REVISTA DE ENFERMAGEM REFERÊNCIA
homepage: https://rr.esenfc.pt/rr/
ISSNe: 2182.2883

RESEARCH ARTICLE (ORIGINAL)

Psychometric study of a Knowledge Questionnaire on Autonomous Nursing Interventions in Patients with Acute Coronary Syndrome

Estudo psicométrico: Questionário de Conhecimentos das Intervenções Autónomas de Enfermagem no Doente com Síndrome Coronário Agudo

Estudio psicométrico: Cuestionario de Conocimientos de las Intervenciones Autónomas de Enfermería en el Paciente con Síndrome Coronario Agudo

João Carlos Bastos Pina [1, 2, 3]
https://orcid.org/0000-0002-0277-9172

Maria Augusta Romão da Veiga Branco [1]
https://orcid.org/0000-0002-7963-2291

Maria Madalena Jesus Cunha Nunes [3, 4]
https://orcid.org/0000-0003-0710-9220

João Carvalho Duarte [3, 4]
https://orcid.org/0000-0001-7082-8012

Cláudia Ribeiro da Silva [5, 6]
https://orcid.org/0000-0002-4025-7236

[1] Polytechnic Institute of Bragança, School of Health, Bragança, Portugal

[2] Regional Health Administration of the North, Health Center Cluster of Douro II - Douro Sul, Basic Emergency Service of Moimenta da Beira/ILS Vehicle of Moimenta da Beira - INEM, Viseu, Portugal

[3] Polytechnic Institute of Viseu, Health School, Viseu, Portugal

[4] Polytechnic Institute of Viseu, Center for the Study of Education, Technologies, and Health (CI&DETS), Viseu, Portugal

[5] Institute of Health Sciences, Universidade Católica Portuguesa, Lisbon, Portugal

[6] Alcoitão School of Health Sciences, Alcoitão, Portugal

Corresponding author
João Carlos Bastos Pina
E-mail: joaopina@live.com.pt

Received: 19.05.20
Accepted: 01.10.20

Abstract

Background: The recognition of nurses autonomy can only be achieved if it is correctly measured and validated. In this sense, it is imperative to evaluate their knowledge, recognizing their decisive role.
Objective: To validate and evaluate the psychometric properties of the Knowledge Questionnaire about Autonomous Nursing Interventions for patients with Acute Coronary Syndrome.
Methodology: Methodological, descriptive, analytical-correlational and cross-sectional study. Internal consistency was assessed using Cronbach's alpha and confirmatory factor analysis in a sample of 738 Portuguese nurses enrolled in the Ordem dos Enfermeiros.
Results: The average age was 37.57 years, 76.0% of which were women. After the refinement of the questionnaire, the confirmatory factor analysis showed an acceptable quality of adjustment of the factor structure composed of 9 factors with 44 items (x^2/gl = 2.042; CFI = 0.846; GFI = 0.826; RMSEA = 0.053; RMR = 0.069). The overall internal consistency was α = 0.930, showing high reliability, explaining 56.739% of total variance.
Conclusion: The questionnaire is reliable and valid, revealing the potential for investigation, monitoring and evaluation of nurses' knowledge in a training context and clinical practice.

Keywords: professional autonomy; nursing care; methods; validation study; acute coronary syndrome

Resumo

Enquadramento: O reconhecimento da autonomia dos enfermeiros só poderá ser conseguido se esta for corretamente mensurada e validada. Neste sentido, torna-se imperioso avaliar os seus conhecimentos, reconhecendo o seu papel decisivo.
Objetivo: Validar e avaliar as propriedades psicométricas do Questionário de Conhecimentos acerca das Intervenções Autónomas de Enfermagem face ao Doente com Síndrome Coronário Agudo.
Metodologia: Estudo metodológico, descritivo analítico-correlacional e transversal. Avaliou-se a consistência interna através do alfa de Cronbach e a análise fatorial confirmatória numa amostra de 738 enfermeiros portugueses inscritos na Ordem dos Enfermeiros.
Resultados: A média de idades foi de 37,57 anos, sendo 76,0% mulheres. Após o refinamento do questionário, a análise fatorial confirmatória evidenciou uma qualidade de ajustamento aceitável da estrutura fatorial composta por 9 fatores com 44 itens (x^2/gl = 2,042; CFI = 0,846; GFI = 0,826; RMSEA = 0,053; RMR = 0,069). A consistência interna global foi de α = 0,930, mostrando uma fiabilidade elevada, explicando 56,739% de variância total.
Conclusão: O questionário é fiável e válido revelando potencial para investigação, monitorização e avaliação dos conhecimentos dos enfermeiros em contexto formativo e prática clínica.

