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Developing a Transition to Practice Cardiac Nursing Program (TTP-CNP) Self-Assessment Instrument Using MEASURE Approach in a Tertiary Military Cardiac Specialized Centre in Saudi Arabia

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Abstract

This study aims to develop a self- assessment instrument that evaluates the Transition to Practice Cardiac Nursing Program (TTP-CNP) using MEASURE approach in a Tertiary Military Cardiac Specialized Centre in Saudi Arabia. The TTP-CNP instrument's reliability and validity were evaluated. Cronbach's Alpha was used to estimate the instrument internal consistency. The construct reliability was measured using test-retest reliability. Content and face validity were measured using content validity ratio (CVR), content validity index (CVI), and face validity index (FVI) and the instrument was determined to be valid and reliable. The instrument can be used as a reliable and valid measure for assessing TTP-CNP programs, however, more testing on larger samples using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) is suggested to confirm our conclusion.

Keywords: Cardiovascular Nursing, Surveys and Questionnaires, Reproducibility of Results, Program, Validity, Reliability, Saudi Arabia.

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INTRODUCTION

Literature suggests that nursing transition to practice (TTP) programs can successfully help support new nurses through such challenging time (Djukic *et al*., 2023). In this paper, the scope of the TTP program covers the Cardiac Nursing Residency Program (CNRP) and the Cardiac Nursing Fellowship Program (CNFP) which combined called (TTP-CNP) in a Tertiary Military Cardiac Specialized Centre in Saudi Arabia. The residency program is concerned with those newly hired nurses with no previous experience while fellowship program also consist of newly hired nurses, however, with prior experience in nursing. The Cardiac Nursing Residency Program is a twelve months program for newly graduated Registered Nurses (RNs) with less than one year of clinical experience which encompasses organization orientation, practice-based experience, and supplemental activities to promote nursing professional development. Similarly, the fellowship program covers the same aspects yet, it spans over a period of nine months. These two programs are considered as a part of the transition to practice program that runs in the Centre. Even though the Transition to Practice Cardiac Nursing Program (TTP-CNP) is specially designed according to the Cardiac Centre structure and requirements, we believe that the developed instrument used to evaluate the TTP-CNP that is being discussed throughout this paper can be used for such similar TTP-CNP cardiac nursing program worldwide. Nevertheless, it should be noted that the instrument was developed and adjusted based on the mentioned program that is part of constitution of the Centre TTP program.

