially under this circumstances that simulation is widespread, it is necessary to pay attention to how to guarantee the quality of simulation. Most researchers have focused on the outcomes of high fidelity simulated situations, such as the ability of clinical knowledge and skills (Khalaila, 2014; Kim and Shin, 2016), critical thinking and risk assessment (Shin et al., 2015a, 2015b; Zarifsanaiey et al., 2016), cognitive and psychomotor skills (Shin et al., 2015a, 2015b), building up confidence (Lubbers and Rossman, 2017), teamwork performance (Hallin et al., 2016), leadership (Smith et al., 2015) and so forth. It is worth mentioning that some researchers have paid attention to the quality of simulation. One study demonstrated that low fidelity simulation could not attract students' attention, nor could it improve students' confidence (Basak et al., 2016). One study illustrated that the basic quality of teachers and students is needed to guarantee the quality of simulated teaching (Yang et al., 2016). Other studies have also paid attention to the influencing factors of simulation quality, including design and construction of simulation (Roh and Jang, 2017). According to the literature we have looked into, the evaluation of the influential factors in the preparation and implementation of situational simulation has been ignored, and there is few standardized evaluation tool or quality index system to evaluate nursing simulation (Manz et al., 2013; Lan, 2014; Zhang et al., 2011). Therefore, it is necessary to put up with a scientific and comprehensive quality index system of simulation with the combination of expert opinion and scientific mathematical statistics, to provide some guidance for higher quality simulation teaching.

2. Methods

We developed a research team including 1 nursing education expert, 1 clinical nursing expert and 2 students with master degree. And the research team is responsible for developing the initial draft of the Evaluation Index system of Nursing Simulation teaching Quality(short for the Evaluation Index system), recruiting experts and distributing related materials, analyzing the suggestions from experts and making corresponding corrections.

2.1. Construct an Evaluation Index System

2.1.1. Construct the Evaluation Index System Draft

Based on massive literature (Wilford and Doyle, 2006; Arthur et al., 2013) and the model constructed by Jeffries simulation theory (Jeffries et al., 2015), we developed the initial draft of quality index system, including 5 first-level index, 14 second-level index and 52 third-level index.

2.1.2. Adjust the Evaluation Index System Draft Through Delphi

After construct the Evaluation Index system Draft, Delphi method was adopted to adjust the Evaluation Index system Draft and confirm the Evaluation Index system.

To make it more specified and reliable, we made some inclusion criteria for experts enrolled in our study, including: willing to take part in this study; experienced in simulation teaching; > 10 years' experience in nursing education, nursing management or clinical nursing; with bachelor or higher degree. As for the numbers of experts, we invited 27 experts based on the criteria and our resources, thus it can guarantee the study go on smoothly as well release financial pressure and labor cost (Zhi jing and Xia, 2008).

Firstly, send these experts the Evaluation Index system Draft and instruction of how to make evaluation and advice through email. Secondly, summarize and analyze all the outcomes, index inclusion criterion: Mean value assignment > 4.5; coefficient of variation < 3; exclusion criterion: Mean value assignment < 3.5; coefficient of variation > 3, other index whose Mean value assignment between 4.5 and 3.5 needs adjustment or delete based on experts' opinion. Based on the criterion, adjust the index according to experts' suggestions. Thirdly, summarize and illustrate all adjustments, then send the revised Evaluation Index system to experts. Until, the opinions of all experts tend to be the same, the Evaluation Index system is confirmed.

2.2. Weight Assignment of Evaluation Index System

2.2.1. Build the Model

When it comes to complex problems, it is necessary to build up the logical relationship of different hierarchical levels, making the problem more structured (Cao, 2012). Generally, hierarchical model mainly includes the highest level (target level), middle level (standard level), the lowest level (program level). In our study, we built a model with 3 levels corresponding to the quality index system, including 5 first-level index, 14 second-level index and 52 third-level index.

