A pilot study to assess validity and reliability of newly developed "Clinical Competence Self Assessment Tool (CCSAT)"

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Abstract

Introduction: Despite, Shortage of nurses globally and increased absorption of inexperienced nursing graduates in hospitals, there is scarcity of reliable and valid tools to assess their clinical competence.

Aim: Pilot testing of clinical competence self assessment tool.

Materials and Methods: A Clinical Competence Self Assessment Tool (CCSAT) with 94 items was developed based on literature review and Delphi consensus. It had three subscales- professional behavior, knowledge and skills. It was applied on 200 upcoming nursing graduates. Cronbach's alpha and exploratory factor analysis was used to assess internal consistency and validity.

Results: The KMO (Kaiser-Meyer-Olkin for sampling adequacy) value for all three subscales was > 0.83 and Bartlett's test of sphericity values < 0.00. All subscales achieved Cronbach's alpha value of > 0.81. The overall value of Cronbach's alpha for CCSAT was 0.944. Two items each were reduced and modified.

Conclusion: CCSAT was found to be feasible, reliable and valid. Two items each were revised and reduced. Final tool post pilot study contained 92 items.

Keywords: CCSAT, Factor analysis, Pilot testing, Reliability, Validity.

Introduction

Globally shortage of nurses has always remained an issue.(1) To manage this shortage, lesser experienced new nursing graduates are increasingly being employed in hospitals.(2) However, new nursing graduates have limited experience of hospital settings as nursing school education permits only brief exposure of complex hospital environment.(3)

Competence in nursing mainly refers to knowledge and or skills and professional standards.(4-6) There had been few researches conducted to develop tools to measure competence of nursing graduates.

Shwu ru liou et al in Taiwn developed a "clinical competence questionnaire" based on Patricia Benner's "from novice to expert model". The Cronbach's alpha was 0.98. It assessed clinical competence of upcoming nursing graduates in professional behavior, basic clinical skills and advanced clinical skills.(7)

Jan Nilsson et al in Sweden also developed a new tool measuring nurses self reported professional competence for student nurses and practicing nurses. The scale had 88 items and 8 factors, which achieved Cronbach's alpha values > 0.70.(8)

Fisher M. et al, developed a tool for assessing clinical performance of a novice nurse, the items were drawn from the Australian Nursing Council Inc. (ANCI) (1991) competency statements. They assessed the reliability of the tool. It had 44 items. A correlation descriptive design was used to determine the inter rater reliability between assessors using this competency based tool. A pilot study utilizing a convenience sample of 30 new graduate nurses were each assessed by two observers for a mean period of 127.5 minutes. Kappa coefficients were calculated to determine the level of agreement between the two observers. Very little rating agreements were found for individual items: however there was no significant difference in the total competency scores between the two observers. The competency assessment tool has face validity and is internally consistent however inter rater reliability for individual items were found to be poor.(9)

The competence of graduating nursing students is an important issue in health care as it is related to professional standards, patient safety and the quality of nursing care(1) when approaching graduation; nursing students are expected to have adequate nurse competence to fulfill their duties safely and effectively.(10) Lack of valid and reliable tool to assess competence is suggested in literature review.(11-13)

Aim: To assess validity and reliability of "Clinical Competence Self Assessment Tool (CCSAT)" developed to assess clinical competence of upcoming nursing graduates.

Materials and Methods

A Cross sectional descriptive study was design used to collect the data. Study period was from December 2016 to February 2017. The 200, upcoming nursing graduates of 08 randomly selected nursing colleges were self administered, Clinical Competence Self Assessment Tool.

Procedure: Obtained the written consent from the nursing graduates. CCSAT was self administered and took 30-45 minutes for tool completion by each nursing graduate.