MATERIALS & METHODS

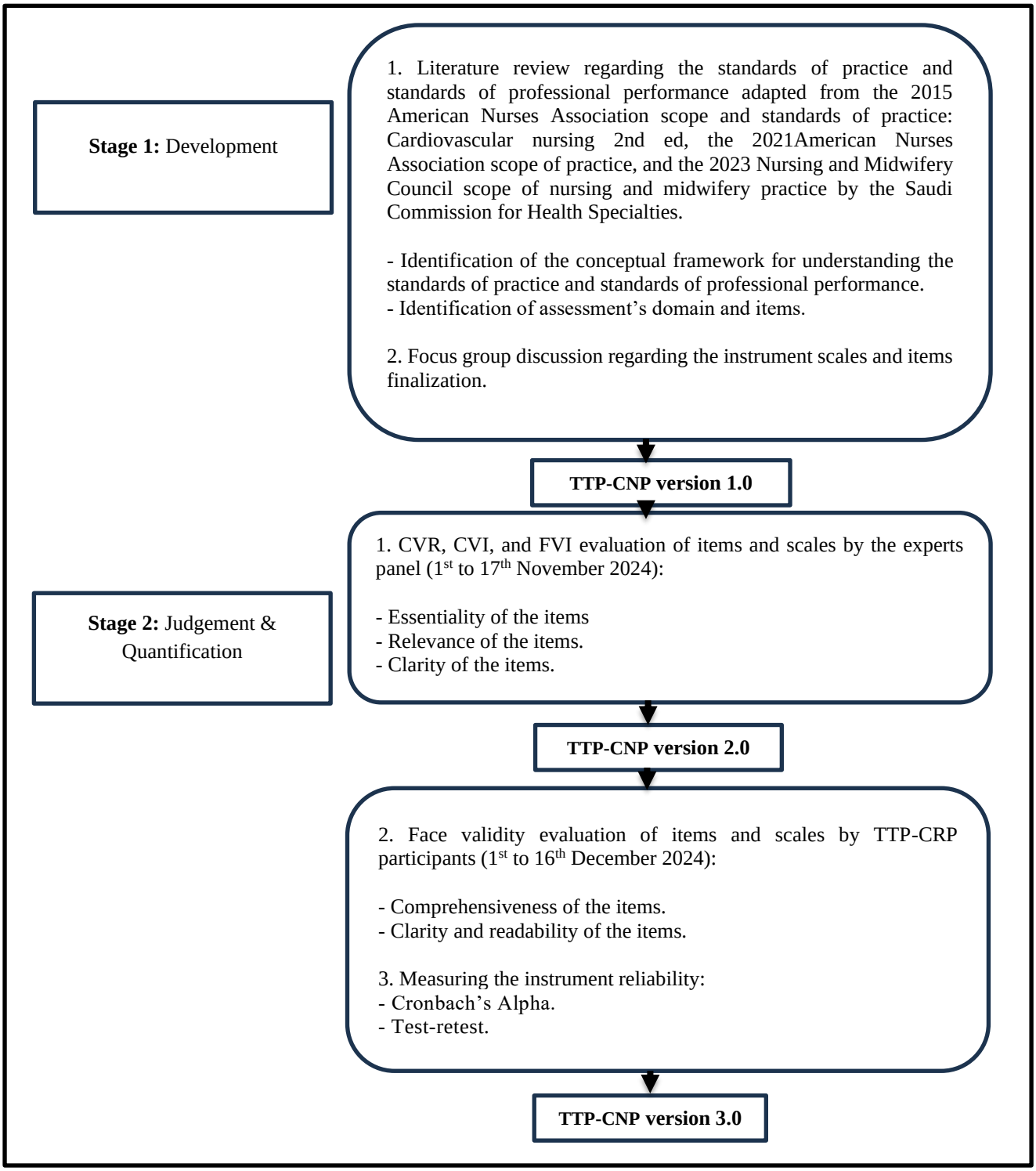
Study Design

This cross-sectional study was conducted at Prince Sultan Cardiac Centre in Riyadh, Saudi Arabia. The authors employed judgmental sampling method to invite the expert panel members to conduct the content validity [i.e., to calculate the Content Validity Index

(CVI), Content Validity Ratio (CVR) and Face Validity Index (FVI)] based on their credibility and expertise. Additionally, the authors also employed purposive sampling to select respondents for face validity where a link was sent to a number of the Transition to Practice Cardiac Nursing Program participants with the developed instrument to calculate face validity. Figure 1 depicts the two-stage approach authors implemented for the development and validity of the TTP-CNP self-assessment instrument using MEASURE approach i.e., stage I resulted in generating the instrument's items (development), while stage II was concerned with evaluating the performance of the instrument's items (judgement and consequent quantification).

Figure 1

Stages of processes of development and validity of the Transition to Practice Cardiac Nursing Program (TTP-CNP)



Furthermore, the stages of developing the TTP-CNP self-assessment instrument and testing its reliability and validity were done through two steps:

1. Review of literature and focus group to identify the instrument theoretical framework in terms of the instrument domains and constructs.
2. Judgement and then quantification of the developed instrument.

Table 1
Theoretical Blueprint of the to Practice Cardiac Nursing Program (TTP-CNP) self-assessment instrument

Domain	Sub-domain	Novice to expert Benner scale domain scales				
		Expert	Proficient	Competent	Advance Beginner	Novice
Domain 1. Standards of Practice	Assessment Diagnosis Outcomes identification Planning Implementation Evaluation					
Domain 2. Standards of Professional Performance	Professionalism and Ethical Practice Education Evidence-Based Practice and Research Quality and Safety Management Communication and Information Technology Environmental Health					

Stage 1: Developing the Transition to Practice Cardiac Nursing Program (TTP-CNP) self-assessment instrument:

After reviewing the literature in regard to transition into practice in nursing, the instrument first draft was then developed to take into account two domains; first is standards of practice and then the clinical standards of professional performance in residency program. The main resources for developing the instruments were: the 2015 American Nurses Association scope and standards of practice: Cardiovascular nursing 2nd ed, the 2021American Nurses Association scope of practice, and the 2023 Nursing and Midwifery Council scope of nursing and midwifery practice by the Saudi Commission for Health Specialties. Accordingly, the TTP instrument first draft was finalized based on extensive literature review as well as conducted focus group discussion among the panel of expert clinical nursing educators, senior clinical nursing staff at the Cardiac Centre and a university professor of Epidemiology.

Based on the results of the literature review and the conducted focus group discussion among the experts panel, the instrument of the TTP-CNP was developed to consists of 3 parts: The first part is concerned with demographics, while the second part is related to 1st domain of clinical standards of practice, which contains six sub-domains, and finally, the third part is concerned with the TTP-CNP 2nd domain standards of professional performance, which contains six sub-domains as indicated in table 1. The second and third part consists of statements in which the participant will rate themselves in each item from novice to expert using Benner's scale.

The Expert Panel:

The experts panel consists of two nursing educators, two senior clinical nursing staff and a medical doctor who works as a university Epidemiology professor. Consequently, the conceptual framework and the first draft of the instrument (TTP-CNP self-assessment instrument Version 1.0) was created to contain two domains with 42 items in addition to the demographic part of the tool. However, the final version of the instrument (TTP-CNP self-assessment instrument Version 3.0) contains 37 items after removing five items due to duplication and redundancy. Also, the wording of a number of items was revised (i.e., item 1, 7, 22 and 39).

