NANDA-I® nursing diagnoses in adult critical patients with COVID-19

Diagnósticos de enfermagem da NANDA-I® em pacientes críticos adultos portadores de COVID-19

Diagnósticos en enfermería de NANDA-I® en pacientes críticos adultos con COVID-19

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Abstract

Objective: To identify possible nursing diagnoses according to the NANDA-International classification present in critically ill adult patients with COVID-19 based on diagnostic clues described in the scientific literature.

Method: This is a descriptive study, developed in three stages: literature review and grouping of diagnostic clues identified according to Basic Human Needs; survey of NANDA-International nursing diagnoses based on the correspondence between diagnostic clues described in the literature with title and diagnostic indicators; validation of diagnostic correspondence by expert nurses. An agreement index ≥ 0.80 was used.

Results: From the reading of 20 studies, 51 diagnostic clues were selected and grouped into 11 Psychobiological Basic Human Needs. After three rounds of analysis by the experts, a correspondence of 51 diagnostic clues with 26 NANDA-International nursing diagnosis titles was identified. The domains of this classification with the highest number of diagnoses were: activity/rest (n=9); safety/protection (n=7) and nutrition (n=4). It is noteworthy that 45.1% of the diagnostic clues corresponded to more than one diagnostic title. Moreover, most nursing diagnoses (60.0%) refer to real problems and 40.0% to potential problems.

Conclusion: The results obtained allowed the identification of diagnostic clues present in critically ill adult patients with COVID-19 and to verify their equivalence with 26 diagnostic titles from NANDA-International.

Resumo

Objetivo: Identificar possíveis diagnósticos de enfermagem conforme a classificação da NANDA-*International* presentes em pacientes críticos adultos portadores de COVID-19 a partir de pistas diagnósticas descritas pela literatura científica.

Métodos: Estudo descritivo, desenvolvido em três etapas: revisão de literatura e agrupamento das pistas diagnósticas identificadas de acordo com as Necessidades Humanas Básicas; levantamento dos diagnósticos de enfermagem da NANDA-*International* a partir da correspondência entre as pistas diagnósticas descritas pela literatura com o título e indicadores diagnósticos; validação da correspondência diagnóstica por enfermeiros peritos. Foi utilizado o índice de concordância ≥ 0,80.

Resultados: A partir da leitura de 20 estudos, elegeram-se 51 pistas diagnósticas que foram agrupadas em 11 Necessidades Humanas Básicas Psicobiológicas. Após três rodadas de análise pelos peritos, identificou-se correspondência das 51 pistas diagnósticas com 26 títulos diagnósticos de enfermagem da NANDA-*International*. Os domínios dessa classificação com maior número de diagnósticos foram: atividade/repouso (n=9); segurança/proteção (n=7) e nutrição (n=4). Ressalta-se que 45,1% das pistas diagnósticas apresentaram correspondência com mais de um título diagnóstico. Além disso, a maioria dos diagnósticos de enfermagem (60,0%) refere-se a problemas reais e 40,0% a problemas potenciais.

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Conflicts of interest: none to declare.

Conclusão: Os resultados obtidos permitiram a identificação de pistas diagnósticas presentes em pacientes críticos adultos portadores de COVID-19 e verificar sua equivalência com 26 títulos diagnósticos da NANDA-*International*.

Resumen

Objetivo: Identificar posibles diagnósticos en enfermería según la clasificación de NANDA-*International* presentes en pacientes críticos adultos con COVID-19 a partir de pistas diagnósticas que se describen en la literatura científica.

Métodos: Estudio descriptivo, desarrollado en tres etapas: revisión de literatura y agrupación de las pistas diagnósticas identificadas de acuerdo con las Necesidades Humanas Básicas; recopilación de los diagnósticos de enfermería de NANDA-*International* a partir de la correspondencia entre las pistas diagnósticas que se describen en la literatura con el título e indicadores diagnósticos; validación de la correspondencia diagnóstica por enfermeros expertos. Se utilizó el índice de coincidencia ≥ 0,80.