2.2.2. Construct Expert Judgment Matrix

Judgment matrix assignment is a key part of Analytic Hierarchy Process, to ensure the consistency of judgmental thinking, since if the assignment is not reasonable, the calculated weight is unreasonable. In our study, we chose 5-point Likert scale to reflect the importance weight of each indicator, then based on the elicited value judgment of the experts, the importance weights of these index are calculated using Analytic Hierarchy Process (APH) method (Lucas et al., 2017). Saaty's (1980) fundamental 9-point scale was adopted since it is much easier and clearer for experts to determine the importance of each indicator at all levels.

2.2.3. Weights Coefficient Calculating and Consistency Testing

There are several methods to calculate the weight coefficient of quality index, such as geometric mean method (root mean square method), arithmetic average method (sum method), eigenvector method, least square method (Deng et al., 2012). In our study, we chose geometric mean method. As for consistency testing, Saaty's (1980) consistency index (C.I.) and average random consistency index (R.I.) are always adopted, and the ratio of C.I. and R.I.is called C.R. When the order n > 2, when the consistency ratio of the judgment matrix is CR < 0.10, the judgment matrix is considered to have satisfactory consistency; if C.R. > 0.10, the judgment matrix needs to be adjusted.

2.2.4. Ethical Consideration

We applied to Ethics Committees of Peking University, Medical center for human medical ethics review. Through the ethics committee review, our project is in accordance with the relevant provisions of Chinese Ministry of Health Biomedical Research Ethics Review Method for Research Involving Human Being (try out) and the declaration of Helsinki on biology of human trials, thus our research was agreed to be

conducted with the decision number PUIRB-2016.V.1.1 on 2016.7.1. After that, we began to conduct our survey, we illustrated all the information related to this study to every participants, and every participants was voluntarily participated in this study with a written informed consent.

2.2.5. Quality Control

The whole process of expert consultation and research is conducted rigorously under the guidance of research groups of the teaching and research department. In the preparation of the first, second and third round consultation questionnaire, the research team was aware of the latest literature. As for choosing a consultant, we took many factors into consideration, including knowledge of simulation, educational experience, clinical experience and so forth, to guarantee the interrogation is more objective and effective.

3. Results

3.1. Quality Index of Nursing Simulating Education

In this study, we adopted two rounds of expert consultation, enrolling a total of 27 experts from 6 major cities including Beijing, Shandong, Guizhou, Ningxia, Hebei and Heilongjiang. The recovery rates of two rounds consultation questionnaire were respectively 96.43% and 100%. Also, there are 18(66.67%) and 14(51.85%) experts providing literary suggestions respectively in the first and second round. And the coefficient authority of 27 experts was 0.89. It can be considered that the experts involved in this study have higher authority.

To judge the degree of expert opinion coordination, Kendall's W and chi-square test were adopted. The value of Kendall's W is between 0 and 1, and higher the value means the opinion of the experts is more consistent and the coordination of the items is better. Since the number of first-level index was < 7, only the second and third-level index were analyzed. And it turned out that the Kendall's W were respectively 0.515 and 0.589, meanwhile the differences were statistically significant by chi-square test ($P < 0.001$), and detailed information was listed in Table 1.

The degree of concentration of expert opinions is analyzed by Importance value, Full-score rate, Coefficient of variation. The greater the importance assignment, the greater the Full-score rate and smaller the CV value indicate that the degree of expert opinion concentration is better. And the expert opinion concentration is listed in Table 2.

In round 1, the research team deleted 3 index, modified 18 index, merged 6 index, split 1 index, added 9 index based on the exclusion criterion and experts' opinions. In round 2, the research team only revised 6 third level index, added 2 index. Thus, the Evaluation Index system of Nursing Simulation teaching Quality was confirmed, which includes 5 first-level index, 14 second-level index and 62 third-level index.

3.2. Quality Evaluation System Weight Distribution

According to the AHP, Evaluation Index system of Nursing Simulation teaching Quality was distributed 4 layers, A represents the

Table 1
The result of expert opinions' coordination degree.