Stage 2: Judging the TTP-CNP Self-Assessment Instrument:

Testing Reliability and Validity:

Simply put, reliability is defined as the extent of consistency of a measure i.e., to which a study would be replicable or reproducible if this measurement were to be taken again under the same conditions. Validity on the other hand, is concerned with the accuracy of a measure. In other words, it means whether the results of such measurement do represent what they are intended to measure. It should be noted that the validity and reliability of an instrument is closely related. Meaningly, an instrument cannot be considered as valid unless it is proven to be reliable. In the contrary, the instrument reliability does not depend on its validity (Nunnally J & Bernstein L., 1994). These two aforementioned steps were all detailed using the MEASURE approach described below.

The MEASURE Approach to Instrument Development:

Based on the guidelines of leading psychometricians, mainly Benson (1998), DeVellis (2016), Dimitrov (2012), and Mvududu and Sink (2013), Kalkbrenner (2021) developed the MEASURE Approach in 2021 to instrument development. This developed approach acronym is comprised of the first letter of seven empirically supported steps that constitute the process of developing and validating scores on given measures. Consequently, the MEASURE acronym stands for: "(a) Make the purpose and rationale clear, (b) Establish empirical framework, (c) Articulate theoretical blueprint, (d) Synthesize content and scale development, (e) Use expert reviewers, (f) Recruit participants, and (g) Evaluate validity and reliability" (Kalkbrenner, 2021). Accordingly, the authors are going to detail below the steps taken in the process of developing the TTP-CNP self-assessment instrument using the MEASURE Approach.

(a) Make the Purpose and Rationale Clear:

At the beginning, researchers should define the purpose of conducting an instrument development study. That should be done by telling the reader what the researchers are aiming to measure and why measuring the proposed construct is therefore important (DeVellis, 2016; Dimitrov, 2012).

For this reason, our aim for developing a TTP-CNP self-assessment instrument was to fill the present gap found as there is no cardiac nursing TTP program self-assessment instrument to the best of our knowledge after reviewing the literature. As a result, the authors started this process in order to have a self-assessment instrument that measure both cardiac nursing standards to practice and standards to professional performance. Moreover, the instrument is a self-assessment tool that aims to help the respondent reflect on their clinical performance after the completion of the TTP-CNP program, in which it measures their performance of the standards of practice pertaining to cardiovascular nursing which will be rated according to the novice to expert Benner scale. Therefore, according to Kalkbrenner (2021) "An instrument development study is necessary if the literature is lacking a measure to appraise the researcher's desired construct of measurement." (Kalkbrenner, 2021).

Consequently in this paper, Asiri and colleagues (2025) made their purpose and rationale clear (i.e., step 1) by (a) describing the intention of creating a measure for appraising cardiac nursing standards to practice and standards to professional performance in a self-assessment manner, (b) revealing a gap in measurement literature for appraising both aspects of cardiac nursing standards to practice and standards to professional performance with a single, relatively brief composite scale, and (c) highlighting the need for such a measure in evaluating cardiac nursing TTP programs in specific, which has great potential for measuring the effectiveness of such programs that can enhance the future research and practice of nursing personnel, especially those who work in cardiac specialized care settings.

(b) Establish Empirical Framework:

This study used "From Novice to Expert Theory" as its theoretical framework, which was developed by Patricia Benner in 1982. In her theory, Benner discussed the concept which revolves around how nurses develop their skills as well as how they understand patient care over time, which occur through educational opportunities and personal experiences. Accordingly, Benner classified the five levels of one's nursing experience as following: novice, advanced beginner, competent, proficient, and finally expert. These levels indicate the growth nurses experience as they progress in their own career. As a result, each level builds off of knowledge and experiences gained from previous levels. Moreover, Benner states that "an expert is described as a nurse who provides the greatest care and has the most experience, knowledge, and understanding" (O'Brien Hall, 2020; Thomas & Kellgren, 2017). For this reason, the developed TTP-CNP self-assessment instrument used the five levels of one's nursing experience "i.e., novice to expert" to self-rate the nurse clinical performance after completion of the Transition-to-practice (TTP) programs.

(c) Articulate Theoretical Blueprint:

According to Kalkbrenner (2021), by creating a theoretical blueprint, the researchers can start to refine as well as organize their empirical framework. Furthermore, Kalkbrenner defines the theoretical blueprint as "a tool for enhancing the content validity of a measure by offering researchers two primary advantages, including (a) creating the content and domain areas for the construct of measurement and (b) determining the approximate proportion of items that should be developed across each content and domain area" (Kalkbrenner, 2021). Moreover, content and domain areas in a blueprint are also defined by Kalkbrenner, in which content areas refers to "the specific subject aspects for the construct of measurement. Domain areas in a blueprint refer to the various application-based dimensions of the construct of measurement." (Kalkbrenner, 2021). Kalkbrenner also indicated the need for providing a justification from the literature to explain the need for using such content and/or domain areas.

On the other hand, within the first year, around half of new nurses leave their position, which was primarily indicated as a result to the large competency gap between professional practice and their educational preparation (Labrague & McEnroe-Petitte, 2018). In addition, it should be noted that for more than 90 years, the need and importance of having an effective transition to practice program in nursing has been reported and documented (Townsend, 1931).

