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Validity, reliability and psychometric properties of the Italian version of the Nurses' Cancer Pain Management Competency Scale

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Keywords: Nurses' Cancer Pain Management Competency Scale; reliability; validity; cancer pain
Parole chiave: Scala della competenza infermieristica per la gestione del dolore da cancro; affidabilità; validità; dolore da cancro

Abstract

Background and aim. *The Nurses' Cancer Pain Management Competency Scale (NCPMCS) is a tool to explore nurses' competencies and subjective experiences in cancer pain management, and to help nurses understand their current shortcomings in cancer pain management in medical oncology departments. In the hypothesis that cancer pain is not a problem exclusively specific to the oncology context, we tested the psychometric characteristics of the scale on the general Italian nurses population.*
Methods. *A cross-sectional design was used in which a sample of nurses was enrolled from 16 hospital in Northern, Southern and Central Italy. A convenience sampling method was used to recruit Italian nurses who met the eligibility criteria completed the study for developing the Italian version of the Nurses' Cancer Pain Management Competency Scale. Internal consistency was assessed using Cronbach's alpha, and construct validity was examined using exploratory factor analysis. Data collection took place in July 2024.*
Results. *The sample involved 128 nurses who met the inclusion criteria. The sample was predominantly female (68%). The factor loads of the NCPMCS ranged between 0.81 and 0.92, and the t value was greater than 1.96 for all 14 items. On a 4-point scale for total competency, the mean score was 1.94 ±0.81. The multidimensional nature of pain (2.01 ±0.93) was the factor that showed the highest mean score, whereas the management of pain factor was the lowest (1.87 ±0.83). The Cronbach's alpha of the scale was 0.806 and ranged from 0.719 to 0.836.*
The results showed that the chi-square degree of freedom ratio was 2.662, the goodness-of-fit index was 0.854, the root mean square of approximate error was 0.037, the value-added fitting index was 0.876, the comparative fitting index was 0.928.
Conclusion. *The scale is valid and reliable for the evaluation of nursing competencies in managing cancer pain even among nurses who do not work in medical oncology departments.*

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Introduction

Many people are affected by cancer, and its prevalence is increasing as the population is aging (1). Pain is a common symptom of cancer diagnosis and rises in prevalence throughout and beyond cancer treatment (1).Pain caused by cancer takes many forms. It may feel dull, painful, sharp, or burning. It can be constant, intermittent, mild, moderate or severe (2). Mild pain may be uncomfortable and noticeable, but it does not interfere with normal daily living activities. Specifically, mild pain can be barely noticeable and easily ignored (1). Moderate pain begins to hinder daily life. Specifically, moderate pain cannot be ignored for more than a few minutes. Severe pain can make the patient unable to carry out normal daily living activities (1). Specifically, severe pain requires attention and prevents you from performing tasks and functions. It may interfere with restful sleep pattern, limit physical activity, and even make conversation difficult (1).

The amount of pain experience depends on a number of factors, including the type of cancer, how advanced it is, where it is located, and your pain tolerance (1). Most cancer pain is manageable, and pain control is an essential part of treatment (2).

In a recent review, a total of 52 studies were selected for the meta-analyses on pain and pain severity in the different stages of cancer disease (1). Pain prevalence rates were 39.3% after cancer treatment 55.0% during anticancer treatment and 66.4% in advanced, metastatic, or terminal disease. Moderate to severe pain was reported by 38.0% of all patients in studies that included all cancer stages (1). Cancer pain needs to be appropriately managed because pain interferes with patients' social and psychological wellbeing (2), and unrelieved pain causes negative clinical consequences (3).

Patients are greatly impacted by the physical and psychological suffering they experience as well as fatigue and depression (4). As one of the most prevalent symptoms experienced by cancer patients, pain can impact a patient's life status, perceived quality of life, psychological well-being, and illness beliefs. In fact, patients with stage III and stage IV cancers generally report severe pain (5).

Pain is more prevalent (86%) among patients with stage III and IV cancer, who have anxiety (63%) and metastasis (76.4%) (5). Of the patients with cancer pain, 68%, 13%, and 19% experience mild, moderate, and severe pain, respectively (5). The highest proportion of cancer pain was seen in patients with gastrointestinal cancer (30%) followed by those with hematologic cancer (21%) (5).

Although currently no studies seem well to describe the association between pain and depression among cancer patients, cancer pain if undertreatment will worsen patients' psychological anguish and depressive feelings (6). It will also have a number of detrimental impacts, including the development of fear-avoidance beliefs, a drop in treatment compliance, and even an impact on patients' treatment and prognosis value (6).

An essential component of the pain management team is oncology nurses, and as a result, managing cancer pain presents significant challenges for nurses (7). Assessing nurses' current cancer pain management competency and effectively developing personalized training programs are of great significance in improving nurses' cancer pain management competency and awareness (8). As of right now, the majority of cancer pain management research and investigation tools are patient-centered, and adequate instruments to assess nurses' cancer pain management proficiency are still lacking (8).

Inadequately managed pain can lead to adverse physical and psychological patient outcomes for individual patients and their families (9). Of particular importance to nursing care, unrelieved pain reduces patient mobility, resulting in complications such as deep vein thrombosis, pulmonary embolus, and pneumonia (7-9). Complications related to inadequate pain management negatively affect the patient's welfare and the hospital performance because of extended lengths of stay and readmissions, both of which increase the cost of care (9).