	Hierarchical level	Index (n)	CV/Kendall's W	χ^2	P
Round 1	First-level	5	0.040	–	–
	Second-level	14	0.252	91.562	< 0.001
	Third-level	52	0.384	539.045	< 0.001
Round 2	First-level	5	0.024	–	–
	Second-level	14	0.515	187.347	< 0.001
	Third-level	60	0.589	919.613	< 0.001

Table 2
The result of expert opinions' concentration degree.

	Hierarchical level	Importance value	Full-score rate (%)	Coefficient of variation
Round 1	First-level	4.89–5.00	92.59–100.00%	0.00–0.09
	Second-level	4.70–5.00	81.48–100.00	0.00–0.18
	Third-level	4.07–4.93	40.74–96.30	0.04–0.31
Round 2	First-level	4.93–5.00	96.30–100.00	0.00–0.04
	Second-level	4.85–5.00	88.89–100.00	0.00–0.09
	Third-level	4.26–4.96	66.67–96.30	0.04–0.30

Table 3
The result of consistency test of each judgment matrix.

	λ_{max}	C.I.	C.R.
A-B	5.200	0.050	0.045
B1-C	3.086	0.043	0.083
B2-C	3.018	0.009	0.018
B3-C	2.000	< 0.001	< 0.001
B4-C	3.018	0.009	0.018
B5-C	3.054	0.027	0.052
C1-D	4.205	0.068	0.077
C2-D	8.553	0.080	0.056
C3-D	3.009	0.005	0.009
C4-D	2.000	0.000	< 0.001
C5-D	5.230	0.058	0.051
C6-D	2.000	< 0.001	< 0.001
C7-D	5.252	0.063	0.056
C8-D	3.032	0.016	0.031
C9-D	7.385	0.064	0.047
C10-D	6.173	0.034	0.028
C11-D	5.200	0.050	0.045
C12-D	3.076	0.038	0.074
C13-D	5.203	0.051	0.045
C14-D	4.106	0.035	0.040

quality of nursing simulation, B represents first-level index, C represents second-level index, and D represents third-level index. In our study, we formed a total of 20 judgment matrix, and Table 3 listed the result of consistency test and weight coefficient of each judgment matrix.

And the B-A level consistency result: CI = 0.050, CR = 0.045, indicating that there is no logical error in the weights of the first-level indicators. The C-B and D-C level consistency result are respectively: CI = 0.023, CR = 0.049 and CI = 0.195, CR = 0.045. Meantime, we got weight coefficient of each index, and the weight coefficients of all index were listed in Table 4.

4. Discussion

4.1. The Characteristics of Quality Indicators System of Nursing Simulation

The quality index system of nursing simulation constructed in this study is scientific, comprehensive and diversified with the following characteristics. First, it is scientific and authoritative to some extent, since it's build based on the well-recognized Jeffries Simulation Theory (Jeffries et al., 2015), which has been recommended by The Nursing and Midwifery Council. In addition, this quality index system was built based on massive literature support (Shinnick and Woo, 2013; Arthur et al., 2013; Dennick, 2016). Second, it is reliable due to qualified experts. In this study, 27 experts are influential and outstanding in simulation teaching, moreover, they are from 6 different areas, reducing area distribution bias to some extent. Thus, with Delphi method and the high quality of experts, this quality index system is rather reliable. Third, the quality index system is systematic and comprehensive, since it does not only take the whole process of simulation into consideration, including the simulation preparation, simulation implementation and post-simulation effect into consideration; but also give consideration to

Table 4
The weights coefficient of each indicator.