Accordingly, when reviewing the literature, no TTP-CNP self-assessment instrument was found for cardiac nursing professionals. Hence, the researchers decided to develop an instrument that was mainly derived from the third edition of the American Nurses Association-Cardiovascular nursing: Scope and standards of practice (2015) (American Nurses Association, 2015), the 2021 American Nurses Association scope of practice (American Association of Colleges of Nursing, 2021), as well as from the Scope of nursing and midwifery practice developed by the Nursing and Midwifery Council, Saudi Commission for Health Specialties (2023) (Nursing and Midwifery Council, 2023). Therefore, Table 1. Theoretical Blueprint of the TTP-CNP self-assessment instrument indicates the extracted content and domains areas.

(d) Synthesize Content and Scale Development

The "From Novice to Expert Theory" was used in this study as its theoretical framework, where Benner classified the five levels of one's nursing experience as following: novice, advanced beginner, competent, proficient, and eventually an expert. These levels indicate the growth nurses witness as they progress in their own career and hence, these levels were used for developing the scale for this TTP-CNP self-assessment instrument as an ordinal scale that indicates the progressive levels of nursing competency in the chosen domains and their constructs.

The domains were decided to cover two main areas, namely, a) cardiac nursing standards of practice and b) standards of professional performance. Each domain had a set of constructs that were derived from the third edition of the American Nurses Association-Cardiovascular nursing: Scope and standards of practice (2015), the 2021 American Nurses Association scope of practice, as well as from the Scope of nursing and midwifery practice developed by the Nursing and Midwifery Council, Saudi Commission for Health Specialties (2023).

(e) Use Expert Reviewers:

When the initial stage of developing the first version of the instrument that contains the raw pool of items along with their scaling format is assembled, the created measure should be then sent to an external group of expert reviewers who have the knowledge in the content area (Ikart, 2019; Lambie *et al*., 2017). It should be noted that the expert reviewers in this stage should be different from the people who did contribute to the development process of the pool of items in its original form in order to provide a non-biased perspective. The number of expert reviewers usually tends to range between three and five experts even though up to 20 expert reviewers have been reported in the literature (Ikart, 2019). Maximizing the measure's content validity is considered as the main purpose of the expert review process which is achieved by obtaining feedback from the chosen panel of experts in regard to "how relevant they think each item is to what you intend to measure" (DeVellis, 2017).

Therefore, in this study, the panel of experts consists of clinical nursing educators, senior clinical nursing staff at the Cardiac Centre and a medical doctor who is a university professor of Epidemiology (i.e., two nursing educators, two senior clinical nursing staff and a university Epidemiology professor) was chosen to perform this step in our project. The results will be detailed in the evaluation of validity and reliability step of the MEASURE approach.

(f) Recruit Participants:

Pilot Testing:

This preliminary testing includes instrument administration to a fairly small developmental sample that is considered similar to the target population. This step allows researchers to check their procedures and test for errors in data imputation. Also, pilot testing is conducted to solicit feedback from participants about the items' readability and the content as well. There are various guidelines for what a small pilot sample should be constituted of; nevertheless, a range of 25 to 150 participants is what pilot samples tend to contain (Browne, 1995; Hertzog, 2008). Pilot study data usually should be reviewed by the participants to gather information about each item content that includes clarity and readability along with checking for presence of any errors in the administration procedures (Kalkbrenner, 2021). In our study, we pilot tested the developed instrument by distributing it across sixteen participants only, which was due to the limitation of small available sample of the TTP-CNP cohort at the time of conducting this study. The results of this pilot testing are indicated in the validity and reliability section below.

(g) Evaluate Validity and Reliability:

Validity and Reliability:

In this study, we used the test - retest as well as Cronbach's Alpha as measures of reliability. For the measurement of validity, we used Content Validity Index (CVI), Content Validity Ratio (CVR), and Face Validity Index (FVI).

Table 2

The domain, sub-domain and number of items of TTP-CNP self-assessment instrument (version 1.0)

Domain	Sub-domain	No. of items	Total Items
Domain 1: Standards of Practice	Assessment	4	23
	Diagnosis	4	
	Outcomes identification	5	
	Planning	3	
	Implementation	5	
	Evaluation	2	
Domain 2: Standards of Professional Performance	Professionalism and Ethical Practice	4	19
	Education	4	
	Evidence-Based Practice and Research	2	
	Quality and Safety Management	3	
	Communication and Information Technology	3	
	Environmental Health	3	
Total instrument items			42

Statistical Analysis

Microsoft Excel was used in this study for data entry and tabulation of CVR, CVI, and FVI. Also, Microsoft Excel was used as well to calculate test - retest correlation coefficient as a measure of reliability. Cronbach's Alpha reliability of internal consistency was measured using SPSS V.30.

RESULTS

Validity:

Content Validity Ratio (CVR) and Content Validity Index (CVI):

There are two types of content validity indicators of an instrument, namely, content validity ratio (CVR), which was developed in 1975 by Lawshe (Patricea *et al*., 2013), that examines the necessity of each question in the tool we are dealing with, while the second one is content validity index (CVI), which is concerned with the relevance of each question in the questionnaire (Madadizadeh & Bahariniya, 2023).

