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Training indicators and quantitative criteria for emergency nurse specialists☆

Man Jiang, Xin Ao*

Medical School of Yangtze University, Jingzhou, Hubei 434023, China

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ABSTRACT

Objective: By constructing a training system of quality evaluation standards for emergency nurse specialist (ENS), we can ensure smooth operations and quality training for ENS.
Methods: First, the frame structure of indicators was designed on the basis of system theory and the balanced scorecard method. Meanwhile, corresponding quantitative standard indicators were compiled through literature analysis and a review of training characteristics. Next, screening indicators were collected through consultation with experts and statistical calculations. The indicators weight coefficient was calculated using the analytic hierarchy process (AHP). Finally, indicators were validated in two groups of nurses in two different training courses.
Results: (1) We created a three-level indicator system: level-I dimensions have 4 indicators, while level-II dimensions and level-III dimensions have 13 and 34 indicators, respectively; (2) The coefficient of expert's judgment is 0.840, familiarity is 0.914 and authority is 0.877, and the three rounds of coordination coefficient are 0.456, 0.553 and 0.715, respectively; (3) There are at least 56 indicators in alternative quantitative standards; and (4) The alpha reliability value of the indicator system in the two training course had no significant difference ($P > 0.05$). The same result was observed when examining two groups of nurses in one training course ($P > 0.05$).
Conclusions: This study established a training system of quality evaluation standards for emergency nurse specialists that is objective, reliable, easy to operate and representative according to scientific selection and verification. This system can therefore provide a basis for quality evaluation and targeted improvement for ENS training in addition to promoting health.

1. Introduction

Since the implementation of ENS training program in China, cities, hospitals and universities at all levels responded quickly, and many qualified people have been trained to meet the needs of hospitals. Many problems with training remain, however, including[1]: limited teaching resources and limited ability at many training institutions; and weak foundational knowledge among students that is difficult to mitigate, which leads to unsatisfactory training effects. This factor is closely correlated with the lack of quality standards for training institutions and ENS programs. Therefore, it is particularly important to establish a system of quantitative standards for ENS. This study examines ENS training as a whole from the perspective of system theory,[2] which is based on management guru Robert's balanced scorecard method,[3] to build a system based on evaluation indicators, which is conducive to the coordinated development of a training system. This study also uses many other methods, such as the expert consultation method,[4] the correlation coefficient calculation method, AHP[5] and paired comparison method to select and verify the evaluation indicators and their quantitative standards. The ultimate goal of this study is to provide a quantitative basis for identifying the problems existing in the training of ENS, evaluate and monitor the training quality.

2. Methods

In this study, the construction of an indicator system and the quantization of indicators consist of four factors: design

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* Corresponding author.
E-mail address: cjdxhlx@126.com (X. Ao).
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indicators, screening indicators, indicators' weight and verifiable indicators.

2.1. Design indicators and their quantitative standards

First, the frame structure of the indicator system is designed on the basis of system theory and the balanced scorecard method in order to determine the level-I dimension. Second, four academic literature databases, i.e., CNKI, PUBMED, VIP, and Wanfang, were searched using the keyword "specialist nurse training" to collect the relevant data. The frequency of elements, which are closely related to level-I indicators in the statistical data, ranked in the frequency of occurrence, and the high frequency elements were selected as metrics to form level-II indicators and level-III indicators. Finally, the level-III indicators were quantized individually. The final design of the alternative indicators included 16 level-I dimensions indicators, 39 level-II dimensions indicators and 61 level-III dimensions indicators. An additional 61 items formed the alternative quantitative standards.