Nurses' improper assessment and management of pain can lead to patient safety concerns and negative health outcomes. Knowledge of pain is influenced by work specific experience and training. In a recent Italian study (10), improved knowledge and attitudes were observed among nurses who did so attended a pain educational program in the last three years, providing further evidence of validity of a refresher course on pain (10). Participation in continuous professional development (in both formal and informal contexts) is an important component of clinical practice. However, nurses' cancer pain management competency is generally still insufficient (6).

Previous studies measured pain management competency using a self-assessed instrument focused on self-efficacy and knowledge (8).

The Nurses' Cancer Pain Management Competency Scale (NCPMCS) is a recently created new scale

to explore nurses' competencies and subjective experiences in cancer pain management, and to help nurses understand their current shortcomings in cancer pain management (11). The scale is divided into four factors and 14 items. The four factors include Clinical conditions, Pain assessment and measurement, Management of pain, and Multidimensional nature of pain. Each nurse can self-evaluate or be evaluated own skills on a scale score ranging from 0 to 4, with 1 (poor), 2 (average), 3 (good), and 4 (excellent) for each of the 14 items (11). Furthermore, based on the scale's specific score, nurses can evaluate their lack of understanding about cancer pain management, advance research into this area, and enhance their capacity to control cancer pain while providing patient care (11, 12). During 2024, the scale was also validated in Italian using a cohort of 243 nurses from different medical oncology departments across the national territory (13). The cronbach's alpha was 0.814 and the Guttman half-reliability was 0.819 indicating high internal consistency of the scale, strong reliability for evaluating nurses' cancer pain management competency and a good stability across time (13).

Recent developments in oncology, which facilitate better control of tumor growth and thereby reduce the associated phenomena of inflammation, ischemia, and compression, have also contributed to the reduction in cancer pain prevalence and severity, improving the patients' quality of life (14). Targeted treatments have also increased patients' survival and, for some patients, have led to a disease-free outcome. Consequently, a novel population of patients called "cancer survivors" has emerged (14). According to a recent systematic review, 47% of cancer survivors report the presence of some chronic pain (moderate to severe pain: 28%) in relation to previous treatments like chemotherapy, radiotherapy, or curative surgery or even in relation to a concomitant chronic pain condition unrelated to cancer or cancer treatment (14). Experiencing pain and insufficient relief can be devastating and negatively affect a patient's quality of life (13-14). Developments in oncology such as new treatments and adjusted pain management guidelines may have influenced the prevalence of cancer pain and severity in patients. Increased attention to the assessment and management of pain might have fostered the decline in the prevalence and severity of pain (14).

The management of chronic pain in this population requires a different approach from that used for individuals with a limited prognosis (14).

A comprehensive clinical examination is needed to distinguish between cancer pain, cancer treatment pain and pain due to comorbid conditions, and to identify the type of underlying pain in order to treat it appropriately (1). Safe, effective and evidence-based management of cancer-related pain is a cornerstone of comprehensive cancer care. Advances in the early detection, diagnosis and treatment of cancer enable patients to survive longer, and an increasing number of healthcare professionals consider cancer to be a disease for which a chronic course can be achieved (2, 4). This means that comprehensive pain management must also be continued for a longer period of time and is essential for patients to maintain an adequate quality of life (5, 10-11). This requires a multidisciplinary approach to the management of pain in cancer survivors, in which community nurses and general practitioners play an important role, especially once a patient has been cured of cancer, but may still experience chronic pain. Pain assessment continues to remain an essential focus of nursing practice (10). Nurse's role is challenging, she must demonstrate that she is clinically proficient and competent (6). Nurses have to use creative assessment skills, clinical judgment, psychological support, advocacy, and good communication skills in such a way that the contribution of drugs, nursing care, and other nonpharmacological treatments are maximized to the patient's benefit (3-5). Nurses' role in controlling cancer pain include believing the patient, assessing pain, identifying the root of the problem, planning the care, administering medication, evaluating effectiveness, ensuring good pain control, and individualizing treatment (11). Patient's or family's beliefs and attitudes toward cancer pain are substantial in pain management (6).

In the hypothesis that cancer pain is not a problem exclusively specific to the oncology context, we tested the psychometric characteristics of the NCPMCS on the general Italian nurses population. Secondary objective was to compare the scores of the scale between nurses educated in pain management versus those who were not educated and to test the stability of the scales over time among nurses who did not work in a medical oncology department.

Methods

Design, Sample, Procedure

A cross-sectional design was used in which a sample of nurses was enrolled from 16 hospital and university centers in the provinces of Lecco, Milan, Como, Bergamo, Varese, Siena, Florence, Grosseto,

Rome, Potenza, Messina, Reggio Calabria, Taranto, Palermo, Catania and Caltanissetta.

To be enrolled in the study, healthcare workers had to be clinical nurses with at least 2 years of work experience. Nurses with less than 2 years of experience or non-clinical nurses (e.g. nurse coordinators) were excluded.

A convenience sampling method was used to recruit Italian nurses who met the eligibility criteria completed the study for developing the Italian version of the Nurses' Cancer Pain Management Competency Scale.

The collection of information took place via an online form. The inclusion criteria were verified and guaranteed with an initial question. Before starting to fill out the questionnaire, the nurses had to indicate that they were nurses with at least 2 years of work experience and that they carried out their professional activity in a clinical context (this excluded nursing coordinators). If the nurse clicked the *'Yes'* he could proceed with filling in the socio-demographic data and the questionnaire. If they answered *'No'*, our application did not give the possibility to proceed with completing the questionnaire.