Resultados: A partir de la lectura de 20 estudios, se eligieron 51 pistas diagnósticas que se agruparon en 11 Necesidades Humanas Básicas Psicobiológicas. Después de tres rondas de análisis de los expertos se identificó la correspondencia de las 51 pistas diagnósticas con 26 títulos diagnósticos de enfermería de NANDA-*International*. Los dominios de esa clasificación con un mayor número de diagnósticos fueron: actividad/reposo (n=9); seguridad/protección (n=7) y nutrición (n=4). Se destaca que 45,1 % de las pistas diagnósticas presentaron correspondencia con más de un título diagnóstico. Además, la mayoría de los diagnósticos de enfermería (60,0 %) se refiere a problemas reales y el 40,0 % a problemas potenciales.

Conclusión: Los resultados alcanzados permitieron la identificación de pistas diagnósticas presentes en pacientes críticos adultos con COVID-19 y verificar su equivalencia con 26 títulos diagnósticos de NANDA-*International*.

Introduction

COVID-19 refers to a new infectious disease on the world stage and, for this reason, there are gaps in the definition of its clinical, transmissible and therapeutic aspects.[1] Such gaps make the management of these patients challenging, especially in intensive care unit (ICU) environments, where there is a close relationship between life and death. For the nursing team, this challenge becomes even greater, given a scenario with shortage of human resources and devaluation of their practice. On the other hand, the relevance of nurses' clinical role is recognized in to quickly and accurately identify responses to the health conditions of each individual, considering the complexity of care required.[2]

For greater effectiveness of nursing practices, there are systems for classification of nursing diagnoses, outcomes and interventions, useful tools to guide nurses' clinical reasoning. These systems consist of standardized languages used to improve and enable communication about the health status of individuals and, consequently, improve the care provided based on a scientific basis.[3] With regard to classification systems in the context of nursing diagnoses (ND), NANDA-International (NANDA-I®) stands out.[4]

The survey of ND must be based on diagnostic reasoning that considers the so-called diagnostic clues. These can be understood as patient manifestations that represent signs, traces, signs, indications or characteristics of an ND.[5]

Studies on ND in patients with COVID-19 were the target of investigations in the context of community health[6] and hospital with analysis of medical records.[7] Nationally, studies were identified based on clinical manifestations described in guidelines of the Ministry of Health[8] and using ICNP® to relate diagnoses/outcomes and nursing interventions in patients severe cases affected by COVID-19 and sepsis.[9] It is suggested, therefore, that the survey of ND in critically ill patients with COVID-19 through diagnostic clues will favor a better understanding of the clinical aspects of this disease, which is still not fully elucidated in the literature.

In this context, with a view to improving the quality of nursing care for critically ill patients with COVID-19, it is essential to recognize which priority NDs are. In addition to this, the importance of documenting nursing care is emphasized, based on a standardized language, with a view to monitoring the clinical evolution of patients with COVID-19, for the implementation of evidence-based nursing interventions. Thus, this study aimed to identify possible ND according to the NANDA-I® classification present in adult critical patients with COVID-19, based on diagnostic clues described in the scientific literature.

Methods

This is a descriptive study, carried out between June 2020 and February 2021, in three stages: literature

review, survey of NANDA-I® ND from the diagnostic clues identified in the literature, and validation of diagnostic correspondence by expert nurses. To guide the presentation of information, the Standards for Quality Improvement Reporting Excellence (SQUIRE) version 2.0 were considered.[10]

In the first stage, a literature review[11] was carried out with the following guiding question: "What are the existing clues for identifying ND in adult critically ill patients with COVID-19?".