Furthermore, when it comes to the reports regarding instrument development, one of the most widely reported approach for measuring content validity is the content validity index (Davis LL., 1992; Grant JS, 1997; Lynn MR., 1986a). In this approach, panel members are asked to rate the items of the instrument in terms of its relevancy to the construct underlying study according to the theoretical definitions of the construct itself along with its dimensions on a 4-point ordinal scale i.e., (1[not relevant], 2[somewhat relevant], 3[quite relevant], 4[highly relevant]) (Davis LL., 1992).

According to Yusoff (2019), content validation process is done following these six steps: "a) Preparing content validation form (b) Selecting a review panel of experts (c) Conducting content validation (d) Reviewing domain and items (e) Providing score on each item (f) Calculating CVI" (Yusoff, 2019). For the TTP-CNP self-assessment instrument, after completing the aforementioned steps, we measured the CVI for item (I-CVI) and CVI for scale (S-CVI) as following:

1. Recoding relevancy scale filled by expert:

Original scale rating	New rating scale
1 or 2	0
3 or 4	1

2. Calculating item level content validity index (I-CVI): Formula of I-CVI= agreed items/number of experts:

Item Number	Experts in agreement	I-CVI	Item Number	Experts in agreement	I-CVI
1	5	1	22	5	1
2	5	1	23	5	1
3	5	1	24	5	1
4	5	1	25	5	1
5	5	1	26	5	1
6	5	1	27	5	1
7	5	1	28	5	1
8	5	1	29	5	1
9	5	1	30	5	1
10	5	1	31	5	1

11	5	1	32	5	1
12	5	1	33	5	1
13	5	1	34	5	1
14	5	1	35	5	1
15	5	1	36	5	1
16	5	1	37	5	1
17	5	1	38	5	1
18	5	1	39	5	1
19	5	1	40	5	1
20	5	1	41	5	1
21	4	0.8	42	5	1

It's recommended by researchers that a scale would be considered having excellent content validity if it is composed of item CVI of 0.78 or higher as well as scale S-CVI/UA of 0.8 or higher and S-CVI/Ave of 0.9 or higher (Jingcheng Shi *et al*., 2012). So accordingly, the acceptable I-CVI should be 0.78 or higher and therefore, all the items I-CVI is acceptable and shall be retained as a result. In addition, the TTP-CNP self-assessment instrument scale S-CVI/UA value is 0.97 and the scale S-CVI/Ave value is 0.99 and therefore, the TTP-CNP self-assessment instrument S-CVI is considered acceptable.

For the TTP-CNP program instrument when it comes to the instrument CVR, we measured the CVR for item (I-CVR) and CVR for scale (S-CVR) as following:

1. Recoding Necessity scale filled by expert:

Original scale rating	New rating scale
1 or 2	0
3 or 4	1

2. Calculating item level content validity Ratio (CVR): Formula of CVR= (Ne - N/2)/(N/2).

Item Number	Experts in agreement	I-CVR	Item Number	Experts in agreement	I-CVR
1	5	1	22	5	1
2	5	1	23	5	1
3	5	1	24	5	1
4	5	1	25	5	1
5	5	1	26	5	1
6	4	0.8	27	5	1
7	5	1	28	5	1
8	5	1	29	5	1
9	5	1	30	5	1
10	5	1	31	5	1
11	5	1	32	5	1
12	5	1	33	5	1
13	5	1	34	4	0.8
14	5	1	35	5	1
15	5	1	36	4	0.8
16	5	1	37	4	0.8
17	5	1	38	4	0.8
18	5	1	39	5	1
19	5	1	40	5	1
20	5	1	41	5	1
21	5	1	42	5	1

Where Ne= number of experts rating 'essential' while N= total number of recruited experts. So CVR will range within -1 to +1. After that, we use the Lawshe Table for CVR to check the minimum value of CVR for our number of experts, which is five experts, to determine whether the item is valid or not. Accordingly, the TTP-CNP self-assessment instrument final version 3.0 after removing the agreed upon items by the experts as detailed in the discussion section has a CVR of 1 and therefore, is considered acceptable.

Face Validity Index (FVI):

The panel expert reviewed the items in the instrument and afterwards, after removing the agreed upon items by the experts as detailed in the discussion section, they found that the test is considered as a valid

measure of the concept which is being measured based on scoring it in regards to its clarity as detailed below.

For the TTP-CNP program instrument when it comes to the instrument FVI, we measured the FVI for item (I- FVI) and FVI for scale (S- FVI) as following:

1. Recoding Necessity scale filled by expert:

Original scale rating	New rating scale
1 or 2	0
3or 4	1

2. Calculating item level face validity Index (I-FVI):

Item Number	Experts in agreement	I-FVI	Item Number	Experts in agreement	I-FVI
1	5	1	22	5	1
2	5	1	23	5	1
3	5	1	24	5	1
4	5	1	25	5	1
5	5	1	26	5	1
6	4	0.8	27	5	1
7	5	1	28	5	1
8	5	1	29	5	1
9	5	1	30	5	1
10	5	1	31	5	1
11	5	1	32	5	1
12	5	1	33	5	1
13	5	1	34	4	0.8
14	5	1	35	5	1
15	5	1	36	4	0.8
16	5	1	37	4	0.8
17	5	1	38	4	0.8
18	5	1	39	5	1
19	5	1	40	5	1
20	5	1	41	5	1
21	5	1	42	5	1