Data collection

Data collection was conducted from July 1st to July 30th, 2024 and was conducted by 6 nurses through the administration of an online questionnaire via Google Form (15) as explained below.

Thirty days after initial data collection, nurses not working on medical oncology departments were telephoned for readministration of the NCPMCS to assess test-retest reliability.

These nurses received training on the aims and protocol of the study and were trained by the first author to collect data using an excel dataset.

The first author was always available by telephone during data collection and met every 2 weeks via Google Meet (16) with data collectors to monitor study progress.

With permission from the hospital administration, the research team distributed questionnaires via computerized software (Google Form) (15) already used for previous studies (10, 13). The authors provided the department group an electronic questionnaire with a link.

An email was sent to 11 nursing coordinators with the invitation to send the questionnaire to their nurses.

Attached to the email was a short letter which explained the project and a link to click to access the compilation of the questionnaire was sent. The email was presented by the five main authors. The information is then collected and automatically connected to a spreadsheet. The spreadsheet is populated with the survey and quiz answers. The editors were V.D. and L.M. Participants responded to the survey on a voluntary basis. The answer to the survey was considered a written consent participate.

Questionnaires

The questionnaire is made up of individual and multiple choice questions and is structured in two sections (a total of 21 items).

The first section concerned the collection of the nurses' general characteristics were surveyed using a self-administered questionnaire covering age, sex, academic degree, workplace location, position, duration of their nursing career, experience in the current department and pain management training, work in an oncology department or not (7 items).

The second section concerned the administration of the Nurses' Cancer Pain Management Competency Scale (NCPMCS) (14 items) (11, 12). The NCPMCS is designed to assess clinical nurses' competency in managing cancer pain. The scale is divided into 4 dimensions and 14 items. The 4 dimensions include Clinical conditions, Pain assessment and measurement, Management of pain, and Multidimensional nature of pain. There were 5 items describing nurses' competency to establish pain management strategy and carry out pain health education in time, 5 items describing nurses' competency to assess and measure cancer pain, 2 items describing their competency to manage cancer pain, and 2 items describing nurses' competency to understand the multidimensional nature of cancer pain. All items is assigned a score ranging from 0 to 4, with 1 representing very difficult (poor), 2 representing some what difficult (average), 3 representing almost complete (good), and 4 representing very good (excellent). A higher score indicated the nurse's competency to manage cancer pain. The Cronbach's α of the original scale was 0.890, and the Cronbach's α of each factor was 0.690-0.830 (12).

The Italian validation was carried out by Damico and colleagues in 2024 (13).

The group completed the questionnaire anonymously after being informed of the pertinent privacy principles and measures. However, we requested telephone contact or email to contact the nurses of the departments outside medical oncology for a re-test 30 days later ensure the completeness

and quantity of the questionnaire, the researchers checked whether there were omissions and errors in the completed questionnaires.

Low-quality data such as too short questionnaire filling time and excessive overlap of item frequency were excluded from the audit process.

Data analysis

A descriptive analysis was used to study the frequency distribution of all variables of interest. For normally distributed data, mean and standard deviation (SD) were applied.

Descriptive statistics were calculated to summarize quantitative data. The internal consistency reliability was identified using Cronbach's alpha (α). Exploratory factor analysis with principal component analysis and varimax rotation was used to investigate the construct validity of the NCPMCS.

Pearson correlation coefficient was calculated by the critical ratio method and correlation coefficient method for item analysis, and the scale reliability was described by Cronbach's αcoefficient, Guttman split-half reliability.

Item level content validity index (I-CVI) and Scale level content validity index (S-CVI) in the expert evaluation were adopted. S-CVI evaluated the content validity of the scale and evaluated the structural validity of the scale through exploratory factor analysis and confirmatory factor analysis. The test level is $\alpha = 0.05$.

The factorial structure of the scale was examined using confirmatory factor analysis (CFA) for each separate NCPMCS scale, a crucial step in construct validity testing. Testing of the theoretical assumptions began with an examination of the factor structure of the Italian version of the NCPMCS (17).

The discriminant validity of the NSPMCS was established by comparing a subgroup of nurses who had received pain-assessment/management education with another subgroup who had not. Because the small number of nurses in both groups, the nonparametric Mann-Whitney U test was used for this analysis (12).

Reliabilities for each factor and each scale derived from the CFA were estimated using factor score determinacy coefficients (12, 17). These coefficients represent an estimate of the internal consistency of the solution, the certainty with which factor axes are fixed in the variable space (12). They represent the squared multiple correlations (SMCs) of factor scores predicted from scores on observed variables (18).

In a good solution, SMCs range between 0 and 1; the larger the SMCs, the more stable the factors. A high SMC (say, .70 or better) means that the observed variables account for substantial variance in the factor scores. A low SMC means the factors are poorly defined by the observed variables.

The reliability of the NCPMCS was also tested with the intraclass correlation coefficient (ICC). This coefficient gives an estimate of the test-retest stability of the scale scores; thus, it provides complementary information to that given by the internal consistency reliability.

Additionally, exploratory factor analysis of the study was performed using the KMO test and the χ^2 value of Bartlett's spheroid test to examine the strength of the partial correlation (how the factors explain each other) between the variable and for measures sampling adequacy for each variable in the model and the complete model.

The P value was fixed at .05. Statistical analysis was performed using SPSS 21.0 software package (19), except for the CFA, which was performed with Mplus 6.1 (20) as already used for another validation study (21).