The bibliographic survey was carried out in the Virtual Health Library (VHL), in the Cumulative Index of Nursing and Allied Health Literature (CINAHL), in the US National Library of Medicine, National Institutes of Health (PubMed), in Scopus, in the Web of Science, and in Embase. For searches in the databases, the controlled descriptors present in the Health Sciences Descriptors (DeCS) and in the Medical Subject Headings (MeSH), plus the Boolean operators "AND" and "OR" were used, resulting in following search strategy: ("Coronavirus Infections" OR "COVID-19") AND ("SARS Virus" OR "SARS-CoV" OR "CoV-SARS") AND (Signs and Symptoms) AND ("Review" OR "Systematic Review"). It is noteworthy that this step was carried out with the help of a librarian with experience in the field of health sciences.

The inclusion criteria used for sample selection were: review articles (narrative, integrative, systematic, scoping or umbrella) published between the years 2019 to 2020, available in full, that discussed diagnostic clues present in critically ill patients with COVID-19. Considering that the topic addressed is recent in the scientific community, the choice of review articles was chosen, as this design allows obtaining comprehensive information on the clinical manifestations of COVID-19 in the world context. Reviews that targeted children and pregnant women were excluded.

To remove duplicate studies, they were imported from the databases into Endnote®. Subsequently, the screening of titles and abstracts was performed using Rayyan QCRI®, independently by two researchers (Doctor 1 and 2) and the divergent cases were evaluated by a third researcher (Doctor 3).

As diagnostic clues, the manifestations of critically ill adult patients with COVID-19 that represent signs, traces, signs, indications or characteristics of a ND were considered.[5] It is noteworthy that the identification of diagnostic clues was also performed by three researchers (Doctors 1, 2 and 3) independently. Then, the selected diagnostic clues were submitted to an approval process (Doctor 4) in order to discuss differences, being constantly checked to confirm the findings. Subsequently, diagnostic clues were grouped according to Basic Human Needs (BNH).[12] The choice for this theoretical framework was based on the fact that the BNH Theory is the most widespread among Brazilian hospital institutions, especially in the context of critical care.[13]

In the second stage, the survey of NANDA-I® ND was carried out, following the precepts of diagnostic reasoning of the Risner Model.[14] For the analysis stage, clinically relevant data extracted from the literature were categorized according to the BNH, which made it possible to identify gaps in information not covered in the bibliographic survey. For the synthesis process, the relevant diagnostic clues were grouped to compose the judgment of a diagnostic hypothesis by comparing the clues with normality standards.[14] Based on the taxonomic structure of NANDA-I, ND related to diagnostic hypotheses were sought. The definition of the diagnostic title and the correspondence of diagnostic clues with NANDA-I diagnostic indicators (related factor/risk factor, defining characteristics, associated conditions and population at risk) supported the selection of NDs using standardized language. It is noteworthy that this step was conducted by two researchers (Doctors 1 and 2) in a Microsoft Excel® spreadsheet and later discussed with two other researchers (Doctors 3 and 4) to identify differences and propose a version only.

In the third stage, correspondence validation between diagnostic clues and NANDA-I® ND was carried out by five expert nurses, independently.[15] There is divergence in the literature regarding the adequate number of experts to be included in the validation stage, with recommendations between five and ten participants being highlighted.[15,16] It is noteworthy that, in addition to the quantitative selection of experts, it is important to consider their

qualitative selection with regard to training, qualification, availability and expertise in the subject in question.[16]

For the composition of an expert committee, selection criteria were considered to ensure participants' knowledge of the subject in question, in order to certify reliability of results. Thus, five nurses were selected (located through the *Plataforma Lattes* - http://lattes.cnpq.br/) who met the following inclusion criteria: professional experience of at least five years in teaching or care and scientific production with the thematic nursing in critical care and nursing classification systems.

The following were sent to the expert nurses via e-mail: a professional profile characterization form; instrument referring to the survey of ND from the diagnostic clues described in the literature; invitation letter with detailed instructions related to filling out the instrument; file in PDF format with NANDA-I® NDs; and the informed consent form.

