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RESEARCH ARTICLE

Assessment of Reliability and Validity of a Nursing Tool Used to Examine Knowledge, Attitude, and Practices of Professional Nurses in Writing Nursing Care Plans at a Teaching Hospital in Gauteng Province, South Africa

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Abstract:

Background:

A nursing care plan is a guideline developed for a patient's needs. A well-documented care plan provides holistic patient-centred care and includes assessing, evaluating, and administering a variety of interventions as well as teaching patients and families. There are existing tools to measure nurses' knowledge, attitude, and practices in writing nursing care plans in many countries. However, cultural differences and most of the tools do not cover region-specific aspects of diseases, making it challenging to be used between countries.

Objective:

This study aimed to develop and validate a tool for determining the knowledge, attitudes, and practices of nurses in writing nursing care plans at a teaching hospital in Gauteng province, South Africa.

Methods:

A cross-sectional study was conducted among 218 registered nurses in selected hospital wards. Reliability was examined using Cronbach alpha and item-total correlation, while validity was assessed using Exploratory Factor Analysis (EFA) and convergent validity. SPSS for Windows (version 10.0; SPSS, Inc., Chicago, IL, USA) was used to analyze data.

Results

Cronbach's alpha was 0.75 for knowledge, 0.74 for attitude, and 0.77 for practices. The item-total correlation values ranged from -0.203 to 0.742. Kaiser-Meyer-Olkin was 0.877, 0.793, and 0.797 for the three dimensions, respectively and the Bartlett test was significant ($p < 0.0001$). The EFA showed that all the items had loadings ≥ 0.5 except for item A1. Knowledge and practice had a good convergent validity.

Implications for Nursing

Efforts to develop, validate and implement a new instrument to assess nursing knowledge, attitudes, and practice in writing nursing care plans improve communication between nursing staff, and involve patients more in their care, resulting in fewer medical errors and improving the quality of patient care.

Conclusion:

This study indicates that the tool has satisfactory reliability, and the use of EFA for the investigation of validity is adequate, but one item in the attitude dimension has a lower threshold value. Further confirmatory factor analysis studies with a larger sample size are needed to support construct validity.

Keywords: Exploratory factor analysis, Nursing care plan, Registered nurses, Validation, Questionnaire, Patient care.

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1. INTRODUCTION

Nursing has been essential in delivering nursing care to patients, families, and communities for many years [1 - 3]. The primary role of a nurse is to provide holistic and patient-centred care, which includes assessing, evaluating, and administering a variety of interventions as well as empowering patients and families to become active participants in their care [4, 5]. A nursing care plan is written documentation outlining the steps the nurse takes to provide care to a patient. The care plan details the direction of the nursing care an individual patient may need and records the intervention's effectiveness. A well-documented nursing care plan provides standardized, evidence-based, holistic, and patient-centred care. Professional/registered nurses are responsible for planning and delivering nursing care plans [6]. A nursing care plan is a safe, ethical, and effective source of patient condition, diagnosis, and treatment, so it should fulfill the legal requirements of nursing care documentation [7].

A nursing care plan is essential in communication among nursing team members. Nursing errors are a common phenomenon in healthcare settings, and poor communication among the nursing team is one of the leading causes [8 - 11]. Studies assessing challenges to implementing the nursing care plan reveal many issues. The problems that make it challenging to implement nursing care include high patient workload, lack of equipment, and shortage of nursing staff. Other challenges include inadequate follow-up by nursing managers, insufficient time to apply the nursing care planned, poorly documented nursing records, low educational qualifications, and lack of in-service training [12 - 15].

Several studies have been conducted in Ethiopia [7], Kenya [16], and Uganda [17] to evaluate nurses' knowledge, attitude, and practices in writing nursing care plans. These show that existing instruments are already developed and validated in various countries, which researchers could use to measure the nurse's knowledge, attitude, and practices in writing nursing care plans. However, cultural differences and some of these tools developed do not cover all aspects of nursing care plans for many countries, including South Africa, due to differences in disease profile, implying the need to establish a new, regionally specific, and generic tool.