Ethical considerations

Nurses who showed interest for the study were recruited and asked to sign the informed consent prior to participating in the study and completing the questionnaires. The study questionnaire was introduced to each participant, and for each participant was asked to answer the questions. The study protocol was in line with the Declaration of Helsinki, as revised in 2013 (22).

The nurses belonging to the different geographical area and departments completed the survey and were offered the possibility to remain anonymous. Data were collected in completely anonymous form. Therefore, the approval of an Ethics Committee was not necessary and the GDPR EU 2016/678 in force in Italy since 2018 does not apply for our study design (23).

Results

Sample

Of the 200 hypothetical nurses, 128 completed measures of sociodemographic characteristics and measures of nursing competency in cancer pain management. Of the responding nurses, 83.6% (n=107) did not work in a medical oncology department. The sample was predominantly female (68%), the average

Table 1 - General Characteristics of Italian nurses sample (N= 128).

Variable	Results
Age (year)	
Mean, SD	39.3 (± 10.6)
Range, n, %	
25-29	9 (7.1)
30-39	77 (60.2)
40-49	3 (2.3)
50-60	39 (30.4)
Sex n, %	
Male	41 (32)
Female	87 (68)
Level of Education n, %	
Diplome in Nursing	26 (20.3)
Bachelor's Degree in Nursing	102 (79.7)
Master's Degree in Nursing Science	49 (38.3)
1st level Master degree	31 (24.2)
Department n, %	
Oncological department	21 (16.4)
Other department	107 (83.6)
Refresher course on pain for the last 5 years[1] n, %	
Yes	39 (30.4)
Not	89 (69.6)
Work experience (year)	
Mean (SD)	12.6 (+ 7.2)
Range n, %	
2-4	13 (10.2)
5-10	79 (61.7)
11-19	12 (9.3)
20-30	24 (18.8)

[1] It includes participation in courses, conferences and research relating to pain in the last 5 years.

age was 39 years and 79.7% had a Bachelor's Degree in Nursing. Work experience was approximately 13 years (Table 1).

Pain Management Educational Needs/Resources.

Of the 128 nurses, 39 (30.4%) nurses had received pain management training in the last five years, and 53 (41.4%) had no available protocols related to pain management in their work department. The most preferred educational modality was simulation-based learning for 115 nurses (89.8), followed by web-based learning for 12 nurses (9.3%) and skills practice for 1 nurses (0.8%).

Confirmatory factor analysis of the Nurses' Cancer Pain Management Competency Scale.

Figure 1 gives a graphical description of the final nurses' cancer pain management competency model,

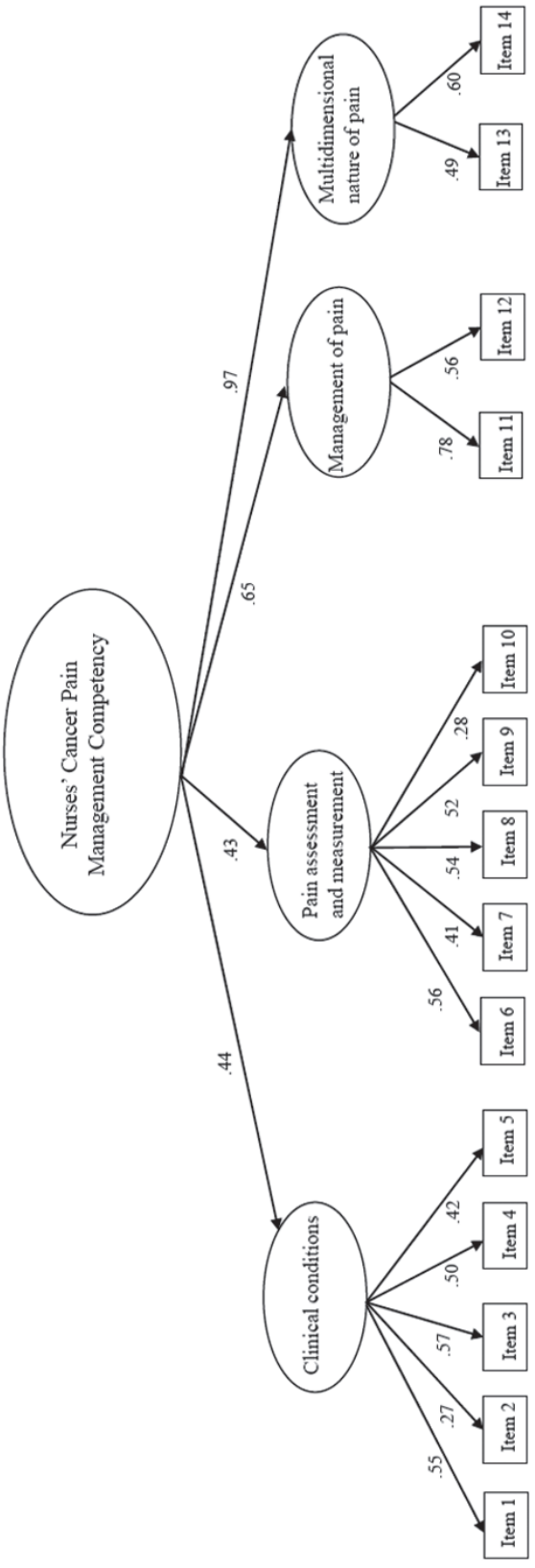

Figure 1 - Confirmatory factor analysis of the Nurses' Cancer Pain Management Competency Scale.

which fit the data well. The analysis was carried out only among nurses who did not work within a medical oncology department (n= 107).

