An exploratory factor analysis for developing and validating a scale of Nursing Students Competence Instrument

Chun-Chih Lin [a,b,*], Chiung-Jung (Jo) Wu [c,d,e,f], Ya-Chu Hsiao [g,h], Chin-Yen Han [g,h], Chang-Chiao Hung [a,b]

[a] Department of Nursing, Chang Gung University of Science and Technology, 2, Chia-Pu Rd, West Sec. Pu-tz, ChiaYi 613, Taiwan, ROC
[b] Department of Nursing, Chang Gung Memorial Hospital at ChiaYi, 6, Chia-Pu Rd, West Sec. Pu-tz, ChiaYi 613, Taiwan, ROC
[c] School of Nursing, Midwifery and Paramedicine, Faculty of Health Sciences, Australian Catholic University, 1100 Nudgee Rd, Banyo, QLD 4014, Australia
[d] School of Nursing, Queensland University of Technology (QUT), Australia
[e] Royal Brisbane and Women's Hospital (RBBWH), Australia
[f] Mater Medical Research Institute-University of Queensland (MRI-UQ), Australia
[g] Department of Nursing, Chang Gung University of Science and Technology, 261 Wen-Hwa, 1st Road, Kwei-Shan, Taoyuan 333, Taiwan, ROC
[h] Department of Nursing, Chang Gung Memorial Hospital at Linkou, No. 5, Fuxing St., Guishan Dist., Tauyuan 333, Taiwan, ROC

ARTICLE INFO

ABSTRACT

Background: Nursing competency is a standard component of the nursing curriculum in baccalaureate nursing education in Taiwan. However, limited studies have been found on the development of a measurement for assessing Taiwanese baccalaureate-level nursing competency.
Objective: The aim of this study was to develop and validate a Nursing Students Competence Instrument (NSCI) for Taiwanese baccalaureate-level nursing students.
Design: The items of this newly developed scale were derived from a previous published qualitative study by the authors. Validity and reliability of the instruments were assessed with exploratory factor analysis. In considering external validity and homogenous characteristics, data were collected from two periods of time: February 2011 and 2012.
Setting: Four hundreds nursing students enrolled in the 2-year baccalaureate-level at the study university in Taiwan were invited to participate in the study.
Participants: Two hundreds and nine nursing students in the 2-year baccalaureate-level program were recruited.
Methods: Descriptive statistics and exploratory factor analysis were used to determine validity of the instrument. Cronbach alpha, split-half coefficients and item analysis verified the reliability of instrument.
Results: Significant levels of reliability and validity for the newly developed Nursing Student Competency Instrument were found. The competency instrument comprised four dimensions with 27 items for graduates to meet to determine their nursing competency. Four factors were analyzed and categorized as integrating care abilities, leading humanity concerns, advancing career talents, and dealing with tension, and explained 22.29%, 18.59%, 15.99% and 11.23% of total variance, respectively; these four explained 68.09% of the total variance.
Conclusions: Results support validation of the new nursing competence assessment scale for Taiwanese nursing students at baccalaureate levels.
The authors recommend that the NSCI could be applied in the nursing schools to evaluate the learning outcomes of nursing students' competence.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Nurse education has generally recognized the importance of nursing competency in the provision of professional nursing development. The Taiwan Nursing Accreditation Council (TNAC) (TNAC, 2010) set a primary goal for all nursing programs to cultivate and facilitate in nursing graduates safe, competent, and skillful care of patients. These nursing competencies, therefore, are a standard component of the nursing curriculum to guide education and evaluation of nursing students' learning outcomes. These nursing competencies define and relate to

* Corresponding author at: ChiaYi Campus, Department of Nursing, Chang Gung University of Science and Technology, 2, Chia-Pu Rd, West Sec. Pu-tz, ChiaYi 613, Taiwan, ROC.
E-mail addresses: cclin01@mail.cgust.edu.tw, chunchih@ms22.url.com.tw (C.-C. Lin), Jo.Wu@acu.edu.au, c3.wu@qut.edu.au (C.-J.(J.) Wu), yjshiao@mail.cgust.edu.tw (Y.-C. Hsiao), cyhan@mail.cgust.edu.tw (C.-Y. Han), cchung@mail.cgust.edu.tw (C.-C. Hung).

an individual's capacity and proficiency in the nursing profession (Watson et al., 2001; Nursing and Midwifery, 2006). Thus, nursing graduates must meet the responsibilities associated with competence in professional development (Klein, 2006). The assessment of nursing competency becomes a fundamental aspect of nursing students commensurate with achieving learning outcomes to meet the aims of nursing schools. "A nurse who can be trusted by patients and their families" is generally accepted as a key goal in most nursing schools.

The TNAC standards have specified eight core values (nursing competencies) within professional nursing for new graduates since 2007. These values aim to guide the continuing improvement of nursing schools. These core values are essential as a standard of nursing programs for new graduates and are encapsulated as (1) critical thinking and reasoning, (2) general clinical skills, (3) basic biomedical science, (4) communication and team work capability, (5) caring, (6) ethics, (7) accountability, and (8) life-long learning (Chen, 2010; TNAC, 2010). Individual nursing school is based on these core values; however, they are linked with the specific characteristics of each school and their students, and each develops or reforms its own core values in the nursing curriculum.