Validity indicates the extent to which a research tool is accurately measuring what it is intended to measure, while reliability is concerned with the degree to which a tool produces consistent findings when used repeatedly. Validity is categorized into three criteria: content validity, construct validity, and criterion validity. Reliability also has three attributes, of which the most common use is internal consistency, assessed using item-total correlation, split-half reliability, Kuder-Richardson coefficient, and Cronbach alpha. A new tool should have been completed using a representative sample to be valid and reliable. Thus, this study aimed to develop and validate a questionnaire used to gather data to examine nurse's knowledge, attitude and practices in writing

nursing care plans at a teaching hospital in South Africa.

2. MATERIALS AND METHODS

2.1. Study Design, Setting, and Population

A cross-sectional study was conducted at a teaching hospital for three months, from April to June 2021. The hospital is a teaching hospital for one of the universities in South Africa. It has more than 500 patient beds and approximately 931 nurses working the day shift in the selected wards for the study. The study population was registered nurses chosen in the following wards: General Surgery, Paediatrics, Specialist, Psychiatric, Medical, as well as Obstetrics and Gynaecology.

2.2. Inclusion and Exclusion Criteria

All registered nurses permanently employed, working a day shift in the selected wards, and registered with the South African Nursing Council were considered for the study. Registered nurses not permanently employed and those placed by nursing agencies were excluded.

2.3. Sample Size and Sampling Technique

The minimum required sample size was 273. The sample size was calculated using the Rao-Soft online sample size calculator with the following assumptions: approximately 931 registered nurses working the day shift in the selected wards; a 95% confidence interval; with a 5% margin of error; 50% response distribution. A convenient sampling method was used to select the six wards and a simple random sampling technique was used to select registered nurses after proportional allocation within each of the six selected wards in the hospital.

2.4. Data Collection

Researchers collected data using a self-administered questionnaire which they developed by reviewing relevant literature [7, 16 - 18]. Most of these tools were standardized, reflecting the environment and culture of the patients they were initially developed for, which shows that these tools may not be appropriate for use in other countries whose backgrounds and cultures are different. Therefore, this study's nursing care plan questions were created and developed based on the SA national guideline.

The questionnaire has two sections: Section A is about participants' demographics, which relate to their age, gender, level of qualification, years of experience as a nurse, and current working unit. Section B consists of three domains that contain a total of 26 items which cover knowledge, attitude, and practice questions for writing nursing care plans (Table 1).

The knowledge and attitude domain has ten questions each, while the practice has six questions. All were measured using a 5-point Likert scale (Strongly disagree, Disagree, Neither agree nor do not agree, Agree, Strongly agree) [17, 18], and the correct responses scored "1", and incorrect answers scored "0" in each domain. Three trained research assistants administered the tool and piloted it before data collection commenced. The instrument was piloted on five registered nurses for clarity and comprehension, and the research team improved the wording.

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Table 1. Domain named according to the question distribution.

Knowledge	K1.	The nursing care plan is an important tool to assist in the provision of quality patient care
	K2.	History taking is very important in drawing up a nursing care plan
	K3.	Assessment of a patient allows the nurse to identify problems that might have been missed from history taking
	K4.	The patient's history and assessment assist in formulating the nursing diagnosis of the patient
	K5.	It is difficult to draw a nursing diagnosis of a patient for a nursing care plan
	K6.	Patient care is compromised if a patient is not given a proper nursing diagnosis
	K7.	A nursing care plan allows proper planning of activities to be done for /with the patient
	K8.	Nursing interventions should be specific to the problems identified
	K9.	Evaluation should be done continuously to ensure quality patient care
	K10.	Every step of nursing care should be recorded to ensure continuous patient care
Attitude	A1.	Formulation of the Nursing care plan is time-consuming
	A2.	It is difficult to draw a Nursing care plan
	A3.	Nursing care plan steps are not clear
	A4.	Other categories of Nursing personnel should write the nursing care plan
	A5.	There are no resources for writing a nursing care plan
	A6.	There should be a standardized nursing care plan to refer to when writing a nursing care plan
	A7.	I would not write a Nursing care plan for a patient
	A8.	A patient can be given quality patient care without a drawn nursing care plan
	A9.	Other patient-related activities are very important than drawing a nursing care plan
	A10.	A nursing care plan should be cancelled
Practice	P1.	In the ward, every patient has a nursing care plan
	P2.	I draw a nursing care plan for every problem identified by the patient
	P3.	I would follow every step involved in writing a nursing care plan
	P4.	The nursing care plans are written in an accessible and easy-to-use format
	P5.	I review the nursing care plan twice daily for each patient
	P6.	When I draft a nursing care plan, I write an expected outcome statement in measurable terms