Palavras-chave: autonomia profissional; cuidados de enfermagem; métodos; estudo de validação; síndrome coronário agudo

Resumen

Marco contextual: El reconocimiento de la autonomía de los enfermeros solo puede lograrse si esta se mide y valida correctamente. En este sentido, es imperativo evaluar sus conocimientos y reconocer la función decisiva que desempeñan.
Objetivo: Validar y evaluar las propiedades psicométricas del Cuestionario de Conocimientos de las Intervenciones Autónomas de Enfermería en el Paciente con Síndrome Coronario Agudo.
Metodología: Estudio metodológico, descriptivo, analítico-correlacional y transversal. La consistencia interna se evaluó mediante el alfa de Cronbach y el análisis factorial confirmatorio en una muestra de 738 enfermeros portugueses inscritos en el Colegio de Enfermeros.
Resultados: La edad media era de 37,57 años, el 76,0% eran mujeres. Tras el perfeccionamiento del cuestionario, el análisis factorial confirmatorio mostró una calidad de ajuste aceptable de la estructura factorial compuesta por 9 factores con 44 ítems (x^2/gl = 2,042; CFI = 0,846; GFI = 0,826; RMSEA = 0,053; RMR = 0,069). La consistencia interna global fue = 0,930, lo que muestra una alta fiabilidad, que explica el 56,739% de la variancia total.
Conclusión: El cuestionario es fiable y válido, y revela el potencial de investigación, monitorización y evaluación de los conocimientos de los enfermeros en el contexto formativo y la práctica clínica.

Palabras clave: autonomía profesional; atención de enfermería; métodos; estudio de validación; síndrome coronario agudo

How to cite this article: Pina, J. C., Branco, M. A., Nunes, M. M., Duarte, J. C., & Silva, C. R. (2020). Psychometric study of a Knowledge Questionnaire on Autonomous Nursing Interventions in Patients with Acute Coronary Syndrome. *Revista de Enfermagem Referência*, *5*(4), e20070. doi:10.12707/RV20070

Introduction

Cardiovascular diseases (CVDs) are the leading cause of death worldwide: every year, more people die from CVDs than from any other cause. In 2016, CVDs were responsible for 17.9 million deaths worldwide: 31% of all global deaths and 44% of all noncommunicable disease deaths. This number is expected to reach almost 23.6 million by 2030 (World Health Organization, 2018). In Portugal, the mortality rate for diseases of the circulatory system is around 29.3% (PORDATA, 2017), being the leading cause of death.

In recent years, two-thirds of deaths from coronary events have occurred in pre-hospital environments, particularly in cases of fatal arrhythmias suddenly triggered by ischemia (Instituto Nacional de Emergência Médica & Departamento de Formação em Emergência Médica, 2019). Thus, the nurse's education and knowledge are essential for the prevention and early identification of acute coronary events, contributing to the reduction of mortality and morbidity rates.

As a highly fatal condition, the acute coronary syndrome (ACS) is a challenge because it requires prompt symptom recognition, care-seeking behavior, and immediate nursing intervention (Patel, Mohanan, Prabhakaran, & Huffman, 2017).

Nursing is a science focused on the human responses to life processes and transitions throughout the health/illness process, with emphasis on the need for development of interventions that support a more critical-reflective professional practice. Hence, nurses must develop mechanisms to enhance their value, giving visibility to the care they deliver to the population (Alves, 2015).

Regarding the nurses' decision-making process, in Portugal, the regulation affecting nursing practice (*Regulamento do Exercício Profissional dos Enfermeiros* - REPE) states, in Article 5, that nursing care is characterized by the presence and development of a helping relationship with the user (systemic and systematic approach), whose interaction is objectively documented during the nursing process, through the application of a scientific methodology (*Ordem dos Enfermeiros* [OE], 2015).

The planning of nursing care for critically ill patients using a scientific methodology inherent to the nursing process sustains the nurses' decision-making process regarding the implementation of interventions while integrating the research findings into clinical practice. After identifying the needs, nursing interventions are prescribed to early detect potential complications and problems, and solve or mitigate the identified problems based on a precise, effective, and prompt intervention paradigm (Regulamento n.º 429/2018 of 16 July 2018). Examples of these interventions are the "appropriate implementation of advanced life support measures" and the "appropriate management of complex therapeutic protocols" (OE, 2017, p. 13).

Following this line of thought, Facione, Crossetti, and Riegel (2017) believe that holistic critical thinking in nursing will be as or more relevant and stronger as the importance given to the first steps of the nursing process, allowing the acquisition of solid knowledge about the patient's needs and an accurate nursing diagnosis. The authors also believe that holistic critical thinking results from the combination of a reflective judgment that is open to a set of cognitive abilities that are intrinsic to the nursing professional and should consider the following aspects in the formal decision-making process: the way problems are framed, the quality of the evidence, the appropriateness of the methods, the reasonableness of the criteria, the applicability of theories and principles, the patient's preferences, and the healthcare setting.

