

Validity and Reliability of the Proposed Core Competency for Infection Control Nurses (ICNs) of Hospitals in Hong Kong

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ABSTRACT

Literature review and the Delphi approach were used to draft the core competency items of hospital ICNs in Hong Kong. Content validity, internal consistency and test-retest reliability of the proposed core competency were ensured. The result serves as the foundation of developing training and assessment tools for ICNs in Hong Kong.

BACKGROUND

There is only half a century of history of ICNs in the world with the first ICN appointed in UK in 1959.¹ Infection control programs were introduced to Hong Kong in 1980s with limited resources.^{2,3} After the SARS epidemic in Hong Kong in 2003, infection control became popular. The most prominent change was that more and more ICNs were deployed. Hence, the competency level of ICNs became the concern of hospital management and clients.

Infection control professional groups in UK and North America had developed their own competency standards.^{4,5} However, these publications from overseas standards cannot be employed directly in the local setting because of differences in healthcare structure, philosophy and management approach, setting and resources, disease epidemiology and education background. Therefore, we propose a core competency for specialist ICNs in Hong Kong. This paper describes the process of development of the proposed core competency for ICNs in Hong Kong.

METHODS

Design

The study was divided into three stages. First, the Delphi approach was used to draft the core competency. Then, both qualitative and quantitative approaches were employed to establish the content validity. Lastly, the reliability were developed based on traditional statistical methods and Rasch model.

Ethical considerations

This study was approved by the Human Subjects Ethics Sub-committee of The Hong Kong Polytechnic University, Hong Kong SAR.

Stage 1: Drafting the core competency using the Delphi approach

Using email as the main method of communication for the Delphi approach. At the start, the investigator drafted the competency categories of ICNs based on a literature review and transformed them into a questionnaire for collecting opinions. The experts were asked if they agreed or disagreed with the categories on the questionnaire. The investigator acted as the study coordinator and decision maker. She reviewed the returned comments and modified the items when necessary. Direct discussions with experts were used when clarification of returned information was needed. A few rounds were held until the consensus was achieved. Then, the investigator drafted the competency items from the literature based on the agreed competency categories. The drafted competency items were transformed into a questionnaire. The experts were then asked if they agreed or disagreed with the listed items. Each questionnaire had a free-text area to allow the experts to fill in additional categories, items or other comments. Several rounds were conducted until consensus was achieved.

Sample

Purposive sampling was used. A panel of six subject matter experts consisted of two Infection Control Officers (ICOs) and four ICNs who were the leaders of large Infection Control Teams in public hospitals, was established.

Data analysis

Only categories or items on which 80% or more of the members agreed were included.^{6,7} The Kappa statistics were worked out to quantify the quality of the content validity by the Online Calculator of University of Joensuu, Finland.^{8,9,10}

Results of Stage 1

A total of four rounds were conducted. The first two rounds were used to develop the competency categories and the latter two to develop the competency items. We finally obtained 10 categories and 51 items. The categories included 1) surveillance; 2) program management and evaluation; 3) evidence based practice; 4) education; 5) team and service management; 6) collaboration and partnership; 7) outbreak investigation and control; 8) research and development; 9) expert knowledge and continuing education; and 10) professional development. The free-marginal multi-rater Kappa for 51 items between six panel experts was 0.84 showing excellent agreement between experts.⁸ In addition, some of the draft competency items consisted of double-barreled sentences. We split these items to obtain 64 competency

items.

Stage 2: Establishing content validity

A questionnaire consisting of the 64-item draft core competency of ICNs that was developed in stage 1, was employed. The experts were asked to rate these items in terms of relevance to the core competency of ICNs. A 4-point ordinal rating scale from Lynn's study was used.¹¹ At the end of the questionnaire, the experts were asked if all the content domains were included in the draft core competency list. They were requested to specify the missing content in the case of a negative answer.