The degree of nursing competency is not only the ability to provide nursing care, but also, involves individual motivation and ability toward professional nursing. Measuring these nursing competencies is challenging because it involves complex dimensions through the process of learning within both classes and daily activities as well as the intrinsic quality of every competence as a whole (Smith, 2012). Furthermore, each nursing competence is imbued with the process of learning within both classes and daily activities, and it is important to monitor how learning goals are achieved (Lee-Hsieh et al., 2003).

Although there is evidence to evaluate clinical assessment in undergraduate nursing students (Wu et al., 2015), a systematic review in identifying nursing competency assessment tools has recommended the needs for individual country to develop a validated assessment tool based on the national guidelines (Ličen and Plazar, 2015). There is no specific instrument in Taiwan to assess the relevant nursing competencies. Therefore, this present study is necessary to address the gaps of the literature to develop an instrument to measure the level of nursing competencies among baccalaureate-level nursing students in Taiwan according to the TNAC standards.

2. Aim of Study

The aims of this study were to develop and validate a new scale, namely the Nursing Students Competence Instrument (NSCI).

3. Methods

3.1. Design

A descriptive research design with a survey was used (Floyd, 2013) to develop and evaluate the NSCI. This study consisted of three phases: Phase 1-NSCI items development; Phase 2-expert panel review, and Phase 3-evaluation.

3.1.1. Phase 1: NSCI Items Development

The process of development NSCI items were derived from previous qualitative study in exploring the same level of Taiwanese nursing students' perceptions in complaining and achieving TANC requirements (Lin et al., 2016). The instrument contains 30 items with a 10-point Likert response scale (Hinkin, 1998). The highest scores (10) demonstrated the highest level of agreement for the item measured, and a lowest score (1) revealed a lowest level of agreement on the item rated. These items were easy to understand, and the responses were simple to grasp in self-evaluation of nursing competencies as learning outcomes.

The 30-item instrument consisted of three items for critical thinking and reasoning component; seven items for care ability involving general clinical skills and basic biomedical science. The communication and teamwork capability comprised four items and caring with five items. In addition, the accountability, stress and coping, and life-long learning sections had four, four, and three items, respectively. The definition of core nursing values from the TNAC was discussed and constructed to reflect the outcomes of the nursing curriculum and contributed to the total number of items to be measured for each core value of nursing.

3.1.2. Phase 2: Expert Panel to Review NSCI Items

Five experts from nursing education critiqued and verified it for its relevance, simplicity, clarity, and ambiguity. Items from the NSCI for experts were in a Likert 4-point scale ranging from 1 to 4, with 4 as the highest, "very appropriate", 3 for "appropriate", 2 for "inappropriate", and 1 for "very inappropriate". Furthermore, the validity of the NSCI was tested by nursing experts' comments. According to the experts, all original 30 items were relevant to the research design and the structure of the questionnaire. Item-specific content validity indices (CVI) were calculated, and six items were revised as suggested. All revised items were worded into meaningful sentences. The mean score of the original 30-item instrument ranged from 3.6 to 4, and CVI ranged from 0.93 to 0.97. In the later progression of instrument development, three items were deleted by considering statistical significance. The CVI with 27 items had similar results to 30 items, with scores ranging from 0.92 to 0.97.

3.1.3. Phase 3: Evaluation

After NSCI items reviewed by the expert panel, further analysis of the NSCI was conducted. The construct validity was identified as the statistics of EFA and correlations. Cronbach's alpha coefficient, split-half coefficient, and item analysis contributed to the reliability of the instrument. After measuring the reliability and validity of the NSCI, 27 items were deemed to evaluate the nursing students' competencies as measurable learning outcomes. A new formation of NSCI with four dimensions was identified and reformed as integrating care abilities, leading humanity concerns, advancing career talents, and dealing with tension.

3.2. Sample Size Considerations

The sample size calculation were based on a stable factor structure model, which requires a minimum of 100 and 200 subjects, and a subject variable ratio of at least 2:1 to reduce the standard error (SE) of the correlations to negligible proportions (Kline, 1993). Accordingly, the number of subjects in this study was 209 for the 27 variables to meet the exploratory factor analysis requirement with alpha = 0.05.

3.3. Recruitment

Nursing students enrolled in participating university were approached for potential participation if they meet the following inclusion criteria: nursing students who held nursing diploma and currently enrolled at the baccalaureate-level. Students without holing a diploma in nursing prior to studying in baccalaureate-level were excluded.

3.4. Data Collection

Nursing students enrolled in the participating university were approached and provided with a participant information sheet and consent form and the students were required to provide written informed consent prior to their participation. All students were assured that neither their results nor their participation in this survey would affect their final marks in any subject. In considering external validity and the need to recruit subjects with homogenous characteristics, data