Hence, the relevance of this research is justified. This study aimed to validate and assess the psychometric properties of the *Questionário de Conhecimentos acerca das Intervenções Autónomas de Enfermagem face ao Doente com Síndrome Coronário Agudo* [Knowledge Questionnaire on Autonomous Nursing Interventions in Patients with Acute Coronary Syndrome].

Background

The term ACS is characterized by an imbalance between myocardial oxygen supply and demand mechanisms, triggered by the rupture or erosion of an atherosclerotic plaque that can lodge in the coronary circulation and cause an ischemia (Macedo & Rosa, 2010; Nikolaou et al., 2015).

Reducing the interval between symptom onset and initial treatment, if possible before hospital admission, is important to increase the survival rates after ischemic episodes (Instituto Nacional de Emergência Médica & Departamento de Formação em Emergência Médica, 2019). Thus, rapid clinical intervention is essential for successfully treating patients with ACS due to the need to reduce the risk of fatal arrhythmias.

A detailed medical history is the cornerstone for establishing a diagnosis of ACS, which is usually characterized by the presence of precordial pain radiating to the back, neck, jaw, or left arm, and possibly associated with shortness of breath, nausea/vomiting, fatigue, palpitations, sweating, or syncope (Nikolaou et al., 2015; Ibanez et al., 2018).

Factors associated with the delay in seeking emergency care are low socioeconomic status, being a woman, means of transportation, self-medication, non-recognition of the signs and symptoms of a cardiac event, denial of the cardiac event, and previous non-specialized care (Ouchi, Teixeira, Góes Ribeiro, & Oliveira, 2017).

Thus, according to the same authors, health professionals must have specific technical-scientific knowledge to improve care, increasing survival and minimizing complications.

Regarding nurses' decision-making processes, the REPE distinguishes between autonomous and interdependent interventions. Autonomous interventions are:

> performed by the nurses under their own initiative and responsibility, according to their professional qualifications, either in care delivery, management, teaching, training, or consulting, with the contributions in nursing research. (OE, 2015, p. 102)

Interdependent interventions are:

> performed by the nurses, according to their professional qualifications, together with other professionals, to achieve a common objective, resulting from action plans previously established by the multidisciplinary teams in which they are integrated and the pre-formalized prescriptions or guidelines. (OE, 2015, p. 102)

The *Questionário de Conhecimentos acerca das Intervenções Autónomas de Enfermagem Face ao Doente com Síndrome Coronário Agudo* (QCIAEFDSCA) was designed to identify Portuguese nurses' level of knowledge (poor, fair, or good) about autonomous interventions in patients with ACS.

Methodology

A methodological study with a psychometric approach was conducted based on the cross-sectional data collection in a non-probability convenience sample of 738 nurses registered with the OE between November 2019 and January 2020.

The Ethics Committee of the Polytechnic Institute of Bragança approved the study (Opinion no. 4/2019:RA001-2019/0015). After authorization from the OE, the questionnaire was published on this institution's website and disseminated through its mailing list (Ref. SAI-OE/2019/27). The participants who agreed to answer the questionnaire signed the informed consent before their individual participation in the study online via Google Forms®.

The QCIAEFDSCA was built based on the following documents: OE Bylaws (2015) and REPE (Decree-Law no. 161/96 of 4 September); OE Regulations (no. 429/2018 of 16 July; no. 140/2019 of 6 February); Quality Standards of Specialized Care in Medical-Surgical Nursing in the Area of Critical Care Nursing (25 November 2017); Quality Standards of Nursing Care: Conceptual Framework and Descriptive Statements (2001); International Classification for Nursing Practice (2015 version); and scientific literature on ACS.

Nursing interventions aimed at patients with ACS were developed based on the guidelines for International Classification for Nursing Practice (ICNP) Catalogue Development:

> 1. Must include a term from the Action Axis; 2. Must include at least one Target Term. A target term can be a term from any axis except the Judgement Axis; 3. May include additional terms as needed from Action or any other axis. (OE & ICN, 2008, p.15)

The QCIAEFDSCA is a self-administered instrument consisting of 57 items divided into two parts: the first part includes in-depth questions about the concept of autonomous nursing interventions; the second part includes questions for assessing nurses' level of knowledge about the interventions carried out with patients with ACS, during the various steps of the nursing process.

The principal investigator, João Pina, designed this questionnaire in Portugal. It has a Likert scale ranging from 1 (*completely false*), 2 (*partially false*), 3 (*don't know*), 4 (*partially true*) to 5 (*completely true*). There can only be one answer to each question.

Descriptive, correlational, and internal consistency statistics were calculated through Pearson's correlation coefficient and Cronbach's alpha using IBM SPSS Statistics® software, version 24.0. The following categories were considered for internal consistency: > 0.9 *excellent*; 0.8 – 0.9 *good*; 0.7 – 0.8 *acceptable*; 0.6 – 0.7 *questionable*; 0.5 – 0.6 *poor*; < 0.5 *unacceptable* (Marôco, 2014).