Sample

An expert panel that consisted of three subject matter experts who were the ICOs from different major public hospitals was established.^{11,12}

Data analysis

The content validity index (CVI) and inter-rater agreement was calculated. Free-marginal multi-rater Kappa statistics were worked out using the Online Calculator of University of Joensuu, Finland.^{9,10}

Results of Stage 2

The content experts commented that all the dimensions of the core competency were available in the questionnaire. CVI was 0.75, which was fairly satisfactory.¹³ The inter-rater agreement was 75% (48/64 items). The free-marginal multi-rater Kappa was 0.67 representing a good level of agreement.⁸

Stage 3: Establishing reliability

The 64 items developed in stage 1 were transformed into a questionnaire. Subjects were invited to answer two identical questionnaires two weeks apart.^{11,14,15} To minimize the memory effect, the sequence of items in each questionnaire was randomly assigned. Subjects were asked to rate each competency item as *very important*, *important*, *undecided*, *not important* or *not very important*. Their demographic information was also requested.

Sample

Due to the limited number of ICNs in Hong Kong, their input was reserved for the follow up studies. Nurses who had previously worked as ICNs (i.e. ex-ICNs) were

invited to participate in this study. 18 ex-ICNs were invited through snowball sampling.

Data analysis

Demographic data and test-retest reliability were analysed by SPSS version 15.0. Rating scale diagnostics were performed using Winsteps (Bond & Fox) version 1.0.0, which was a Rasch analysis software package. Coefficient alpha was worked out by both SPSS and Winsteps.

Results of Stage 3

1. Response rate and demographics

In total, 17 (94.4%) of 18 ex-ICNs completed the second questionnaire. Among the 18 subjects, most of them (77.8%) were female. The majority (50.0%) fell into the 31-40 year old age group. Their work experience in the infection control field ranged from one to 10 years with the mean of 5.5. Most of them (94.4%) worked as full-time ICNs and 83.3% worked in an acute setting. All of them were working in public hospitals and 50.0% of them worked in a large hospital that having more than 1,000 patient beds.

2. Reliability

The internal consistency for the first returns of 18 ex-ICNs for 64 items was high, with a coefficient alpha of 0.98. Seventeen pairs of data were used to check the test-retest reliability. The means of each item on the first and second tests were calculated. The correlation between two respective means was then compared and Spearman's correlation coefficient was 0.839 ($p < 0.000$). This showed that there was no significant difference between the means of two returns.

3. Rating scale diagnostics

The category structure was summarized in Table 1. Among the five rating categories, only four were used. No item was rated as "not very important". Only two frequencies rated as "not important". This illustrated that the ex-ICNs generally agreed with the competency items that drafted by the field experts, which echoed with the valid content. The Rasch-Andrich thresholds increased monotonically from -2.97 to 3.95 showing that the scale was ordered. The thresholds between categories were within the optimal distance, which should be between 1.4 and 5 logits.¹⁶ This illustrated that each category defined a distinct position on the scale. Results showed that rating scale of the questionnaire was functional. The probability graph of the rating scale is visualized as Fig. 1. Each category has a distinct peak in the graph. The thresholds

were presented at the intersections of rating scale categories.

CONCLUSIONS

The core competency of ICNs drafted by panel experts using Delphi approach was valid and reliable. The information on content validity was enhanced by free-marginal multi-rater Kappa in addition to CVI. The functional rating scale of the questionnaire ensured the quality of data collected.¹⁶ To promote the quality of infection control service, it is important to equip with reliable and valid training and assessment for ICNs in Hong Kong. Core competency is the major component for the development. The result of this study builds the foundation on this future direction.

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Table 1: Summary of category structure

Category		Observed		Rasch-Andrich threshold
<u>Rating</u>	<u>Label</u>	<u>Count</u>	<u>%</u>	
1	Not very important	0	0	-
2	Not important	2	0	None
3	Undecided	46	4	-2.97
4	Important	585	51	-0.98
5	Very important	519	45	3.95

Fig.1: Probability graph of rating scale