The document sent to the experts for validation was structured by the authors in columnar format. In the first column, BNHs were described; in the second, the diagnostic clues extracted from the review articles that made up each BNH; in the next column, the diagnostic titles as well as the diagnostic indicators (defining characteristics, related and risk factors, associated conditions or population at risk) of NANDA-I®. Thus, the diagnostic correspondence validation was based on the equivalence between the groups of diagnostic clues with NANDA-I® title and diagnostic indicators.

Expert nurses were instructed to make their notes and suggestions in a space beside each NANDA-I® ND. Each expert informed whether or not they agreed with the set of diagnostic clues identified for each BNH and NANDA-I® ND. In case of disagreement, they were also asked to explain the reasons and possible suggestions for NDs.

Data analysis was performed using the Microsoft Excel®, version 2016. The agreement index (AI) was calculated for each ND listed [AI=NC/(NC+ND)×100], where NC refers to the number of agreements, and ND, to the number of disagreements.[17] The questionnaire was circulated through the group of experts until the minimum agreement value of 80% was obtained.[15,17] As for expert characterization, a descriptive statistical analysis was performed by calculating the absolute and relative frequency. Approval was obtained by the Institutional Review Board (Opinion 4,114,490) and the recommendations of Resolution 466/2012 (CAAE (*Certificado de Apresentação para Apreciação Ética* - Certificate of Presentation for Ethical Consideration) 33855620.7.0000.5153) were followed.

Results

In the first stage, 289 studies were found in electronic and manual searches. Since they are duplicated, 52 were removed from the listing. After reviewing titles and abstracts, 205 articles were excluded, remaining 32 for full text analysis. Of these, one study was not found and 11 were excluded. Thus, 20 articles were included in the study (Figure 1).

From the reading of the 20 studies, 51 diagnostic clues were chosen in adult critically ill patients with COVID-19 (Chart 1). It should be noticed that the most prevalent diagnostic clues were: fever (50.0%), headache (45.0%), dyspnea (40.0%), fatigue (40.0%), diarrhea (35.0%), muscle pain (35.0%) and high intracranial pressure (35.0%).

As for the results of the second stage, the 51 diagnostic clues were grouped into 11 psychobiological BNHs and resulted in the identification of 23 diagnostic titles. The BNHs with the highest number of diagnostic clues were: vascular regulation (45.0%), oxygenation (16.0%) and thermal regulation (12.0%). The third stage of the study consisted of the diagnostic correspondence validation between the diagnostic clues and the NANDA-I® ND performed by expert nurses in three rounds. Most participants were female (80.0%), four with a doctorate in nursing (80.0%) and one with a master's degree in nursing (20.0%). The other characterizations of the experts are presented in table 1.

In the first round, 52.2% (n=12) of the correspondence obtained agreement of 100.0% and 17.4% (n=4) agreement of 80.0%, being, therefore, considered valid by experts. Other seven NANDA-I® NDs