The following Pearson's correlation coefficients were considered: $r < 0.2$ *very weak*; $0.2 \leq r \leq 0.39$ *weak*; $0.4 \leq r \leq 0.69$ *moderate*; $0.7 \leq r \leq 0.89$ *strong*; $0.9 \leq r \leq 1$ *very strong* (Marôco, 2014).

Construct validity was assessed through an exploratory principal components factor analysis in IBM SPSS AMOS software, version 24.0.

Results

This study included 738 participants, representing approximately 1% of the Portuguese nurses registered with the OE. Participants were aged between 21 and 67 years, with a mean age of 37.57 years (Standard Deviation [*SD*] ± 9.83 years), mostly women (76%), with a 3-year or 4-year nursing degree (75.1%), and a master's/PhD degree (25.4%).

On average, the length of service was 14.28 years (*SD* ± 9.77 years). Concerning the professional titles attributed by the OE, 61.2% of them hold the title of nurse and 38.8% hold the title of specialist nurse.

Participants worked mainly in multipurpose intensive care units, representing 66.1% of the sample. Most of the specialist nurses were specialized in medical-surgical nursing (42.7%).

More than half of the participants currently worked as a generalist nurse (67.6%), and only 22.5% of them worked as a specialist nurse.

In the analysis of the reliability of the QCIAEFDSCA, the statistics (means and standard deviations) and the correlations obtained between each item and the total score showed how the item is combined with the total score. Considering the mean scores, the means ranged from 3.06 (item 25) to 4.91 (item 41).

In the analysis of the internal consistency, the overall Cronbach's alpha was classified as *good* ($\alpha = 0.892$). Cronbach's alpha value did not increase if any items were deleted, that is, none of the items were reducing the scale's internal consistency. However, some items had very weak item-total correlations: item 4 ($r = 0.054$), item 5 ($r = 0.077$), and item 16 ($r = -0.069$).

Construct validity was analyzed using an exploratory factor analysis. The Kaiser-Meyer-Olkin (KMO) test for sampling adequacy was used to assess if the data were suitable for a factor analysis. Despite the lack of a rigorous test for KMO values, they can be classified as follows (Pestana & Gageiro, 2008): ≤ 0.50 - *unacceptable*;]0.50 – 0.60] - *miserable*;]0.60 – 0.70] - *mediocre*;]0.70 – 0.80] - *middling*;

]0.80 – 0.90] – *meritorious*, and]0.90 - 1.00] - *marvelous*.
Regarding the instrument's validity, an exploratory factor analysis was performed to ensure its content validity, considering the lack of information on its factor structure. Thus, the good results in the KMO test (KMO = 0.875) and Bartlett's test of sphericity (x^2 = 6747.982; p = 0.000) showed that the questionnaire's validation process could continue and that the variables under study were not correlated.
Based on these results, a principal components analysis was performed with varimax rotation. The scree plot was analyzed to determine the number of interpretable dimensions, considering factors whose eigenvalues were greater than or equal to 1. The following criteria were used to choose the best factor structure: three or more items in each dimension and Cronbach's alpha coefficients greater than 0.60.
The items for each factor were selected based on the following criteria: 1st - Factor loadings greater than 0.40 on a factor; 2nd - The difference between the factor loadings on both factors is equal to or greater than 0.10.
Based on these criteria, a 9-factor solution was selected, which explained 56.739% of the variance. Based on this factor solution, 14 items (2; 3; 4; 5; 12; 14; 16; 27; 37; 38; 39; 47; 48; 49) were eliminated because they loaded below 0.40 on all factors or above 0.40 on more than one factor, with a difference below 0.10 between them, thus being considered ambiguous items. A total of 43 items were distributed in 9 factors.
The overall Cronbach's alpha is very high (0.930) if these 14 items are deleted, corresponding to a high internal consistency.