2.5. Data Analysis

Data were analyzed using the statistical programme STATA version 16.0 (StataCorp., USA). The demographic characteristics of the participants were presented using frequencies and percentages. The distribution of items was evaluated using mean, standard deviation (SD), skewness, and kurtosis. The internal consistency reliability was assessed using Cronbach alpha coefficients and item-total correlation. The Cronbach alpha coefficients are considered satisfactory if a cutoff value is greater than 0.7 [19 - 21], while the item-total correlation with a threshold value greater than 0.20 is considered satisfactory [22 - 24].

The validity of the tool was evaluated using content and construct validity. The content validity was assessed by giving the questionnaire to a panel of experienced nurses to evaluate its face and content validity (*i.e.* appearance, clearness, and comprehensibility of the questions). The construct validity was evaluated using convergent validity and Exploratory factor analysis (EFA). Convergent validity was investigated by calculating 'Spearman's correlation coefficients (*r*) classified as low ($r < 0.30$), moderate ($0.30 < r < 0.60$), and high ($r > 0.60$) [25]. The EFA used the maximum likelihood method with varimax rotation. The Kaiser-Meyer-Olkin measure (KMO) of sampling adequacy > 0.60 and Bartlett's test of sphericity with a *p*-value < 0.05 determined the suitability of the data for factor analysis [26 - 28]. To run a principal component analysis, it is

suggested that multiple techniques be used for factor extraction [29]. Thus, this study used the following techniques for factor extraction: the Cattell scree plot, Kaiser criteria of an eigenvalue > 1 , and the cumulative percentage of variance. The principal component analysis model retained items in each factor with loading values greater than 0.5 [30].

2.6. Ethical Considerations

Ethical clearance to conduct the study was obtained from a university Research Ethics Committee (REF: SMUREC/H/205/2020: G) while permission to access participants was sought from the management of the hospital. All participants were informed about the aim and objectives of the study before completing an informed concern form.

3. RESULTS

3.1. Sociodemographic Characteristics

Two hundred and eighteen registered nurses participated in this study, with a response rate of 79.9%. Seventy-two percent of the nurses were 50 years and younger, and 93% were females. Over two-thirds (72%) of the participants had a diploma as the highest qualification. More than half (58%) had five or more years of work experience as nurses and 29% were working in the medical ward followed by 20% in the specialist and 20% in Obstetrics and Gynaecology wards.

Table 2. Demographic Information.

-	No.	%
Age	-	-
≤30	46	21
31-40	65	30
41-50	45	21
60+	62	28
Sex	-	-
Male	15	7
Female	203	93
Level of Education	-	-
Diploma	157	72
Bachelors	49	23
Postgraduate	10	4
Unspecified	2	1
Years of Nursing Experience	-	-
≤5	91	42
>5	127	58
Current Workstation/unit/ward	-	-
Medical	63	29
Specialist	43	20
Surgical	31	14
Psychiatry	18	8
O&G	44	20
Paediatrics	19	9

Diploma: a 3-year post-matric nursing qualification leading to registration with the South African Nursing Council

3.2. Items Analysis

The summary statistics for each item of the domain are presented in Table 3. All items in the domain of knowledge have a mean greater than 2, while all items in the attitude and practice domain have a mean below 2. With the exception of items K3, K5, and K10, the skewness statistics for all the items of the knowledge domain are not within the range of ± 2 , whereas for an attitude domain, all the values are within the range of ± 2 except item A10. All the items in the domain of practice are within the range of ± 2 .