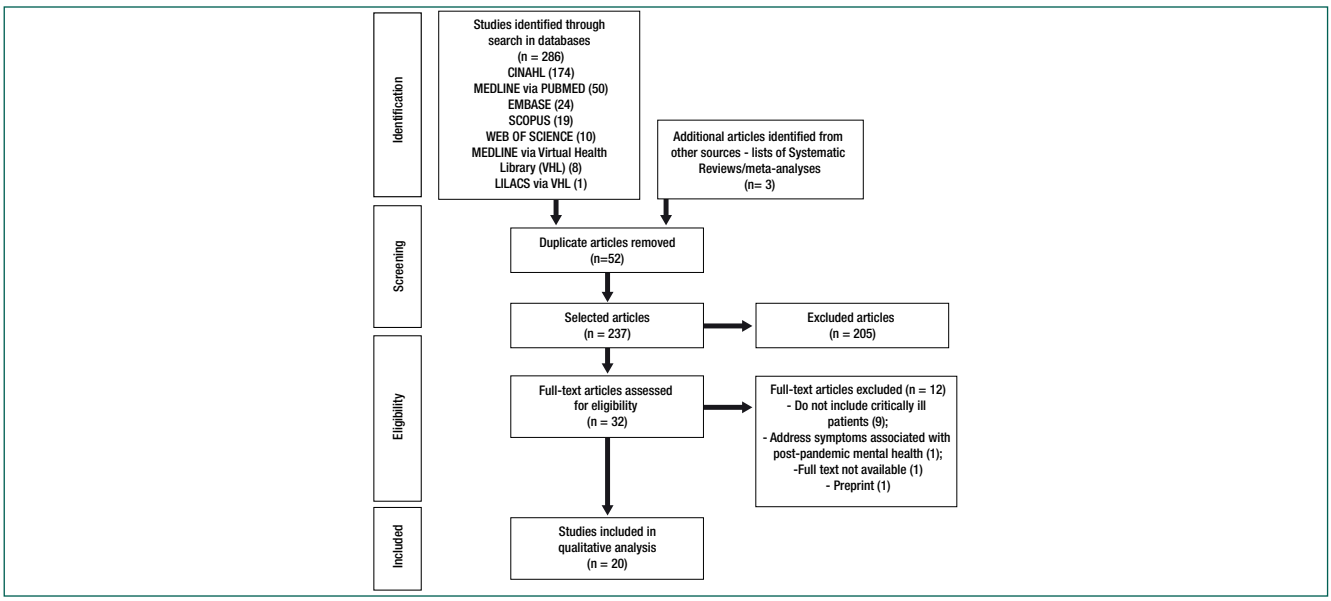

Figure 1. Selection flowchart of articles of review of the scientific literature

Chart 1. Characteristics of the studies included in the review

Country	Review type	Study objective	Diagnostic clues
Italy	Narration	Assess and compare the cardiac manifestations of COVID-19, MERS-CoV and H1N1.[18]	Arrhythmias; palpitations; tachycardia (Heart Rate>125bpm); ventricular/atrial fibrillation; hypotension; cardiac insufficiency; elevated troponin; hypoxemia; hypovolemia; risk for cardiac arrest; sepsis; systemic inflammatory response syndrome; acute coagulopathy; dyspnea; fatigue; pulmonary edema; acute kidney failure; fever; chills; chest pain.
China	Narrative	Assess the extrarespiratory manifestations of COVID-19.[19]	Ageusia; anosmia; hyposmia; anorexia; dysgeusia; nausea/vomiting; diarrhea; abdominal pain/discomfort; arrhythmias; ccardiac insufficiency; acroischemia; dizziness; raised intracranial pressure; acute kidney failure; skin injuries; convulsion; headache; chest pain; abdominal pain/discomfort; ataxia; muscle atrophy.
China	Narration	Clarify whether the SARS-CoV-2 virus can reach the central nervous system (CNS) and induce neuronal damage that leads to acute respiratory distress.[20]	Nausea/vomiting; dyspnea; fever; headache; raised intracranial pressure.
Brazil	Systematic	Review the literature on neurological complications of SARS-CoV-2 infection.[21]	Ageusia; anosmia; dizziness; fatigue; convulsion; muscle pain; headache; ataxia; muscle atrophy; raised intracranial pressure.
Iran	Narration	Review studies on the neurological manifestations of COVID-19.[22]	Ageusia; anosmia; hyposmia; dizziness; encephalitis; convulsion; muscle pain; headache; ataxia; muscle atrophy; raised intracranial pressure.
France	Narration	Review current knowledge about neurological sequel of COVID-19 and its possible etiology.[23]	Dizziness; agitation; confusion; dyspnea; fever; headache; raised intracranial pressure.
Belgium	Narration	Update the evidence about the prognosis of critically ill diabetic patients affected by COVID-19.[24]	Hyperglycemia; ketoacidosis; hypoxemia; oxygenation 300 mmHg; Tachypnea (Respiratory Rate > 30rpm).
USA	Systematic	Describe neurological and psychological effects of COVID-19 based on a literature review.[25]	Dizziness; convulsion; muscle pain; headache; raised intracranial pressure.
Italy	Systematic	Synthesize the available evidence on the main neurological signs and symptoms in patients with COVID-19.[26]	Dizziness; agitation; cerebral hemorrhage; convulsion; headache; raised intracranial pressure.
China	Narration	Report the gastrointestinal manifestations and pathological findings of patients with COVID-19 and discuss the possibility of fecal transmission of the virus.[27]	Anorexia; Nausea/vomiting; diarrhea; abdominal pain/discomfort; gastrointestinal bleeding; abdominal pain/discomfort.
Germany	Narration	Present the main cutaneous symptoms described in the literature for patients with COVID-19.[28]	Acroischemia; cold ends; dry gangrene; skin injuries.
China	Systematic	Assess the prevalence of comorbidities in patients with COVID-19 and acute respiratory syndrome.[29]	Dyspnea; fatigue; fever.
China	Narration	Not described.[1]	Nausea/vomiting; diarrhea; arrhythmias; elevated troponin; dyspnea; fatigue; acute kidney failure; fever; headache; sore throat.
India	Narration	Summarize types, morphology, origin, transmission, symptoms and diagnostic methods of the SARS virus-CoV-2.[30]	Diarrhea; dyspnea; fatigue; fever; chest pain.
Taiwan	Narration	Analyze the evidence on how the digestive system and liver are affected by the SARS virus-CoV-2.[31]	Anorexia; nausea/vomiting; diarrhea; abdominal pain/discomfort.
China	Narration	Understand the mechanism of viral sepsis caused by COVID-19.[32]	Weak peripheral pulse; cold ends; acute renal failure.
Taiwan	Narration	Not described.[33]	Nausea/vomiting; diarrhea; confusion; dyspnea; hemoptysis; fever; muscle pain; headache; sore throat; chest pain.
Poland	Narration	Present the typical symptoms of COVID-19.[34]	Fever; muscle pain; fatigue; chest pain; systemic inflammatory response syndrome; hypoxemia; arrhythmias; elevated troponin.
Poland	Narration	Present information on the etiology, pathogenesis, diagnosis, clinical picture, treatment and prevention of COVID-19.[35]	Fever; fatigue; muscle pain; sore throat; diarrhea; hemoptysis; chills; sepsis.
India	Narration	Not described.[36]	Dyspnea; muscle pain; fever; fatigue; acute kidney failure; encephalitis.