Table 1
Descriptive statistics of the items by subscale of the QCIAEFDSCA

Nº Item	Items	Mean	*SD*	*r*/item total	r^2	α if item deleted
Factor 1 – Management of Care Designed for Client Autonomy (GCPAC)						
28	In the treatment of ACS, it is essential: ... to inform the client of all procedures: clarify doubts and fears and promote the decision-making process.	4.85	0.462	0.667	0.570	0.705
29	... to maintain the client's dignity and privacy in all moments.	4.92	0.391	0.647	0.527	0.723
30	... to manage the client's anxiety: to evaluate the presence of coping mechanisms and/or implement guided relaxation techniques.	4.77	0.606	0.600	0.373	0.713
31	... to position the client with head-of-bed elevation of at least 30º - 45º.	4.40	0.887	0.462	0.219	0.826
32	... to manage ACS pain/discomfort.	4.86	0.438	0.641	0.489	0.716
		Total Cronbach's alpha coefficient				0.774
Factor 2 - Management of Complex Therapeutic Protocols (Platelet Aggregation Inhibitors and Heparin [F.I.A.P. - H])						
23	The initial pharmacological treatment of ACS includes the administration of: clopidogrel.	3.56	1.324	0.686	0.536	0.840
24	ticagrelor.	3.46	1.309	0.767	0.624	0.806
25	prasugrel.	3.07	1.193	0.803	0.653	0.796
26	heparin.	3.31	1.305	0.616	0.457	0.868
		Total Cronbach's alpha coefficient				0.865
Factor 3 - Risk Management and Prevention of Adverse Events (GRPEA)						
50	The provision of safe and quality nursing care involves, among other things: ... documenting the physical examination at admission to the ER (e.g.).	4..52	0.840	0.495	0.283	0.735
51	... assessing tissue perfusion and skin integrity.	4.72	0.632	0.564	0.359	0.726
52	... monitoring the risk of falls using the Morse Fall Scale (e.g.).	4.20	1.154	0.490	0.288	0.754
55	... implementing measures to prevent HAIs (e.g., aseptic technique).	4.78	0.564	0.504	0.275	0.741
56	... detecting the presence of illicit substances such as drugs or alcohol.	4.40	0.900	0.486	0.333	0.738
57	... identifying signs and symptoms of infection.	4.53	0.830	0.644	0.456	0.695
		Total Cronbach's alpha coefficient				0.766

Factor 4 - Initial Client Assessment Procedures (PIAC)						
10	When an ACS is suspected, the Guidelines recommend a 12-lead ECG in the first 10 minutes.	4.27	0.927	0.399	0.173	0.690
11	The ACS is characterized by retrosternal pain/discomfort caused by myocardial ischemia.	4.29	0.850	0.360	0.144	0.699
13	ACS pain is described as "tightness" or the worst pain ever felt.	4.35	0.811	0.395	0.173	0.686
15	ACS pain/discomfort can radiate: ... along the left arm.	4.70	0.610	0.513	0.288	0.660
17	… to the neck or jaw.	4.51	0.856	0.547	0.369	0.637
18	… to the scapular or epigastric regions.	4.58	0.702	0.499	0.307	0.658
				Total Cronbach's alpha coefficient		0.711
Factor 5 - Management of Complex Therapeutic Protocols (Morphine, Oxygen, Nitrates, Acetylsalicylic Acid [M.O.N.A.]).						
19	The initial pharmacological treatment of ACS includes the administration of: O_2.	3.99	1.253	0.608	0.382	0.832
20	Morphine.	3.99	1.235	0.726	0.536	0.777
21	ASA.	4.31	1.076	0.650	0.447	0.812
22	Nitrates.	4.18	1.099	0.735	0.545	0.776
				Total Cronbach's alpha coefficient		0.842
Factor 6 – Document Management of Client Pain and Well-being (GDDBC)						
40	The management of ACS pain/discomfort requires, among others, the following Nursing interventions: ... to assess the client's pain, at regular intervals, SOS whenever relevant, using a pain scale (e.g., the Visual Analogue Scale - VAS).	4.73	0.623	0.464	0.252	0.737
41	... to characterize pain and ask the client about its site, severity, intensity, quality, duration, start time, precipitating and relieving factors, etc.	4.90	0.345	0.670	0.474	0.689
42	... to monitor pain management: presence/absence of significant improvement versus the treatment implemented, in partnership with the attending physician.	4.81	0.546	0.508	0.319	0.713
43	... to identify signs and symptoms of discomfort (Compromised Status).	4.78	0.525	0.603	0.402	0.678
54	… to discontinue intravenous therapy in case of adverse reactions, communicating it to the attending physician and documenting it in the clinical process	4.78	0.570	0.464	0.241	0.731
				Total Cronbach's alpha coefficient		0.747
Factor 7 - Pain Management and Client Empowerment (GDCC)						
44	The management of ACS pain/discomfort requires, among others, the following Nursing interventions: ... to educate the client about pain and the side effects of the medication administered.	4.71	0.639	0.634	0.428	0.651
45	… to monitor the risk of negative response to nurse-controlled analgesia.	4.50	0.875	0.516	0.276	0.722
46	… to identify the client's attitude toward pain and received care, explaining and clarifying their rights (debriefing).	4.63	0.695	0.604	0.402	0.660
53	… to manage medication side effects: for example, to assess the risk of drug-drug interaction or occurrence of past adverse events.	4.67	0.701	0.464	0.232	0.734
				Total Cronbach's alpha coefficient		0.749
Factor 8 - Management of Autonomous Nursing Interventions (GIEA)						
1	Nursing interventions are autonomous and interdependent.	4.61	0.751	0.347	0.122	0.671
6	Nurses organize, coordinate, implement, supervise, and evaluate nursing interventions at the three levels of prevention.	4.62	0.696	0.435	0.195	0.632
7	Nurses decide on the techniques and resources to use in nursing care delivery.	4.56	0.735	0.476	0.231	0.614
8	In emergency situations, nurses act according to their qualifications and knowledge.	4.42	0.837	0.484	0.254	0.611
9	Nurses administer the prescribed therapy, identify its effects, and act accordingly.	4.69	0.605	0.460	0.230	0.627
				Total Cronbach's alpha coefficient		0.682
Factor 9 - Management of Interdependent Nursing Interventions (GIEI)						
33	To manage oxygen therapy.	4.64	0.767	0.335	0.123	0.609
34	To monitor SpO2 levels with a pulse oximeter.	4.64	0.713	0.444	0.200	0.523
35	To insert a venous catheter(s) in the client, to administer the prescribed medication for symptomatic relief in ACS.	4.77	0.619	0.434	0.214	0.538
36	To collect arterial, venous, or capillary blood samples, according to medical prescription (e.g., analysis of the biochemical markers of myocardial necrosis).	4.69	0.730	0.414	0.198	0.546
				Total Cronbach's alpha coefficient		0.623