3.3. Reliability Analysis

Cronbach alpha and item-total correlation were used to evaluate internal consistency. As shown in Table 3, Cronbach's alpha gave values of 0.75, 0.74, and 0.77 for the domain of knowledge, attitude, and practices, respectively. The item-total correlation analysis in each domain showed that, except for items A7 and P5, all items had a positive and statistically significant correlation ($p < 0.05$). The correlation coefficient ranged from -0.203 to 0.742.

3.4. Validity Analysis

3.4.1. Content and Face Validity

The first step to validating the tool was to test the face and content validity meant to identify the questions' clearness, comprehensibility, and appearance. This was performed by five nursing experts selected according to their field of expertise. Suggestions were made, and related items were restructured

according to the expert's opinions. Subsequently, a pilot study was conducted to examine the study methods' feasibility and the questionnaire's clarity. The pilot study results indicated that nurses understood the questions; thus, the need for changes was ruled out.

3.4.1.1. Construct Validity

The second step for validation was to calculate the KMO to determine how suitable the data is for EFA. The KMO value of 0.877 and the Bartlett test of sphericity gave a chi-squared value of 928.9 ($df=45$, $p < 0.001$) for the knowledge domain, while for the attitude domain, KMO was 0.793 with a Bartlett test of sphericity 402.1 ($df=45$, $p < 0.001$). For the practice domain, the KMO was 0.797 with a Bartlett test of sphericity of 295.9 ($df=15$, $p < 0.001$). These findings showed that the EFA was suitable for the three domains [26 - 29].

The EFA was conducted for individual domains and is shown in Table 4. Two factors were extracted using varimax rotation with an eigenvalue of >1 , which explained 59.0% of the total variance for knowledge. Three factors were extracted for the attitude dimension after varimax rotation extracted with an eigenvalue >1.0 and explained 56.0% of the total variance. For the practice dimension, one factor was extracted by varimax rotation with an eigenvalue of >1.0 , which explained 46.4% of the total variance. An analysis of individual factor loadings shows that except for item A1, all had a loading of ≥ 0.5 , indicating each item's existence power [30].

3.4.1.2. Convergence Validity

Lastly, the convergent validity was examined using Spearman's correlation coefficient and shown in Table 5. The

findings revealed that the majority of scores for items of knowledge and practice domains were classified as moderate ($0.30 < r < 0.60$), while for attitude dimension was classified as low ($r < 0.30$).

Table 3. Summary statistics of each item .

	Items	Mean (SD.)	Skewness	Kurtosis	Item-total Correlation	Cronbach's Alpha
Knowledge	K1.	4.74(0.63)	-3.17	14.62	0.699	0.75
	K2.	4.87(0.35)	-2.47	8.13	0.583	
	K3.	4.83(0.37)	-1.85	4.41	0.641	
	K4.	4.83(0.40)	-2.18	6.92	0.609	
	K5.	3.41(1.47)	-0.25	1.52	0.465	
	K6.	4.45(1.04)	-2.09	6.59	0.648	
	K7.	4.71(0.55)	-2.11	8.27	0.665	
	K8.	4.73(0.54)	-2.42	10.55	0.643	
	K9.	4.75(0.49)	-2.25	9.99	0.684	
	K10.	4.76(0.46)	-1.64	4.68	0.720	
Attitude	A1.	0.51(0.50)	-0.07	1.00	0.585	0.74
	A2.	0.77(0.42)	-1.29	2.66	0.549	
	A3.	0.77(0.42)	-1.26	2.58	0.577	
	A4.	0.23(0.42)	1.29	2.66	0.434	
	A5.	0.41(0.49)	0.37	1.14	0.553	
	A6.	0.33(0.47)	0.74	1.55	0.444	
	A7.	0.15(0.35)	1.99	4.98	-0.299	
	A8.	0.53(0.50)	-0.11	1.01	0.689	
	A9.	0.49(0.50)	0.04	1.00	0.613	
	A10.	0.93(0.26)	-3.27	11.70	0.476	
Practice	P1.	0.42(0.49)	0.32	1.09	0.587	0.77
	P2.	0.57(0.49)	-0.29	1.09	0.715	
	P3.	0.83(0.38)	-1.72	3.94	0.682	
	P4.	0.67(0.47)	-0.72	1.52	0.742	
	P5.	0.71(0.45)	-0.93	1.87	-0.203	
	P6.	0.62(0.48)	-0.53	1.28	0.668	

Table 4. Factor loading of the original items of knowledge, attitude, and practices.