We calculated the I-FVI by dividing the number of items rated as either 3 or 4 (agreed item) to the number of raters, which in our case five experts. Accordingly, the I-FVI was found to exceed the cut-off value of 0.83 for all 42 items except for the five items detailed in the table above, which was removed as agreed by the expert panel. Thus, the TTP-CNP program self-assessment instrument S-FVI was found to be 0.99 and as a result, the final TTP-CNP version 3.0 of the instrument has an acceptable face and content validity.

Reliability:

After validating the instrument and thereafter removing item 6, 34, and 36-38 due to redundancy, reliability was assessed using the test-re-test method. As a result, it was found that the instrument which is constructed now from 37 questionnaire items as version 3.0, has a test-retest reliability of 0.7 and therefore, it has a good reliability.

Table 3

The domain, sub-domain and number of items of TTP-CNP program self-assessment instrument version 3.0

Domain	Sub-domain	No. of items	Total Items
Domain 1: Standards of Practice	Assessment	4	22
	Diagnosis	2	
	Outcomes identification	5	
	Planning	3	
	Implementation	5	
	Evaluation	2	
Domain 2: Standards of Professional Performance	Professionalism and Ethical Practice	4	15
	Education	4	
	Evidence-Based Practice and Research	2	

Quality and Safety Management	1	
Communication and Information Technology	1	
Environmental Health	3	
Total instrument items		37

Also, Cronbach's Alpha was used to estimate the instrument internal consistency. The results showed that Cronbach's Alpha of the entire scale is greater than 0.90 which indicates that the measures are closely related as a group, however, since its greater than 0.95, our results may suggest some redundancy. Accordingly, after assessing each subscale Cronbach's Alpha, we found that each subscale had an excellent internal consistency. Additionally, this was supported by the content and face validity results, indicating a strong level of agreement among the expert reviewers in terms of the instrument relevancy, essentiality, and clarity.

Table 4
TTP-CNP Scale Cronbach's Alpha

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.986	.987	37

Table 5
TTP-CNP Subscales Cronbach's Alpha

Reliability Statistics			
TTP-CNP Subscales	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Assessment	.804	.822	4
Diagnosis	.789	.804	3
Outcomes identification	.927	.930	5
Planning	.899	.905	3
Implementation	.891	.893	5
Evaluation	.859	.864	2
Professionalism and Ethical Practice	.961	.963	4
Education	.917	.920	4
Evidence-Based Practice and Research	.912	.913	2
Quality and Safety Management			
Communication and Information Technology		Single item	
Environmental Health	.915	.918	3

DISCUSSION

Content Validity Index (CVI):

Using the content validity index (CVI), each questionnaire domain was evaluated. Every item was then rated on a four-interval scale namely, (1=not relevant; 2 somewhat relevant; 3=quite relevant, and 4=highly relevant) (De Vet H. *et al*., 2011; Lynn MR., 1986b). After that, the ratings given by the panel experts were hence used to calculate the CVI, in which ratings of 3 and 4 represents relevant content, while a rating of 1 and 2 represent invalid content or those none relevant items. The TTP-CNP program self-assessment instrument CVI was then calculated as a result in two indexes, i.e., the item level (I-CVI), and the scale-level (S-CVI) for the relevancy of each item (De Vet H *et al*., 2011; Lynn MR., 1986b).

The I-CVI was calculated by the number of experts providing a score of 3 or 4 divided by the entire number of experts (Lynn MR., 1986b), where the values can range from 0 to 1. In our study, we had a total of five experts. The resulting I-CVI of less than 0.70 suggests that items need to be eliminated, an I-CVI of 0.70 to 0.79 indicates the item needs revisions while an I-CVI of 0.79 or more indicates the items are relevant. Accordingly, after removing the redundancy of four items, the TTP-CNP program self-assessment instrument I-CVI was found to be 0.99 and therefore, the items are relevant.

After that, The S-CVI will be calculated using two methods (Polit DF. & Beck CT., 2006):

i. Using the universal agreement (UA) by experts i.e., the proportion of the items rated by all the experts on one scale 3 or 4 divided by the total number of items =S-CVI/UA &
ii. Using the average of the I-CVI scores for all items across all experts i.e., the sum the I-CVI scores of all items divided by the total number of items = S-CVI/Ave.

It should be noted that the first method, namely S-CVI/UA, is sensitive to the number of experts i.e., the more experts are there to evaluate the scale, the greater the possibility of obtaining a low S-CVI. This is due to the fact that the universal agreement (UA) score is given as 0 when the item doesn't achieve the agreement of all experts. Otherwise, the UA score is given as 1 when all experts are in agreement. Moreover, the S-CVI/Ave is preferred by Polit D.F *et al*., (Polit DF. & Beck CT., 2006) and is more liberal. Furthermore, the S-CVI value of 0.8 or higher is considered acceptable (Polit DF & Beck CT., 2006). Based on the values achieved by the items for I-CVI and S-CVI/Ave of 0.99, the TTP-CNP instrument items final version, after removing the redundancy of five items, ware therefore considered relevant.