The results showed that the chi-square degree of freedom ratio ($\chi 2$ /df) was 2.662, the goodness-of-fit index (GFI) was 0.854, the root mean square of approximate error (RMSEA) was 0.037, the value-added fitting index (IFI) was 0.876, the comparative fitting index (CFI) was 0.928. This model shows that the factorial structure of the nurses' cancer pain management competency scale, although multidimensional at the level of primary factors, is unidimensional at the level of the secondary, higher order factor.

As seen in the path diagram, the original structure of the NCPMCS was accepted without any modification. The factor loads of the NCPMCS ranged between 0.81 and 0.92, and the *t* value was greater than 1.96 for all 14 items.

Reliability of the Nurses' Cancer Pain Management Competency Scale.

The Cronbach's alpha of the scale was 0.806 and ranged from 0.719 to 0.836. On a 4-point scale for total competency, the mean score was 1.94 ±0.81. The multidimensional nature of pain (2.01 ±0.93) was the factor that showed the highest mean score, whereas the management of pain factor was the lowest (1.87 ±0.83). The Guttman half-reliability of the scale was 0.831.

As regards the individual items of the competency scale, the highest score emerged regarding item 5 (*Monitor effects of pain management approaches to adjust the plan of care as needed*) average score = 2.07 (0.78) while the lowest score regarding item 7 (*Use valid and reliable tools for measuring pain and associated symptoms to assess and reassess related outcomes as appropriate for the clinical context and population*), an average score of 1.86 (0.79) emerged (Table 2).

Scale Validity Analysis

The item content validity index (I-CVI) of this scale was 0.811- 1.000, and the S-CVI value was 0.921, based on the results of the expert consultation. Additionally, the study's exploratory factor analysis revealed that the KMO test value was 0.828 and the Bartlett's spheroid test $\chi 2$ value was 2156.347 ($p<$ .001), meeting the requirements for the analysis. The factors were extracted using principal component analysis, then the maximum variance method was utilized to rotate the factors. They extracted common components with eigenvalue > 1 and factor load value > 0.400. Four common factors in all were extracted, according to the results, and no items were removed. The cumulative variance contribution rate was found to be 72.459%, and the factor load value of the 14 items in their dimensions ranged from 0.811 to 0.873, which was consistent with the original scale.

Table 3 shows the comparison between the mean scores of educated versus noneducated nurses over 5 years in pain management.

Educated nurses reported feeling more competent than uneducated nurses regarding competence 1(implement an individualized pain management an that integrates the perspectives of patients, their social support systems, and health care providers in the context of available resources) p < .001; competence 3 (explain how health promotion and self-management strategies are important to the management of pain) p< .001; competence 6 (assess patient preferences and values to determine pain-related goals and priorities) p= .002; competence 9 (explain how cultural, institutional, societal, and regulatory influences affect assessment and management of pain) p< .001; competence 10 (demonstrate the inclusion of patient and others, as appropriate, in the education and shared decision-making process for pain care) p< .001; competence 11 (develop a treatment plan that considers the differences between acute pain, acute-on-chronic pain, chronic/persistent pain, and pain at the end of life) p< .001 and competence 12 (explain how to assess and manage pain across settings and transitions of care) p< .001.

Stability of the NCPMCS

Table 4 shows the test-retest reliability (stability) of the NCPMCS. This analysis was done with the complete sample and repeated in the subgroup of nurses who did not work in a medical oncology department. The ICCs were calculated for each factor and scale. All ICCs demonstrated excellent test-retest reliability, with most of values greater than 0.90 for every factor and scale.

Test-retest reliability was calculated with the ICC correlating the Nurses' Cancer Pain Management Competency Scale scores collected twice with a 30-day interval between testing. Test-retest for the nurses pain management competency was computed only with 107 non-medical oncology nurses at both intervals. P< .001 for each correlation. Abbreviations: 95% CI, 95% confidence interval; ICC, intraclass correlation coefficient.

Table 2 – Descriptive Statistics for Individual Factors of the Nurses' Cancer Pain Management Competency Scale (N= 128).

Factors	Mean	SD	Min	Max
I. Clinical conditions				
1. Implement an individualized pain management an that integrates the perspectives of patients, their social support systems, and health care providers in the context of available resources.	1.91	0.84	1	4
2. Describe the role of the nurse as an advocate in assisting patients to meet treatment goals.	2.02	0.87	1	4
3. Explain how health promotion and self-management strategies are important to the management of pain.	2.00	0.78	1	4
4. Present theories and science for understanding pain.	1.94	0.76	1	4
5. Monitor effects of pain management approaches to adjust the plan of care as needed.	2.07	0.78	1	4
II. Pain assessment and measurement				
6. Assess patient preferences and values to determine pain-related goals and priorities.	1.87	0.80	1	4
7. Use valid and reliable tools for measuring pain and associated symptoms to assess and reassess related outcomes as appropriate for the clinical context and population.	1.86	0.79	1	4
8. Describe the unique pain assessment and management needs of special populations	1.96	0.78	1	4
9. Explain how cultural, institutional, societal, and regulatory influences affect assessment and management of pain.	1.91	0.79	1	4
10. Demonstrate the inclusion of patient and others, as appropriate, in the education and shared decision-making process for pain care.	1.95	0.77	1	4
III. Management of pain				
11. Develop a treatment plan that considers the differences between acute pain, acute-on-chronic pain, chronic/persistent pain, and pain at the end of life.	1.85	0.75	1	4
12. Explain how to assess and manage pain across settings and transitions of care.	1.90	0.71	1	4
IV. Multidimensional nature of pain				
13. Describe the impact of pain on society.	2.03	0.85	1	4
14. Define terminology for describing pain and associated conditions.	1.96	0.90	1	4

Discussion

This is one of the first studies testing an instrument for measuring the nurses' Cancer Pain Management Competency not only in oncological setting.