Clinical Competence Self Assessment Tool (CCSAT): It had a total of 94 items and three subscales. Professional behavior subscale had 19 items with 10 items on professional conduct, ethics and professional development, 03 items in awareness of maintaining therapeutic environment for the client, 04 items on communication with client and health care team and 02 items on implementing critical thinking in patient care. Knowledge subscale had 21 items with 01 item on basic health sciences, 04 items on nursing science, 16 items on theory of common nursing procedures and skills had 54 items with 03 items on health assessment, 43 items on nursing care skills, 08 items on observation and communication skills. Data analysis was done using descriptive analysis, exploratory factor analysis for construct validity and Cronbach's alpha for measuring internal consistency. Principal component factor analysis was used. For deciding the number of factors to extract scree plot and Kaiser's criterion was used. KMO (Kaiser – Meyer-Olkin) test and Bartlett's test of sphericity were used to determine sample adequacy and appropriateness of data for factor analysis.

Results

Majority of study participants 144 (72%) were in the age group 21-23 years and 131 (65.5%) were females. Majority 197 (98.5%) were 12th pass. For opting nursing as career majority 115 (57.5%) had a self interest, however 60 (30%) joined for job surety and 18 (9.0 %) as forced decision by parents. Majority 127 (63.5%) wanted to join government hospital post-graduation, however 32 (16%) in private hospital and 14 (7%) educational centers. About half 112 (56.0%) were very satisfied with nursing education at their institute however 47 (23.5%) were somewhat satisfied and 40 (21.5%) were not satisfied. For development of competence supported by supervision majority 70 (35%) responded in yes, however 61 (30.5%) said to some extent and 36 (18%) said no, 29 (14.5%) were not sure. In response to their preparedness for clinical practice majority 79 (39.5%) felt it was totally sufficient and 71 (35.5%) opined as totally insufficient and one fourth 50 (25%) as somewhat sufficient. In response to adequacy of clinical experience majority 90 (45.0%) said adequate, however 79 (39.5%) felt it could be improved and 31 (15.5%) expressed inadequate. For readiness to work in hospital majority 95 (47.5%) felt that they are ready and 46 (23.0%) said they are unsure. KMO & Bartlett's test values. (Table 1)

Table 1: Values of KMO and bartlett's test

CCSAT-subscales	KMO	Bartlett's test of sphericity
Professional behavior	0.831	Df 171, p< 0.000
Knowledge	0.836	Df 210, p< 0.000
Skills	0.898	Df 1431, p< 0.000

The data is considered suitable for factor analysis if KMO value is > 0.8 and p values <0.00. As the table1 above clearly depicts that for all the subscales the KMO value is >0.8 and the p values was also < 0.00.

Table 2: Mean participant score of subscales

Subscale name	No of items	Scoring range	Mean score & SD
Professional behavior (n=200)	19	0-3	32.25±7.552
Knowledge (n=200)	21	0-2	34.62±6.846
Skills (n=200)	54	0-4	117.56±40.012
CCSAT (n=159)	94	-	185.03±46.690

Table 2 shows the mean participant score of the CCSAT subscales, with 32.25 in professional behavior subscale, 34.62 in knowledge and 117.5 in skills. The mean score of knowledge is highest and of the skills is lowest suggesting theoretical knowledge is better in the upcoming graduates.

Table 3: Inter item correlation of subscales

CCSAT- Subscales	Mean inter item correlation (min/max)
Professional behavior	1.697 (1.390/2.250)
Knowledge	1.649 (1.365/2.030)
Skills	2.177 (1.485/3.030)

Table 3 depicts the mean inter item correlation for all the three subscales as >1.6 which shows that items are correlated with each other.

Table 4: Factor analysis by PCA after Varimax Rotation for professional behavior subscale

Factors	Item	Eigen values	Variance %	Cumulative %
I	1,2,3,4,7,8, 9,19	5.065	26.658	26.658
II	14,15,16,17, 18	1.639	8.269	35.287
III	5,11,13	1.51	8.217	43.503
IV	10,12	1.199	6.312	49.815
V	6	1.024	1.024	55.207

Table 4 shows that five factors were extracted for professional behavior subscale of CCSAT using Kaiser's criterion (factors with Eigen values of > 1 were retained). No items were reduced prior to factor analysis initiation.