Content Validity Ratio (CVR):

The CVR was then calculated to measure each item essentiality i.e., ranging from -1 to +1, in which -1 indicates a perfect disagreement (meaning that no panel member marked the item as essential) while +1 on the other hand represents perfect agreement (i.e., all panel members mark the scale item in the given question as essential). The experts rated the scale individual items on a four-interval scale (1= not useful, 2= not necessary, 3= useful but not essential, 4= necessary). The CVR was then calculated by dividing the subtraction product of the number of experts who indicated an item as essential and half the number of rating experts with half of the number of experts i.e., CVR= (ne-N/2)/(N/2)). A higher resulting score indicates a higher level of agreement among the expert panels on the scale items' necessity.

When interpreting a CVR for a particular item, it is important to consider the CVR table of critical CVR values, which was computed by Lowell Schipper, where CVR critical values is considered as "the lowest level of CVR such that the level of agreement exceeds that of chance for a given item, for a given alpha (type 1 error probability, suggested to be 0.05 using a one-tailed test)" (Ayre & Scally, 2014), in which CVR critical values can be therefore used to determine how many members of a panel need to agree that an item is essential and subsequently which items should be discarded or included in the final version of the instrument.

Accordingly, as per Lawshe critical values table for the five experts in our study, a value of 0.99 CVR to indicate agreement is needed to include the item in the final instrument. Nevertheless, after calculating the scores acquired from all five experts, all items had a total agreement among all of them in regard to its essentiality except for items number 6, 34, 36, 37, and 38 that had a score of 0.8 for each, which shows disagreement on its necessity and hence, its less than 0.99 as indicated by Lawshe table for CVR critical values and therefore it should be either revised or excluded from the final version of the instrument. Accordingly, the instrument was fine-tuned by the study team and the panel decided to remove the aforementioned items from the instrument final version and as a result, the average CVR and UA CVR were both 1.

Face Validity Index (FVI):

In this survey, a panel of five expert in nursing and epidemiology reviewed the items in the questionnaire and agreed that the test is considered as a valid measure of the concept which is being measured based on scoring it in regards to its clarity. Therefore, face validity was assessed quantitively in terms of all items' clarity in each domain through every respondent's rating. Consequently, each respondent rated the clarity for all items in each of domains in accordance to four-interval scale i.e., (1= Item is not clear, 2= Item needs some revision, 3= Item is clear but needs minor revision, & 4= Item is very clear). Moreover, rating an item as either 1 or 2 indicates invalid or unclear content, while rating an item as 3 or 4 indicates a valid or clear content (Yusoff MSB., 2019). Similar to the I-CVI and S-CVI, there are two forms of face validity index (FVI), namely, item-level FVI (I-FVI) and scale-level FVI (S-FVI) (Yusoff MSB., 2019). Furthermore, the I-FVI was therefore calculated by dividing the items number that were rated as 3 or 4 (i.e., agreed items) to the number of raters. On the other hand, S-FVI/Ave was calculated by taking the average of the I-FVI scores for all items across all raters in which its value can then range from 0 to 1. A resulting FVI of at least 0.83 was taken as the acceptable value of FVI (Mohamad Marzuki MF *et al*., 2018; Mohd Muzammil Ozair KAB *et al*., 2017; Yusoff MSB., 2019). Accordingly, the TTP-CNP self-assessment instrument S-FVI was found to be 0.99 and therefore, the items are clear and hence, the TTP-CNP self-assessment instrument final version of the instrument has an acceptable face and content validity. Additionally, as a result of the remarks from the pilot sample of sixteen TTP-CNP participants, the wording of a number of items was revised (i.e., item 1, 7, 22 and 39).

CONCLUSION

In this study, the TTP-CNP self-assessment developed instrument was validated and also assessed for its reliability. In terms of content and face validity, in this scale, the content validity ratio (CVR), content validity index (CVI), and face validity index (FVI) were analyzed using Microsoft Excel. Consequently, the five expert panel evaluated the TTP-CNP self-assessment instrument Version 1.0 based on three attributes, i.e., necessity, relevance, and clarity and the instrument, therefore, was reviewed and rated accordingly. All the expert panel members attained a consensus on the content of the TTP-CNP program self-assessment instrument in regards to the aforementioned criteria, except for items number 6, 34, 36, 37, and 38 that had a score of 0.8 for each, which shows disagreement on its clarity and necessity and hence, was then discarded from the final instrument as decided by the panel experts. Thus, the final version contains 37 items after removing five items due to duplication and redundancy. Also, the

wording of a number of items was revised (i.e., item 1, 7, 22 and 39). Reliability on the other hand was measured using Cronbach's Alpha and test-retest reliability and the tool therefore was found to have acceptable reliability. As a result, the developed instrument final version can be considered as valid and reliable instrument for TTP-CNP self-assessment purposes.