In this study, we demonstrated that the NCPMCS is a valid and reliable method of measuring the cancer pain management competency among nurses.

The dimensionality of the NCPMCS was analyzed by means of one CFA. This CFA was conducted on the items defining each 1 of the 4 scales comprising the NCPMCS (clinical conditions, pain assessment and measurement, management of pain and multidimensional nature of pain). The goodness-of-fit indices supported the hypothesized models. These analyses showed a complex and interesting structure of the index. The scales showed a hierarchical structure, with several valid and reliable primary factors corresponding to narrow dimensions that allow a fine-grained assessment of nurses' cancer pain management competency and valid and reliable higher order factors that support the conventional use of total scores for a more global assessment.

The CFA of this scale allowed the identification of an autonomous management factor but showed also a narrower provider-directed management factor, with low factor loadings that question its validity. More research is needed for a deeper understanding of this result, but it could be a cultural phenomenon reflecting the treatment norms in Italy on pain assessment and management.

In this study, the Italian version of the Nurses'

Table 3 – Comparison of Mean Scale and Factor Scores Between Nurses Educated on pain assessement/management Versus Nurses Not Educated during the last 5 years.

Factors	Educated nurses (n= 39)	Noneducated nurses (n= 89)	Mean difference	t-value	P
I. Clinical conditions, mean (SD)					
1. Implement an individualized pain management an that integrates the perspectives of patients, their social support systems, and health care providers in the context of available resources.	2.43 (0.75)	1.67 (0.75)	0.76	-5.2790	**<.001**
2. Describe the role of the nurse as an advocate in assisting patients to meet treatment goals.	2.12 (0.76)	1.97 (0.91)	0.15	-0.8974	.185
3. Explain how health promotion and self-management strategies are important to the management of pain.	2.48 (0.64)	1.78 (0.74)	0.70	-5.0922	**<.001**
4. Present theories and science for understanding pain.	2.07 (0.70)	1.91 (0.81)	0.16	-1.2721	.205
5. Monitor effects of pain management approaches to adjust the plan of care as needed.	2.20 (0.69)	2.02 (0.84)	0.18	-1.1913	.235
II. Pain assessment and measurement, mean (SD)					
6. Assess patient preferences and values to determine pain-related goals and priorities.	2.56 (0.67)	1.70 (0.78)	0.86	-3.7829	**.0002**
7. Use valid and reliable tools for measuring pain and associated symptoms to assess and reassess related outcomes as appropriate for the clinical context and population.	1.92 (0.73)	1.84 (0.81)	0.08	-0.5308	.596
8. Describe the unique pain assessment and management needs of special populations	2.15 (0.54)	1.88 (0.87)	0.27	-1.7624	.080
9. Explain how cultural, institutional, societal, and regulatory influences affect assessment and management of pain.	2.23 (0.77)	1.78 (0.77)	0.45	-2.8197	**.005**
10. Demonstrate the inclusion of patient and others, as appropriate, in the education and shared decision-making process for pain care.	2.38 (0.63)	1.76 (0.77)	0.62	-4.4225	**<.001**
III. Management of pain, mean (SD)					
11. Develop a treatment plan that considers the differences between acute pain, acute-on-chronic pain, chronic/persistent pain, and pain at the end of life.	2.31 (0.52)	1.65 (0.75)	0.66	-4.9295	**<.001**
12. Explain how to assess and manage pain across settings and transitions of care.	2.28 (0.64)	1.74 (0.69)	0.54	-4.11463	**<.001**
IV. Multidimensional nature of pain, mean (SD)					
13. Describe the impact of pain on society.	1.82 (0.72)	2.13 (0.70)	-0.31	1.70496	.090
14. Define terminology for describing pain and associated conditions.	2.17 (0.82)	1.86 (0.73)	10.31	-1.81807	.071

Cancer Pain Management Competency Scale was introduced as an effective assessment tool to provide reference for cross-sectional investigations and cancer pain management interventions and we also tested the validity, reliability and applicability of the scale among Italian nurses, regardless of the clinical context. To date, most of the research and survey tools on cancer pain management in the world are patient- and oncology-focused, and adequate tools to assess nurses' competence in cancer pain management are still lacking (1, 2, 4). The Italian version of the NCPMCS can be a useful tool for evaluating nurses' competence in managing cancer pain. Different departments can conduct individualized training to improve nurses' cancer pain management competency, enhance evidence based pain management programs, and support nurses in regularly self-evaluating their cancer pain management competency, all in accordance with current pain management guidelines and the unique characteristics of cancer pain. Low cancer pain management competency among nurses may have detrimental effects on patients' outcomes and

Table 4 – Test-Retest Reliability of Nurses' Cancer Pain Management Competency Scale(Full Sample and only nurses who did not work in a medical oncology department).