Note. ACS = acute coronary syndrome; ER = emergency room; HAIs = Healthcare-associated infections; ECG = electrocardiogram; O_2 = oxygen; ASA = acetylsalicylic acid; SpO_2 = peripheral oxygen saturation.

The inferential analysis of the knowledge on autonomous nursing interventions in patients with ACS found significant differences between the nine factors that make up the instrument.

The repeated measures ANOVA found a significant effect, and the post-hoc test revealed significant differences between all dimensions ($F = 613.449$; $p = 0.000$).

The confirmatory factor analysis, using a structural equation modeling software (IBM SPSS AMOS), confirmed the 9-factor structure that was revealed in the exploratory factor analysis (Figure 1).

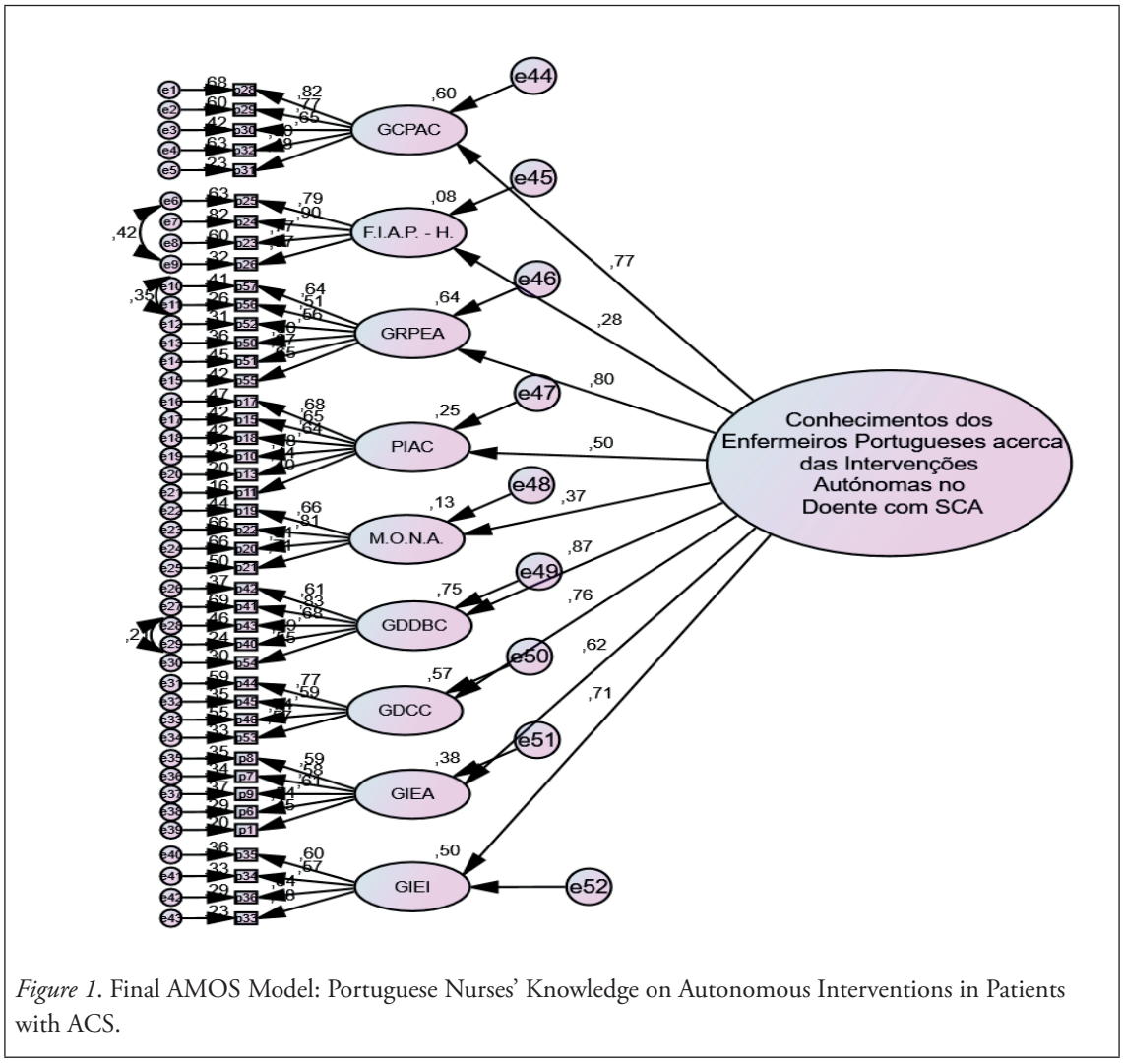

Figure 1. Final AMOS Model: Portuguese Nurses' Knowledge on Autonomous Interventions in Patients with ACS.

As recommended, different absolute fit indices were used, namely the ratio between the chi-square and the degrees of freedom (x^2/df), the Goodness-of-Fit Index (GFI), the Comparative-of-Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Root Mean square Residual (RMR), and the Standardized Root Mean square Residual (SRMR). The model has a good fit if $x^2/df < 3$; GFI and CFI > 0.90; RMSEA, RMR, and SRMR < 0.06 are considered ideal, although scores between 0.08 and 0.10 are acceptable (Marôco, 2014).

Considering the fit indexes found for the 9-factor structure and comparing them with their reference values, the fit is acceptable according to the X^2/df (2.042) and CFI and GFI (0.846; 0.826). The fit is good based on RMSEA (0.053), and the RMR score (0.069) is low and close to zero. Thus, the 9-factor structure found through the exploratory factor analysis is fit according to the confirmatory factor analysis.

Composite reliability is higher than 0.70 in almost all factors, except for factor 8 (0.689) and factor 9 (0.630).

To study convergent validity, which occurs when the items of a factor strongly load on that factor, Fornell and Larcker (1981) suggested assessing the average variance extracted (AVE) of each factor (sum of squares of factor loadings divided by the number of items), which should be ≥ 0.50. Only factors 1, 2, and 5 had scores above 0.50. The lowest AVE score was found in factor 9 (0.259), whose composite reliability was below 0.70.

Based on the contextual methodology of confirmatory factor analysis, discriminant validity assesses if the items of a given factor are not correlated with another factor by identifying if the AVE values are equal to or higher than the squared correlation between factors. Considering the squared correlations between the pairs of factors, almost all of them are lower than the AVE values of the respective factors, thus confirming the discriminant validity of this scale.