Table 1. Characterization of the sample of expert nurses

Sample characterization	n(%)
Female	4(80.0)
Professional experience	
5 to 10 years	1(20.0)
10 to 20 years	3(60.0)
20 to 40 years	1(20.0)
Scientific production on the theme of nursing care in the ICU and nursing classification systems	
Publication in Qualis CAPES A1/A2/A3/B1 magazines or journals	4(80.0)
Presentation of work at a national or international scientific event	3(60.0)
Subject in master's thesis or doctoral thesis	2(40.0)

ICU - Intensive Care Unit

(30.4%) showed agreement below 80.0%. For these, experts suggested including diagnostic clues and diagnostic titles that had not been previously listed, therefore, a second round of validation was needed.

The result of the second round showed that 73.9% (n=17) of the ND had 100% agreement, and 26.1% (n=6) had 80% agreement, being therefore considered valid by experts. Also in the second round, the inclusion of three new NDs were suggested.

The result of the third round of validation indicated the inclusion of "Impaired tissue integrity", "Risk for pressure injury" and "Risk for unstable blood glucose", all with 100.0% of agreement among experts. Thus, at the end of the third round, the 51 diagnostic clues resulted in the identification of 26 NANDA-I® NDs.

The NANDA-I® domains with the highest number of NDs were activity/rest (n=9); safety/protection (n=7) and nutrition (n=4). It is noteworthy that 23 diagnostic clues (45.1%) corresponded with diagnostic indicators (related and risk factors, defining characteristics, associated conditions and population at risk) present in more than one NANDA-I® ND. All diagnostic clues corresponded to at least one NANDA-I® ND. Furthermore, most ND (60.0%) refer to real problems and 40.0% to potential problems. Chart 2 presents the final result of the diagnostic correspondence validation between diagnostic clues and NANDA-I® ND.