2.2. Screening indicators through expert consultations

The criteria for selecting experts for consultation were as follows[6]: (1) Engaged in emergency nursing or teaching, hospital or teaching management for more than 20 years; (2) Senior professional title; (3) Holding a bachelor's or higher degree. After selecting experts at random in different cities and regions according to the admittance criteria, a total of 31 experts were selected.[7] Thirty of those returned a paper survey form containing their feedback for a response rate of 96.78%. Of the selected experts, 9 were teaching management experts, 6 specialist nursing experts, 8 education experts and 7 hospital management experts, these experts aged from 43 to 60; senior professional titles accounted for 100%, and 86% held a master's or higher degree. The expert consultation phase was completed after three rounds of letter consultations.[8] The purpose of the first round was to learn the individuals' perspectives on the research problems by introducing them to the background and significance. This allowed us to better understand how an expert's practical experience, theoretical analysis, background knowledge, intuitive feelings and other personal factors might impact his or her judgments. We also submitted all the indicators to them. Each indicator was evaluated on a 9 point Likert scale (1: extremely unimportant, 9: extremely important) with answers indicated by checking the appropriate box. The quantitative standards for each level-III index were evaluated using a five-point Likert scale (1: completely disagree, 5: completely agree), with answers once again indicated by a check box. The indicators were evaluated on the basis of the experts' assessment of their relative importance, while the quantitative standards were evaluated based on approval ratings. The study, according to the standards of the related researches abroad, regards the importance score that is greater than or equal to the average and the approval rate that is greater than or equal to 80% as the selection standards of indicators and quantitative standards.[9] The second round was based on the statistical results of the first round. After eliminating 2 level-II disagreement indicators, 5 level-III indicators and their corresponding quantization standards, the remaining indicators were resubmitted to experts again to supplement and modify. Three level-II indicators were supplemented in total, however: because the importance scores are lower than average, 2 level-III indicators could not be selected in the third consultation round. This third round took the higher scores indicators from the statistical results of the second round and resubmitted them to the experts in conjunction with the supplementary indicators to observe the stability of the results.

2.3. Screening indicators through statistical calculations

Five institutions engaged in ENS training, comprising 2 Class III Grad A hospitals, 2 Class II Grade A hospital and one ordinary school of higher education were selected. The original data were evaluated for quality with the indicators after the first screening, according to the collected data, after which the score of each indicator was counted and the correlation coefficient between the two indicators was calculated, finally the T test was carried out. Correlation was judged as follows[10]: a correlation coefficient less than 0.3 was regarded as low correlation; between 0.3 and 0.7 is the medium correlation; and correlation exceeding 0.7 was regarded as high correlation. Any two highly correlated indicators must be further integrated and refined into a single indicator.

2.4. Calculating indicators' weight coefficient

Indicators' weight coefficient was calculated by AHP. First, the judgment matrix was designed according to the average scores obtained from the early expert consultation on the importance of indicators. The scale was designed to follow the relative importance of proportional scaling of the AHP method[11] (Table 1). Then, the weight coefficients of the indicators were calculated based on the judgment matrix, and the consistency of the judgment matrix was finally tested to verify the rationality of the judgment matrix.

2.5. Verifying indicators

Considering that there is no mature correlation index system, we could not perform the comparison between indicators. The consistency, stability and reliability of the test results of the index system were validated through the self-contrast method. Through convenience sampling, 2 institutions that were carrying out ENS training were taken as the research subjects to perform a quality evaluation. A total of 10 judges, four men and six women with an average age of 42 ± 0.971 years participated in the evaluation. All were professors. They were randomly divided into two groups. Neither education, professional level, professional experience nor other aspects showed any significant difference. Based on the information provided by the training courses, live lectures, small sample surveys and related personnel questionnaires, seminars or

Table 1
Proportional scaling regarding the level of importance.

Score	Level	Scale
Equal	Equally important	1
More and less than one point	Bounded by equally important and slightly important	2
More than one point	Slightly important	3
More and in between 1 and 2 points	Bounded by slightly important and more important	4
More than two points	More important	5
More and in between 2 and 3 points	Bounded by more important and the very important	6
More than three points	Very important	7
More and in between 3 and 4 points	Bounded by very important and extremely important.	8
More than four points	Extremely important	9
One point less	Slightly secondary	1/3
Less and less than 1 point	Bounded by equally important and slightly secondary	1/4
Two points less	Relatively secondary	1/5
Less and between 1 and 2 points	Bounded by slightly secondary and relatively secondary	1/6
Less and between 2 and 3 points	Bounded by relatively secondary and very secondary	1/8
Four points less	Extremely secondary	1/9