Discussion

This study has some limitations, namely the lack of scientific studies on this topic. Therefore, it was not possible to compare the results and discuss the conclusions. Nevertheless, two positive aspects should be highlighted: the development and psychometric study of the QCI-AEFDSCA tool and the analysis of this topic in a sample of 738 nurses from all over Portugal, in various healthcare settings, although this sample represents only about 1% of the nurses registered with the OE in Portugal.

Cronbach's alpha values by subscale reveal an internal consistency that varies between *reasonable* and *good*: Factor 1 – Management of care designed for client autonomy (GCPAC; $\alpha = 0.774$); Factor 2 – Management of complex therapeutic protocols (F.I.A.P. - H.; $\alpha = 0.865$); Factor 3 – Risk management and prevention of adverse events (GRPEA; $\alpha = 0.766$); Factor 4 – Initial client assessment procedures (IPCC; $\alpha = 0.711$); Factor 5 – Management of complex therapeutic protocols (M.O.N.A.; $\alpha = 0.842$); Factor 6 – Document management of client's pain and well-being (GDDBC; $\alpha = 0.747$); Factor 7 – Pain management and client empowerment (GDCC; $\alpha = 0.749$); Factor 8 – Management of autonomous nursing interventions (GIEA; $\alpha = 0.682$); Factor 9 – Management of interdependent nursing interventions (GIEI; $\alpha = 0.623$).

In turn, the elimination of 14 items, totaling 43 items, improved the internal consistency of the QCIAEFDSCA from $\alpha = 0.892$ to $\alpha = 0.930$, being rated as *very good* or *high*. Therefore, the QCIAEFDSCA seems appropriate for this sample and may constitute a valuable instrument for future studies, particularly in larger samples.

Conclusion

The questionnaire has adequate psychometric properties for assessing knowledge on autonomous nursing interventions in patients with ACS, revealing *very good* or *high* internal consistency ($\alpha = 0.930$), and explaining 56.739% of the total variance.

Regarding the implications for practice, of the nine factors assessed, nurses mostly apply the set of interventions related to the management of interdependent nursing interventions, the management of complex therapeutic protocols, and the management of care designed for client autonomy, being the remaining interventions *less valued.*

This questionnaire has a very solid and objective approach: the assessment of nurses' knowledge about autonomous nursing interventions in patients with ACS.

The first objective is to identify gaps in nurses' knowledge and adequately plan lifelong training sessions based on evidence-based clinical practice.