First-level indicator	Weights coefficient	Second-level indicator	Weights coefficient	Third-level indicator	Weights coefficient	Combination weights
1. Teacher	0.4109	1.1 Knowledge	0.1007	1.1.1 Familiar with the concept, rules and precautions of scenario simulation	0.2446	0.0101
				1.1.2 With solid foundation of professional knowledge	0.6088	0.0252
				1.1.3 Aware of the latest developments of the discipline	0.0494	0.0020
				1.1.4 Familiar about humanity, social science and other disciplines	0.0972	0.0040
		1.2 Ability	0.6738	1.2.1 With adequate clinical experience and strong ability	0.1798	0.0498
				1.2.2 Able to design a reasonable scenario simulation case	0.2138	0.0592
				1.2.3 Able to combine theory with clinical practice	0.2720	0.0753
				1.2.4 Able to organize simulation activities and control the atmosphere	0.1247	0.0345
				1.2.5 Able to solve the conflict and differences between students	0.0480	0.0133
				1.2.6 Good at mobilizing students' enthusiasm and empowering students to complete simulation activities independently	0.0220	0.0061
				1.2.7 Good at guiding students to think independently, solve problems	0.0826	0.0229
				1.2.8 Able to communicate actively and effectively with students	0.0571	0.0158
		1.3 Attitude	0.2255	1.3.1 With rigorous, serious and responsible teaching attitude	0.7010	0.0650
				1.3.2 Fond of simulation teaching, able to actively play the role of simulation teaching	0.1929	0.0179
				1.3.3 Emphasis on students' view, respecting and caring students	0.1061	0.0098
2. Student	0.2593	2.1 Knowledge	0.1365	2.1.1 With nursing- professional and related disciplines' basic knowledge	0.2500	0.0088
				2.1.2 Aware of the concept, rules and precautions of scenario simulation	0.7500	0.0265
		2.2 Ability	0.2385	2.2.1 Able to properly carry out the division of labor and cooperation	0.0841	0.0052
				2.2.2 Able to be put knowledge into the scenario	0.2822	0.0175
				2.2.3 With ability of observation, analysis and comprehensive thinking	0.3724	0.0230
				2.2.4 With ability of independent thinking, self-discovery and problem-solving	0.0474	0.0132
				2.2.5 Able to communicate effectively with teachers and students	0.2139	0.0029
		2.3 Attitude	0.6250	2.3.1 Conscientiously abide by the teaching rules and regulations	0.2500	0.0405
				2.3.2 Strong interest in simulation teaching	0.7500	0.1215
3. Simulation design characteristics	0.096	3.1 Environment	0.2500	3.1.1 The simulated situation is close to the clinical situation	0.3286	0.0079
				3.1.2 Scenarios are consistent with teaching objectives	0.4534	0.0109
				3.1.3 Simulation site area is divided clearly	0.0525	0.0013
				3.1.4 Simulation equipment and items are consistent with teaching content	0.1256	0.0030
				3.1.5 Safe and reliable simulation environment and simulation implementation	0.0398	0.0010
		3.2 Technology or method	0.7500	3.2.1 The application of simulation technology meets the teaching objectives	0.6586	0.0474
				3.2.2 Simulation teaching resources (model people, SP, etc.) are applied reasonably	0.2628	0.0189
				3.2.3 Related labs or technicians provide support for simulation techniques or methods	0.0786	0.0057

Table 4 (*continued*)