Factors	ICC (95% CI)	
	Full sample (n= 128)	Only non-medical oncology nurses (n= 107)
I. Clinical conditions		
1. Implement an individualized pain management an that integrates the perspectives of patients, their social support systems, and health care providers in the context of available resources.	0.87 (0.84-0.90)	0.93 (0.89-0.94)
2. Describe the role of the nurse as an advocate in assisting patients to meet treatment goals.	0.92 (0.91-0.94)	0.93 (0.91-0.95)
3. Explain how health promotion and self-management strategies are important to the management of pain.	0.93 (0.91-0.94)	0.94 (0.91-0.96)
4. Present theories and science for understanding pain.	0.94 (0.92-0.93)	0.94 (0.92-0.96)
5. Monitor effects of pain management approaches to adjust the plan of care as needed.	0.92 (0.90-0.94)	0.93 (0.90-0.95)
II. Pain assessment and measurement		
6. Assess patient preferences and values to determine pain-related goals and priorities.	0.92 (0.90-0.94)	0.92 (0.90-0.94)
7. Use valid and reliable tools for measuring pain and associated symptoms to assess and reassess related outcomes as appropriate for the clinical context and population.	0.92 (0.91-0.94)	0.93 (0.91-0.96)
8. Describe the unique pain assessment and management needs of special populations	0.87 (0.83-0.89)	0.92 (0.91-0.95)
9. Explain how cultural, institutional, societal, and regulatory influences affect assessment and management of pain.	0.87 (0.84-0.90)	0.93 (0.89-0.95)
10. Demonstrate the inclusion of patient and others, as appropriate, in the education and shared decision-making process for pain care.	0.90 (0.87-0.92)	0.92 (0.90-0.94)
III. Management of pain		
11. Develop a treatment plan that considers the differences between acute pain, acute-on-chronic pain, chronic/persistent pain, and pain at the end of life.	0.92 (0.90-0.94)	0.93 (0.91-0.94)
12. Explain how to assess and manage pain across settings and transitions of care.	0.94 (0.91-0.96)	0.94 (0.92-0.96)
IV. Multidimensional nature of pain		
13. Describe the impact of pain on society.	0.92 (0.91-0.94)	0.93 (0.91-0.95)
14. Define terminology for describing pain and associated conditions.	0.94 (0.92-0.93)	0.94 (0.92-0.96)

reduce the efficacy of their cancer pain management practice (13).

Nurses, as a participative advocate for pain management, the nurse's comprehension of cancer pain and the position itself are especially crucial. A thorough evaluation of pain should concentrate on the degree of pain, its location, kind and quality, length, history of the pain, and its radiating effects to other body areas (24, 25).

The study's RMSEA value was 0.037 and its χ^2 value was 2.662. Analysis revealed that the fitting model created using the scale factors had good goodness of fit, suggesting that the Italian version of the scale had strong structural validity. The Italian version of the NCPMCS scale items was consistent with the measurement dimensions, which verified that the preset dimension structure matched well with the actual data. The consistency and stability of the measured findings can be represented by the scale's dependability; the better the reliability, the more stable and dependable the measuring device (21). The higher the internal consistency, the more accurately the measured topic reflects the research topic, and the stronger the correlation between the items in each dimension. The consistency and stability of the measured findings can be represented by the

scale's dependability; the better the reliability, the more stable and dependable the measuring device (20). The higher the internal consistency, the more accurately the measured topic reflects the research topic, and the stronger the correlation between the items in each dimension. It is generally believed that the Cronbach's α coefficient of the total scale is >0.800, the Cronbach's α coefficient of the subscale is >0.700, and the broken half reliability is >0.800, indicating good reliability. In this study, Cronbach's αcoefficient was 0.806, and the reliability of each dimension was 0.719 to 0.836 indicating high internal consistency of the scale and strong reliability of the scale for evaluating nurses' cancer pain management competency. At the same time, all ICCs demonstrated excellent test-retest reliability, with most of values greater than 0.90, indicating that the scale has good stability across time.

In contrast to the Korean validation study (11) which showed the lowest score for the pain assessment and measurement factor, the lowest score was obtained for the management of pain factor. The data is in line with our first validation study (13). While the highest score was always obtained for the multidimensional nature of pain factor in line with the results of Hu and colleagues (11) and our first validation study (13).

Regarding the current practice and training needs, although 30% of all nurses had received cancer pain management training, a high percentage of nurses (41%) did not have a cancer pain management-related protocol in their work department. Although the perceived importance and interest in cancer pain management are increasing, there are still insufficient resources to support nurses' cancer pain management practice in clinical settings. As nurses play an integral role in assessing, managing, and evaluating cancer pain, it is critical for nurses to perform cancer pain management proficiently.

Every nurse should be able to assess and manage pain. Nurses play a critical role in effective pain management because they have frequent contact with patients and are responsible for assessing and managing their pain (26). Adequate pain assessment and management have significant consequences for patients' physical and psychological health (25).

Consistent with previous studies, nurses educated in pain management demonstrated higher responses to the questionnaire which emphasizes the importance of nursing education in the field of pain (26, 27). Pain education interventions influence outcomes sensitive to nursing care (26, 27). Nursing pain care and documentation, audit and feedback to nurses, benchmarking, and pain education programs or protocols influence pain documentation. pain, pain evaluation, pain reappraisal and satisfaction (27). However, pain education strategies vary widely between studies (27), which used multivariate interventions without sufficient systematization or opportunities to transfer study protocols as such (27). It would be useful to standardize on a common strategy regarding a training plan for pain nursing specific to macro areas (e.g. critical care, palliative care, surgery, oncology). Nurses performed better on pain management after participating in training using action learning and online learning (11, 28), and the presence of a protocol in the work setting was shown to improve nurses' pain management competency (29). Therefore, it is necessary to adopt an in-hospital protocol for cancer pain management that is based on current clinical practice guidelines or reviews (30-32) that nurses can refer to at any time, along with competency-based training that can promote nurses' cancer pain management competency. Furthermore, nurses in the present study preferred multi-component educational modalities with the highest simulation-based learning experience.