The adoption and promotion of a critical-reflexive methodology will significantly support nurses, asserting their importance and demonstrating their key role in care autonomy, namely through the participation, development, and/or updating of service standards, guidelines, performance protocols, quality manuals, and scientific studies aimed at achieving both the best and most appropriate levels of evidence and degrees of recommendation in the delivery of care to patients with ACS.

Hence, this questionnaire is a humble contribution to future studies on this topic. The research team believes that this instrument can be applied in the various contexts of nursing care delivery, from health institutions to education/training institutions.

Author contributions

Conceptualization: Pina, J. C., Branco, M. A., Nunes, M. M.
Data curation: Pina, J. C., Duarte, J. C., Silva, C. R.
Methodology: Pina, J. C., Branco, M. A., Nunes, M. M.
Writing – original draft: Pina, J. C., Branco, M. A., Nunes, M. M., Duarte, J. C., Silva, C. R.
Writing – review & editing: Pina, J. C., Branco, M. A., Nunes, M. M., Duarte, J. C., Silva, C. R.

References

Alves, T. M. (2015). *A pessoa em situação crítica em contexto de urgência: Dos cuidados de enfermagem prestados aos cuidados de enfermagem documentados* (Master's Dissertation). Retrieved from http://hdl.handle.net/20.500.11960/1342

Facione, P. A., Crossetti, M. G., & Riegel, F. (2017). Pensamento crítico holístico no processo diagnóstico de enfermagem. *Revista Gaúcha de Enfermagem*, *38*(3), e75576. doi: 10.1590/1983-1447.2017.03.75576

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50. doi: 10.2307/3151312

Ibanez, B., James, S., Agewall, S., Antunes, M. J., Bucciarelli-Ducci, C., Bueno, H., . . . ESC Scientific Document Group. (2018). ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European Heart Journal, 39(2)*, 119-177. doi: 10.1093/eurheartj/ehx393

Instituto Nacional de Emergência Médica, & Departamento de Formação em Emergência Médica. (2019). *Manual de suporte avançado de vida*. Lisboa, Portugal: Author.

Macedo, A., & Rosa, F. (2010). O síndrome coronário agudo nos cuidados de saúde primários. *Acta Médica Portuguesa, 23*(2), 213-222.

Marôco, J. (2014). *Análise estatística com o SPSS Statistics* (6.ª ed.). Pêro Pinheiro, Portugal: ReportNumber.

Nikolaou, N. I., Arntz, H.-R., Bellou, A., Beygui, F., Bossaert, L. L., & Cariou, A. (2015). European Resuscitation Council Guidelines for Resuscitation 2015: Section 8: Initial management of acute coronary syndromes. *Journal of the European Resuscitation Council, 95*, 264-277. doi: 10.1016/j.resuscitation.2015.07.030

Ordem dos Enfermeiros. (2015). *Estatuto da Ordem dos Enfermeiros e REPE.* Lisboa, Portugal: Author.

Ordem dos Enfermeiros. (2017). *Padrões de qualidade dos cuidados de enfermagem especializados em enfermagem médico-cirúrgica.* Lisboa, Portugal: Author.

Ordem dos Enfermeiros, & Conselho Internacional de Enfermeiros. (2008). *Linhas de orientação para a elaboração de catálogos CIPE®: «Guidelines for ICNP® Catalogue Development».* Retrieved from https://www.ordemenfermeiros.pt/arquivo/publicacoes/Docu-

ments/linhas_cipe.pdf

Ouchi, J. D., Teixeira, C., Góes Ribeiro, C. A., & Oliveira, C. C. (2017). Tempo de chegada do paciente infartado na unidade de terapia intensiva: A importância do rápido atendimento. *Ensaios e Ciência: Ciências Biológicas, Agrárias e da Saúde, 21(2)*, 92-97. doi: 10.17921/1415-6938.2017v21n2p92-97

Patel, A., Mohanan, P., Prabhakaran, D., & Huffman, M. D. (2017). Pre-hospital acute coronary syndrome care in Kerala, India: A qualitative analysis. *Indian Heart Journal, 69(1)*, 93-100. doi: 10.1016/j.ihj.2016.07.011

Pestana, M. H., & Gageiro, J. N. (2014). *Análise de dados para ciências sociais: A complementaridade do SPSS* (6.ª ed.). Lisboa, Portugal: Edições Sílabo.

PORDATA. (2017). *Óbitos por algumas causas de morte (%)*. Retrieved from https://www.pordata.pt/Portugal/%C3%93bitos+por+algumas+causas+de+morte+(percentagem) -758

Regulamento nº 429/2018 de 16 de julho. (2018). *Diário da República nº 135/2018*, *II Série*. Ordem dos Enfermeiros. Lisboa, Portugal.

World Health Organization. (2018). *World health statistics 2018: Monitoring health for the sustainable development goals: Noncommunicable diseases and mental health.* Luxembourg, Luxembourg: Author.