Table 5: Factor analysis for knowledge subscale

Factor	Item no.	Eigen values	Variance %	Cumulative %
I	8,9,10,11,12	5.310	25.286	25.286

II	18,19,20,21	2.144	10.208	35.494
III	3,4,5,6	1.549	7.377	42.871
IV	13,14,15	1.179	5.615	48.486
V	1,2	1.072	5.103	53.590
VI	16,17,18	1.016	4.840	58.430

As illustrated in table 5 six factors were extracted for knowledge subscale. Item 7 sharing its variance loaded at 0.428 for factor II and 0.474 for factor V. With experts consultation it was reduced. The Cronbach's alpha value without deleting any item was 0.850 and after deleting was 0.841.

Table 6: Factor analysis results for skills subscale

Factor	Item no.	Eigen values	Variance %	Cumulative %
I	3,11-19	19.294	35.730	35.730
II	1,2,4-9	3.277	6.068	41.798
III	32,35- 40	2.459	4.554	46.352
IV	4,41-45	2.018	3.736	50.089
V	20-23	1.804	3.342	53.430
VI	26-29	1.458	2.701	56.131
VII	7,18,25,34,35	1.426	2.641	58.772
VIII	51-54	1.282	2.375	61.147
IX	48-50,54	1.226	2.270	63.417
X	29-31	1.128	2.089	65.505
XI	8,10	1.068	1.978	67.483

As shown in the table 6 eleven factors were extracted for skills subscale. Item 3-interpreting common blood reports, item 46 disinfection of soiled articles and item 47-observing vital signs were considered for reduction as they were weak and had value <0.40, thus in consultation with experts, item 3 was deleted, however items 46 and 47, were retained with modification.

Table 7: Reliability of subscales

Subscale name	Cronbach's alpha before deleting (94 items)	After deleting item (92 items)
Professional behavior (n=200)	0.817	Nil
Knowledge (n=200)	0.850	0.841, one deletion
Skills (n=200)	0.965	0.96, one deletion
CCSAT (n=159)	0.944	0.94

Reliability of subscales

For a scale to be reliable, Cronbach's alpha value should be more than 0.70. In CCSAT all the subscales achieved values >0.81. The overall alpha value for CCSAT was 0.944 before and after deleting two items. (Table 7)

Discussion

Clinical Competence Self Assessment Tool (CCSAT) is developed to assess perceived clinical competence of upcoming nursing graduates. Cronbach's alpha and Principal Component Analysis was applied to check the content and construct validity of the tool. Cronbach's alpha of newly developed tool should be 0.60 as per literature,[14] for CCSAT it was 0.944 suggesting its reliability.

When compared with similar studies, as in a tool developmental study by Shwu-ru liou and Ching yu cheng in Taiwan who developed Clinical Competence Questionnaire" the Cronbach's alpha was found to be 0.98.[7] In another study by Jan Nilsson et al who developed a tool for self reported professional competence, had 88 items and eight factors. All the factors achieved Cronbach's alpha values > 0.70.[8]

Two tests Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy assess suitability of data for EFA. Bartlett's test of sphericity should reach a significance of $p < 0.05$ and the KMO index should be > 0.6.[15, 16] The KMO value for all the three subscales was > 0.83. Bartletts test of sphericity values for all the three subscales was <0.00. In a similar study on Validation of a Sonographer Skill-Teaching Questionnaire KMO and Bartlett's value was >0.5.

Exploratory Factor Analysis identified five, six and eleven factors in professional behaviors, knowledge and skills subscales each with 5.2%, 58% and 67.4% variance.[17] As per literature, item extraction to continue until researcher reaches at least 60% variance.[14-16] Thus variance explained by the factors in present study was found to be appropriate.

Conclusion

The newly developed Clinical competence self assessment tool is found valid and reliable in its pilot testing. The tool can be tried on a larger sample to further establish its reliability and validity.

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