Limit

The first and most important limitation is the convenience and non-random sampling model, which makes the results influenced by the strict selection of cases. Random sampling would have allowed the instrument to be validated in a more heterogeneous nursing group.

This may have influenced the averages that emerged in the responses, as it is likely that the respondents were the greatest number of nurses motivated by the management of cancer pain and therefore offered the best responses.

Being the first study in Italy that tried to evaluate nursing skills in managing cancer pain, we had difficulty comparing our results and we do not know how generalizable they are.

It is currently not possible to perform the criterion control verification of the local version of the scale, nor are there any other relevant instruments or translated versions available to assess the cancer pain treatment competence of nursing personnel in Italy. We should broaden the sample size and geographical reach of nurses in the future, add to the validation analysis, and investigate the use of this scale in Italy.

We consider our study design as a limitation due to its inability to establish causal relationships and its focus on analyzing potential predictors.

Additionally, acknowledge that the self-assessment tool may introduce response biases influenced by social desirability. Studies using randomized sampling and able to establish causal relationships by focusing on the analysis of potential predictive factors are necessary.

Furthermore, it is likely that nursing skills in cancer pain management reflect the legislative and regulatory context in Italy and the validity of the questionnaire may be different in other European contexts.

Conclusion

The Nurses' Cancer Pain Management Competency Scale, which includes 14 assessment items and 4 dimensions in the "Italian version", is appropriate to evaluate the competence of clinical nurses in the management of cancer pain in the Italian context not only among medical oncology departments. The scale is valid and reliable for the evaluation of nursing competencies in managing cancer pain even among nurses who do not work in medical oncology departments.

To date, the tool is reliable for evaluating the skills of clinical nurses in the treatment of cancer pain. In addition to being a useful tool for clinical settings, this questionnaire makes it easy for researchers to learn more about the general degree of competence in cancer pain management that clinical nurses in Italy possess or lack. The NCPMCS measures competence and may be useful in assisting faculty in developing a pain management program to promote competence in pain management.

Training is a cornerstone in improving nursing knowledge and skills as emerged in the average scores we compared between educated and uneducated nurses. Training programs that utilize multicomponent education and experiential learning are needed to achieve optimal competence in cancer pain management in nurses.

Authors' contributions

All authors contributed equally to the manuscript and read and approved the final version of the manuscript. In particular,VD First author, principal investigator, project manager; MP translation of the questionnaire into Italian; GD: Direct participation in the writing and revision of the article, Dissemination of the questionnaire; LC and LM: Direct participation in the writing and revision of the article, Dissemination of the questionnaire; AD: Writing study protocol and writing results section and tables; LF: Language translation review; MM: revision of manuscript; GR, VM Dissemination of the questionnaire.

Riassunto

Validità, affidabilità e proprietà psicometriche della versione italiana della Nurses' Cancer Pain Management Competency Scale

Introduzione e obiettivo. La Nurses' Cancer Pain Management Competency Scale (NCPMCS) è uno strumento nato per esplorare le competenze e le esperienze soggettive degli infermieri nella gestione del dolore da cancro e per aiutare gli infermieri a comprendere le loro attuali carenze nella gestione del dolore da cancro nei reparti di oncologia medica. Nell'ipotesi che il dolore da cancro non sia un problema esclusivamente specifico del contesto oncologico, abbiamo testato le caratteristiche psicometriche della scala sulla popolazione infermieristica italiana generale.

Metodi. È stato utilizzato un disegno trasversale in cui è stato arruolato un campione di infermieri provenienti da 16 ospedali del Nord, Sud e Centro Italia. È stato utilizzato un metodo di campionamento di convenienza per reclutare gli infermieri italiani che soddisfacevano i criteri di ammissibilità e hanno completato lo studio per lo sviluppo della versione italiana della Nurses' Cancer Pain Management Competency Scale. La coerenza interna è stata valutata utilizzando l'alfa di Cronbach e la validità di costrutto è stata esaminata utilizzando l'analisi fattoriale esplorativa. La raccolta dati è avvenuta nel mese di luglio 2024.

Risultati. Il campione ha coinvolto 128 infermieri che soddisfacevano i criteri di inclusione. Il campione era prevalentemente femminile (68%). I fattori di caricamento della NCPMCS variavano tra 0.81 e 0.92 e il valore *t* era maggiore di 1.96 per tutti i 14 elementi. Su una scala a 4 punti per la competenza totale, il punteggio medio era 1.94 ±0,81. La natura multidimensionale del dolore (2.01 ±0.93) è stato il fattore che ha mostrato il punteggio medio più alto, mentre la gestione del fattore dolore è stata il più basso (1.87 ±0.83). L'alfa di Cronbach era 0.806 e variava da 0.719 a 0.836.

I risultati hanno mostrato che il rapporto del grado di libertà chi quadrato era 2.662, l'indice di bontà di adattamento era 0.854, la radice quadrata media dell'errore approssimato era 0.037, l'indice di adattamento era 0.876, l'indice di adattamento comparativo era 0.928.

Conclusioni. La scala risulta valida ed affidale per la valutazione della competenze infermieristiche nella gestione del dolore da cancro anche tra gli infermieri che non lavorano nei reparti di oncologia medica.

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