-	Knowledge		Attitude				Practice	
	F1	F2	Items	F1	F2	F3	Items	F1
% of Variance	48.1	10.9	-	31.5	13.1	11.4	-	46.4
Eigenvalues	4.8	1.1	-	3.2	1.3	1.1	-	2.78
K6	0.741	-	A9	0.811	-	-	P1	0.606
K9	0.739	-	A8	0.775	-	-	P2	0.749
K10	0.736	-	A5	0.581	-	-	P3	0.675
K8	0.732	-	A7	-0.529	-	-	P4	0.766
K3	0.618	-	A1	0.408	-	-	P5	-0.620
K7	0.605	-	A3	-	0.764	-	P6	0.655
K1	0.542	-	A2	-	0.691	-	-	-
K2	-	0.830	A6	-	0.616	-	-	-
K4	-	0.784	A10	-	0.533	-	-	-
K5	-	0.511	A4	-	-	0.856	-	-

Table 5. Spearman's correlation coefficient for the items of the three dimensions.

-	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	P1	P2	P3	P4	P5
K2	0,51 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K3	0,53 ⁺	0,47 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K4	0,50 ⁺	0,65 ⁺	0,57 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K5	0,14*	0,18 ⁺	0,02	0,14*	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K6	0,45 ⁺	0,20 ⁺	0,47 ⁺	0,22 ⁺	0,11	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K7	0,56 ⁺	0,50 ⁺	0,46 ⁺	0,52 ⁺	0,07	0,37 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K8	0,46 ⁺	0,30 ⁺	0,49 ⁺	0,37 ⁺	0,07	0,42 ⁺	0,50 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K9	0,45 ⁺	0,36 ⁺	0,46 ⁺	0,43 ⁺	0,10	0,45 ⁺	0,50 ⁺	0,51 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K10	0,45 ⁺	0,46 ⁺	0,48 ⁺	0,48 ⁺	0,10	0,46 ⁺	0,63 ⁺	0,53 ⁺	0,71 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A1	0,26 ⁺	0,18 ⁺	0,30 ⁺	0,23 ⁺	0,16 ⁺	0,23 ⁺	0,31 ⁺	0,33 ⁺	0,37 ⁺	0,34 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A2	0,35 ⁺	0,23 ⁺	0,30 ⁺	0,23 ⁺	0,16*	0,25 ⁺	0,22 ⁺	0,24 ⁺	0,19 ⁺	0,25 ⁺	2,38 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-	-
A3	0,39 ⁺	0,19 ⁺	0,29 ⁺	0,23 ⁺	0,17 ⁺	0,24 ⁺	0,25 ⁺	0,32 ⁺	0,25 ⁺	0,26 ⁺	0,27 ⁺	0,42 ⁺	1,00	-	-	-	-	-	-	-	-	-	-	-	-
A4	-0,05	0,02	0,15*	-0,01	0,03	0,03	0,00	0,09	0,10	0,00	0,13*	0,04	0,04	1,00	-	-	-	-	-	-	-	-	-	-	-
A5	0,11	0,05	0,19 ⁺	0,07	0,07	0,10	0,01	0,09	0,16 ⁺	0,11	0,15*	0,21 ⁺	0,15*	0,26 ⁺	1,00	-	-	-	-	-	-	-	-	-	-
A6	0,13*	0,12*	0,14*	0,12*	0,26 ⁺	0,14*	0,09	0,06	0,12*	0,11	0,14*	0,24 ⁺	0,32 ⁺	0,23 ⁺	0,04	1,00	-	-	-	-	-	-	-	-	-