First-level indicator	Weights coefficient	Second-level indicator	Weights coefficient	Third-level indicator	Weights coefficient	Combination weights
4. Educational practices	0.1812	4.1 Preparation	0.3196	4.1.1 Simulated teaching objectives are clear and meet the outline requirements	0.1406	0.0081
				4.1.2 Simulated cases are vivid and specialized	0.2463	0.0143
				4.1.3 Simulated cases are in line with the students' existing knowledge and cognitive level	0.3182	0.0184
				4.1.4 Teachers are aware of teaching content and goals	0.1154	0.0067
				4.1.5 Detailed and comprehensive preparation to overcome problems in simulation teaching	0.0946	0.0055
				4.1.6 Students are well prepared, familiar with cases, scenarios and simulated teaching objectives	0.0527	0.0031
				4.1.7 Teachers and students fully communicate, aware of related simulate issues, such as teaching sites and organizational forms	0.0321	0.0019
		4.2 Implementation	0.5584	4.2.1 Teachers and students perform their duties, simulation is in order	0.1092	0.0110
				4.2.2 Students cooperate with each other and support each other	0.0722	0.0073
				4.2.3 Students fully integrate into the simulated scene to make context-related behaviors and decisions	0.4687	0.0474
				4.2.4 Teachers properly handle the sudden onset of simulated teaching	0.0573	0.0058
				4.2.5 Teachers carefully record student performance and prepare for post-simulation feedback	0.1092	0.0110
				4.2.6 Teachers timely guide and monitor the simulation process	0.1835	0.0186
		4.3 Feedback	0.1220	4.3.1 Teachers organize timely evaluation feedback	0.4600	0.0102
				4.3.2 Students self-evaluate and conclude regarding to their performance	0.2527	0.0056
				4.3.3 Students evaluate each other regarding to their performance	0.0544	0.0012
				4.3.4 Teachers evaluate students' performance objectively and propose suggestions for improvement	0.1165	0.0026
				4.3.5 Teachers and students analyze objectives to reach a consensus	0.1165	0.0026
5. Outcomes	0.0527	5.1 Knowledge	0.2081	5.1.1 Students deepen their understanding of nursing theory	0.2290	0.0025
				5.1.2 Students understand the meaning of simulation teaching	0.0754	0.0008
				5.1.3 Enhance students' ability of comprehensively using knowledge	0.6955	0.0076
		5.2 Ability	0.6608	5.2.1 Improve Students' practical ability	0.2344	0.0082
				5.2.2 Enhance students' communication skills	0.1020	0.0036
				5.2.3 Students build up self-learning ability	0.1460	0.0051
				5.2.4 Enhance students' ability of recognizing, judging and solving clinical practical problems	0.4628	0.0161
				5.2.5 Enhance students' teamwork ability	0.0547	0.0019
		5.3 Emotions	0.1311	5.3.1 Enhance students' responsibility to the care recipient	0.3919	0.0027
				5.3.2 Improve students' recognition of nursing work	0.1643	0.0011
				5.3.3 Improve students' confidence in clinical work	0.3919	0.0027
				5.3.4 Students look forward to participating in simulation activities again	0.0519	0.0004

the knowledge, abilities and attitudes of teachers and students. The evaluation content runs through the whole teaching process. Forth, the quality index system requires diversified evaluation subject, in order to adjust and perfect the teaching activities. In the evaluation index system of this study, teachers and students can conduct self-assessment according to their own situation, also, students are able to evaluate teachers and teaching quality according to the index. Peer teachers are able to evaluate each other according to the index. Diversified evaluation could ensure that the overall teaching evaluation of fairness and objectivity.

4.2. The Weight Distribution of Quality Index System of Nursing Simulation

Analytic Hierarchy Process (AHP) could analyze expert's subjective judgment with mathematical form and conduct multi-objective decision-making analysis of scientific treatment to ensure the scientific result (Saaty, 1980). Constructing the significance assignment by means of the Saaty's scale can greatly reduce the difficulty of expert judgment. In the construction of quality index system that can be applied directly to the scenario simulation, the index involves the whole process and all aspects of simulation teaching. Therefore, experts adopt the two-to-two judgment matrix to determine the importance value of each indicator, the result shows that the consistency of all index at all levels has been verified by the consistency test with CR < 0.10, demonstrating the logic consistency is satisfying, while ensuring scientific and reliability.

Teacher and Student play a leading role in the quality of simulated teaching. The weighted value of the first-level indicator was in the following order: simulation instructor (0.4109), Student (0.2593), Educational practices (0.1812), Simulation design characteristics (0.096) and Outcomes (0.0527). Jeffries believes that situational simulation teaching is a process of simulating strengthening the dynamic interaction between Teacher and Student. Teachers, as knowledge designers, leaders, process maintainers, feedback summaries, are responsible for the positive adjustment of teaching strategies such as improving teaching progress and educational practices to meet students' teaching requirements for situational simulation. Students, as problem analysts, decision makers and role players, can ensure the high-quality implementation of situational simulation teaching plan through active participation in teaching activities, positive interaction with teachers and full integration of roles. Thus, the quality evaluation criteria of the simulation director and the Student are set up, accounting for the major weighted value. Situational simulation teaching is more about learner-centered, student-driven learning, abandoning the traditional learning model of acquiring knowledge and fact-based testing entirely through memorization, and encouraging students to apply knowledge in set scenarios. Thus, students as the main support of the situation simulation teaching activities, the interest in the simulation teaching play a decisive role in ensuring the balance between the simulation instructor and the Student, guaranteeing the smooth development of the simulation teaching. At the same time, teachers play a guiding role in the whole process of simulation teaching. Therefore, the index of this research emphasizes the comprehensive ability of teachers and the preparation and devotion of students.