Still, it should be noted that the number of the nursing staff enrolled in the Cardiac Nursing Transition to Practice Program during the period of developing this tool was around sixteen staff, which is considered the average number of each Cohort as a result of the size of the Cardiac Centre, which affected our reliability chosen tests. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) that are usually used in instrument development requires a minimum of hundred participants according to the literature, which is not feasible in the TTP-CNP. Accordingly, we used Cronbach's Alpha to give a rough estimate of the instrument internal consistency as well as test-retest that measures construct reliability, which reflects the TTP-CNP instrument stability overtime, in addition to the other measures of validity (i.e., CVR, CVI, and FVI). Nevertheless, it should be noted that the small sample size in this study would suggest more research is needed to further test the instrument on larger samples to be able to run EFA and CFA to support our conclusion about the TTP-CNP self-assessment developed instrument validity and reliability.

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REFERENCES

- American Association of Colleges of Nursing. (2021). *The essentials toolkit domains and concepts*.
- American Nurses Association. (2015). *Cardiovascular nursing: Scope and standards of practice* (3rd ed.). Nursesbooks.org.
- Ayre, C., & Scally, A. J. (2014). Critical values for Lawshe's content validity ratio: Revisiting the original methods of calculation. *Measurement and Evaluation in Counseling and Development*, *47*(1), 79–86. https://doi.org/10.1177/0748175613513808
- Browne, R. H. (1995). On the use of a pilot sample for sample size determination. *Statistics in Medicine*, *14*(17), 1933–1940. https://doi.org/10.1002/sim.4780141709
- Davis LL. (1992). Instrument review: Getting the most from a panel of experts. *Applied Nursing Research*, *5*(4), 194–197.
- De Vet H., Terwee C., Mokkink L., & Knol D. (2011). *Reliability. In: Measurement in Medicine: A Practical Guide edn.* (Terwee CB., Knol DL., de Vet HCW., & Mokkink LB., Eds.). Cambridge University Press.
- DeVellis, R. F. (2017). *Scale Development: Theory and Applications* (4th ed.). Sage.
- Djukic, M., Padhye, N., Ke, Z., Yu, E., & Mcvey, C. (2023). *Associations Between the COVID-19 Pandemic and New Nurses' Transition to Practice Outcomes: A Multi-site, Longitudinal Study*. www.journalofnursingregulation.com
- Grant JS, D. LL. (1997). Selection and use of content experts for instrument development. *Res Nurs Health*, *20*(3), 269–274.
- Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, *31*(2), 180–191. https://doi.org/10.1002/nur.20247
- Ikart, E. M. (2019). Survey Questionnaire Survey Pretesting Method: An Evaluation of Survey Questionnaire via Expert Reviews Technique. *Asian Journal of Social Science Studies*, *4*(2), 1. https://doi.org/10.20849/ajsss.v4i2.565
- Jingcheng Shi, Xiankun Mo, & Zhenqiu Sun. (2012). Content validity index in scale development. *Zhong Nan Da Xue Xue Bao Yi Xue Ban.*
- Kalkbrenner, M. T. (2021). *A Practical Guide to Instrument Development and Score Validation in the Social Sciences: The MEASURE Approach*. *26*(1). https://doi.org/10.7275/svg4-e671
- Lambie, G. W., Blount, A. J., & Mullen, P. R. (2017). Establishing Content-Oriented Evidence for Psychological Assessments. *Measurement and Evaluation in Counseling and Development*, *50*(4), 210–216. https://doi.org/10.1080/07481756.2017.1336930
- Lynn MR. (1986a). Determination and quantification of content validity. *Nurs Res*, *35*(6), 382–385.
- Lynn MR. (1986b). Determination and quantification of content validity. *Nurs Res.* , *35*(6), 382–385.
- Madadizadeh, F., & Bahariniya, S. (2023). Tutorial on how to calculating content validity of scales in medical research. *Perioperative Care and Operating Room Management*, *31*.
- Mohamad Marzuki MF, Yaacob NA, & Yaacob NM. (2018). Translation, cross-cultural adaptation, and validation of the malay version of the System Usability Scale Questionnaire for the Assessment of Mobile apps. *JMIR Hum Factors*, *5*(2).
- Mohd Muzammil Ozair KAB., Mohamed SA., & Esa W. Muhamad Saiful Bahri Yusof. (2017). Development and Validation of the knowledge and clinical reasoning of Acute Asthma Management in Emergency Department (K-CRAMED). *Educ Med J* , *2*, 1–17.
- Nunnally J, & Bernstein L. (1994). *Psychometric theory* . McGraw-Hill Higher, INC.
- Nursing and Midwifery Council. (2023). *Scope of nursing and midwifery practice*.
- Patricea, P., Bertea, E., & Zaiţ, A. (2013). *Scale Validity in Exploratory Stages of Research*.

- Polit DF., & Beck CT. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. . *Res Nurs Health*, *29*(5), 489–497.
- Yusoff MSB. (2019). ABC of response process validation and face validity index calculation. *Educ Med J.*, *11*(3), 55–61.
- Yusoff, M. S. B. (2019). ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6