A7	-0,36 ⁺	-0,10	-0,31 ⁺	-0,12*	-0,07	-0,38 ⁺	-0,17 ⁺	-0,28 ⁺	-0,31 ⁺	-2,93 ⁺	-1,97 ⁺	-0,30 ⁺	-0,32 ⁺	-0,10	-0,21 ⁺	-0,09	1,00	-	-	-	-	-	-	-	-
A8	0,26 ⁺	0,19 ⁺	0,26 ⁺	0,13*	0,04	0,24 ⁺	0,27 ⁺	0,24 ⁺	0,36 ⁺	0,33 ⁺	0,30 ⁺	0,27 ⁺	0,30 ⁺	0,23 ⁺	0,38 ⁺	0,09	-0,39 ⁺	1,00	-	-	-	-	-	-	-
A9	0,22 ⁺	0,14*	0,23 ⁺	0,19 ⁺	-0,04	0,17 ⁺	0,18 ⁺	0,11	0,31 ⁺	0,31 ⁺	0,34 ⁺	0,19 ⁺	0,22 ⁺	0,14*	0,32	0,00	-0,36 ⁺	0,58 ⁺	1,00	-	-	-	-	-	-
A10	0,44 ⁺	0,39 ⁺	0,26 ⁺	0,32 ⁺	0,10	0,21 ⁺	0,31 ⁺	0,19 ⁺	0,18 ⁺	0,31 ⁺	0,26 ⁺	0,31 ⁺	0,34 ⁺	0,03	0,16 ⁺	0,12*	-0,23 ⁺	0,30 ⁺	0,24 ⁺	1,00	-	-	-	-	-
P1	0,03	0,11	-0,11	0,06	0,09	-0,05	0,14*	-0,02	0,02	0,01	-0,05	0,09	0,10	0,18 ⁺	0,14*	-0,06	-0,04	0,25 ⁺	0,15*	0,13*	1,00	-	-	-	-
P2	0,16 ⁺	0,15*	0,10	0,03	0,01	0,18 ⁺	0,16 ⁺	0,13*	0,20 ⁺	0,14*	0,12*	0,21 ⁺	0,16 ⁺	0,18 ⁺	0,19 ⁺	-0,01	-0,35 ⁺	0,41 ⁺	0,35 ⁺	0,11*	0,44 ⁺	1,00	-	-	-
P3	0,35 ⁺	0,17 ⁺	0,26 ⁺	0,14*	0,12*	0,39 ⁺	0,25 ⁺	0,28 ⁺	0,28 ⁺	0,29 ⁺	0,14*	0,29 ⁺	0,29 ⁺	-0,01	0,19 ⁺	0,11*	-0,36 ⁺	0,29 ⁺	0,21 ⁺	0,33 ⁺	0,17 ⁺	0,41 ⁺	1,00	-	-
P4	0,27 ⁺	0,12*	0,20 ⁺	0,17 ⁺	0,13*	0,31 ⁺	0,32 ⁺	0,32 ⁺	0,44 ⁺	0,34 ⁺	0,22 ⁺	0,27 ⁺	0,23 ⁺	0,13*	0,21 ⁺	0,11*	-0,29 ⁺	0,39 ⁺	0,28 ⁺	0,14*	0,34 ⁺	0,44 ⁺	0,50 ⁺	1,00	-
P5	-0,04	0,05	0,00	-0,04	-0,11*	-0,01	-0,11	-0,11	-0,08	-0,09	-0,07	-0,08	-0,11*	-0,18 ⁺	-0,07	-0,12*	0,15*	-0,08	0,00	0,05	0,38 ⁺	-0,39 ⁺	-0,21 ⁺	-0,34 ⁺	1,00
P6	0,24 ⁺	0,14*	0,16*	0,15*	0,01	0,19 ⁺	0,17 ⁺	0,23 ⁺	0,32 ⁺	0,21 ⁺	0,15*	0,30 ⁺	0,23 ⁺	-0,01	0,19 ⁺	0,09	-0,30 ⁺	0,28 ⁺	0,22 ⁺	0,26 ⁺	0,22 ⁺	0,34 ⁺	0,42 ⁺	0,43 ⁺	-0,28 ⁺

Note: ⁺Correlation is significant at 0.01 level (1-tailed); * Correlation is significant at 0.01 level (1-tailed)

4. DISCUSSION

This study investigated the validity and reliability of a questionnaire developed to measure registered nurses' knowledge, attitude, and practice in writing nursing care plans. The instrument was a 26-item questionnaire, and most items, except for items in the knowledge domain, were within the range of ±2 to show that items were reasonably normally distributed [31]. The possible reason for the items in the knowledge domain not being normally distributed could be that a different measurement scale was used.