The rational application of teacher simulation techniques or methods can also effectively guarantee the optimization of simulation teaching quality. From the weighted value of the second-level index, Simulation design characteristics–simulation techniques or methods (0.7500), Teacher–ability (0.6738) are higher. The simulation technique or method refers to the teaching method used in simulating teaching and the technical support it provides, which has the highest weight among the second-level index. This is consistent with the study by Arthur that emphasizes the reasonable application of simulation techniques or methods (Arthur et al., 2013). The most commonly used method of scene simulation teaching in nursing is mainly in three forms: man-centered scene simulation with advanced simulation man, standardized patient and students' role-playing. Therefore, the nursing

educators should adopt suitable simulated teaching forms according to the actual situation from colleges or hospitals, it is necessary to avoid over-emphasizing the importance of equipment, but also to prevent the waste of resources. It is valuable to make full use of the technical support they already have and focus on the combination of teaching objectives as well, to strive to achieve the optimization of simulation teaching level.

The combination of teachers' theory and practical skills and students' interest lay the foundation for high-quality simulation teaching. From the combined weighted value of the second-level index, the top two weights are "Teachers' ability to combine theory with clinical practice" (0.0753) and "Students' strong interest in simulation teaching" (0.1215). With the rise of the "ability-oriented" educational philosophy in education circles, the training and evaluation of clinical practitioners' competence in clinical practice has become a hot spot for nursing educators and managers domestically and internationally (Arthur et al., 2013). Teachers should have the ability of combining theory with practice, closely integrating theoretical knowledge with fast-developing clinical practice, ensuring students' real-time learning and helping to raise students' awareness of clinical environment and practical ability. In addition, students' interest in simulating teaching plays a decisive role in ensuring the interaction between Teachers and Students, as well the smooth implementing of Education practices. Therefore, teachers should deal with the form and purpose of simulating students before implementing simulation teaching, to ensure the enthusiasm of students to participate.

4.3. The Effectiveness of Combining Delphi and AHP Method

In our study, we combined Delphi and AHP method to construct Quality index of Nursing Simulating Education and confirm the weight coefficient of each index. This Quality index of Nursing Simulating Education demonstrates the wisdom of experts and the science of quantified measurement. One research investigated the effectiveness of combining these two method while constructing an evaluation system, and it demonstrated that combining Delphi and AHP made more reliable and valid for anesthesia specialist to understand what they are needed to be qualified (Hu et al., 2013). Overall, this quality index system of nursing simulation and its weight are reliable, scientific and practicable.

5. Conclusion

Simulation teaching quality evaluation index system in nursing has been built using Delphi method based on massive literature, thus it turns out to be scientific and reliable. Delphi technique was used through a two-round expert consultation. This simulation teaching quality evaluation index system includes five first level index (Teacher, Student, Simulation design characteristics, Educational practices and Outcomes), 14 secondary index and 62 tertiary index. Moreover, the expert motivation, expert authority and the expert coordination were promising, indicating the construction of Evaluation Index system of Nursing Simulation Teaching Quality was scientific. The weighted value of whole quality index is established at all levels using Analytic Hierarchy Process (AHP). The weight of various index is determined by the importance value of the index from experts by means of Saaty's scale. And it turns out that the weight coefficient is reliable with consistency ratio < 0.10. According to the weighted value of all index, we found out that Teacher and Student play a leading role in the quality of simulated teaching. Also, the rational application of teacher simulation techniques or methods can also effectively guarantee the optimization of simulation teaching quality. More detailed, the combination of teachers' theory and practical skills and students' interest lays the foundation for high-quality simulation teaching.

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