The reliability of the three domains assessed using Cronbach alpha equalled 0.75 for knowledge, 0.74 for attitude, and 0.77 for practice. Andualem *et al.*, in their study in Ethiopia, found Cronbach's Alpha value of 0.912, 0.784, and 0.713 for knowledge, attitude, and practice questions, respectively [18]. A value greater than 0.7 is considered acceptable [20 - 22] and indicates that items in the current study had relatively high internal consistency. The study used an inter-total correlation coefficient to evaluate the reliability and found it to be above the acceptable threshold of 0.2 [23 - 25], indicating that items in the tool belonged to the same construct and that the overall scale was stable and reliable.

Following the internal consistency, EFA was performed to assess the construct validity of the different domains of the questionnaire. The KMO measure of the sampling values were 0.877, 0.793, and 0.797 for knowledge, attitude, and practice, more than the 0.60 thresholds [26 - 28], demonstrating that the data was sufficient to implement EFA. The Bartlett test of sphericity for all the domains was statistically significant,

allowing the EFA to be conducted. Regarding factor loading, except for A1 under the attitude domain with a loading value of 0.408, the results showed that all items obtained loading values >0.5, which is considered ideal and satisfactory [30]. Because other authors recommended a loading factor of ≥0.3 [31] or ≥0.4 [32], item A1 (*i.e.* Formulation of the Nursing care plan is time-consuming) was retained irrespective of its loading below 0.5, after a brainstorming session with three experienced nurses at the hospital: psychiatric nurse, midwife, and general nurse.

Subsequently, convergent validity was evaluated using the correlation matrix, and it found that items of knowledge and practice showed significant and moderate correlations (0.30 < *r* < 0.60), indicating good convergent validity [25]. Attitude items, however, had low correlations (*r* < 0.30). Most studies that develop a questionnaire to examine nurses' knowledge, attitude, and practices in writing nursing care plans did not assess convergent validity [7, 16 - 18]. However, one study that tested the instrument validity found three items had total-item correlation coefficient values less than 0.3, and the authors decided not to exclude these items in the revised version of the tool [33, 34].

The study limitation should be considered; participants were registered nurses from one hospital affiliated with a medical university in the Gauteng province of South Africa (SA). Gauteng is the smallest of the nine provinces of SA but highly urbanized and shares the largest (26%) of the country's population. Hence, further study is needed to validate this tool and should include rural hospitals and those not allied with medical schools. The research team selected only six disciplines for the study - adding other fields to a further investigation is essential.

5. IMPLICATIONS FOR NURSING

This instrument will likely assist in and ensure the routine quality of patient care. Furthermore, the excellent and reliable tool will help policymakers in knowing the level of nurses' knowledge, attitude, and practice regarding the drawing of nursing care plans and relevant interventions developed and implemented.

CONCLUSION

This study developed and examined the reliability and validity of the questionnaire used to evaluate registered nurses' knowledge, attitude, and practice in writing nursing care plans. The results indicated that the tool had satisfactory internal consistency and reliability. The researchers found the use of EFA for the investigation of validity to be adequate; however, one item in the attitude domain had a lower threshold value. Further confirmatory factor analysis studies with a larger sample size are needed to support construct validity analysis.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

A Research Ethics Committee gave Ethical clearance (REF: SMUREC/H/205/2020: G) while the hospital's management permitted access to participants. All participants gave informed consent after getting full information about the study from the researchers.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The corresponding author [T.S.N] can provide the data sets upon reasonable request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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