Discussion

From the analysis of the diagnostic clues identified in the studies, it was found that all were grouped into Psychobiological BNH, with emphasis on Vascular Regulation and Oxygenation, which consequently culminated in the survey of NDs in the domain "activity/rest" and class "cardiovascular responses /pulmonary". This result may be related to the pathogenesis of COVID-19, in which most severe cases admitted to ICU present comorbidities such as systemic arterial hypertension and respiratory failure.[1] This fact is confirmed in another study, which also shows a predominance of clinical manifestations aimed at cardiac and pulmonary responses.[37]

There is a lack in the literature on the relationship between cardiovascular alterations and symptoms of COVID-19. However, studies show a similarity in the pathophysiological mechanism of cardiac injury caused by SARS-CoV-2 with that of pulmonary involvement. It is believed to be related to the virus's affinity for the angiotensin-converting enzyme (ACE) II,[38] highly expressed in the lungs and heart, allowing infection of these organs and dissemination of the virus.[39] Injury to cardiac tissue can also be associated with an exacerbated inflammatory response, which leads to high levels of cytokines and hypoxia, resulting from pulmonary impairment or ischemic injury due to vascular alterations.[40] Therefore, these alterations may favor the presence of diagnostic clues such as weak peripheral pulse, cold extremities, hypotension, hypoxemia, systemic inflammatory response syndrome, acute coagulopathy, ventricular/atrial fibrillation, among others.

Other NDs in the activity/rest domain were specifically associated with oxygenation, such as "Impaired spontaneous ventilation", "Ineffective breathing pattern" and "Dysfunctional ventilatory weaning response". It is known that the main target of the coronavirus pathogen is the respiratory system. It is believed that primary viral replication occurs in the mucosal epithelium of the upper respiratory tract, with greater multiplication in the lower respiratory tract and gastrointestinal mucosa, giving rise to mild viremia. It can also cause acute lung injury with consequent "Impaired gas exchange", aggravating acute respiratory distress syndrome (ARDS) and pulmonary failure.[20] Therefore, diag-

Chart 2. Final result of the diagnostic correspondence validation between the diagnostic clues identified in the literature and the NANDA-I® ND performed by expert nurses

BNH	Diagnostic clues	Diagnostic title*	Domain/Class*	Corresponding diagnostic indicators**	%
Food	Ageusia; Anorexia; Anosmia; Dysgeusia; Hyposmia	Imbalanced nutrition: less than body requirements	Nutrition/Intake	Defining characteristics: Alteration in taste sensation; Food intake less than recommended daily allowance. Related factor: Insufficient dietary intake.	100
Elimination	Diarrhea; Abdominal pain/Discomfort	Diarrhea	Elimination and exchange/ Gastrointestinal function	Defining characteristics: Colic; Abdominal pain; Associated conditions: Infection.	80
	Nausea/Vomiting	Nausea	Comfort/Physical comfort	Defining characteristics: Feeling sick. Associated conditions: Biochemical dysfunction; Gastrointestinal irritation.	100
Hormone regulation	Hyperglycemia; Ketoacidosis	Risk for metabolic imbalance syndrome	Nutrition/Metabolism	Defining characteristic: Risk for unstable blood glucose.	100
		Risk for unstable blood glucose	Nutrition/Metabolism	Defining characteristic: Insufficient diabetes management	100
Vascular regulation	Arrhythmias; palpitations; tachycardia (HR >125 beats per minute - bpm); ventricular/atrial fibrillation; hypotension; cardiac insufficiency; elevated troponin; weak peripheral pulse	Risk for decreased cardiac output	Activity and rest/Cardiovascular and pulmonary responses	Associated conditions: altered contractility, alteration in heart rate, alteration in rhythm.	80
	Acroischemia; weak peripheral pulse; cold ends; dry gangrene	Ineffective peripheral tissue perfusion	Activity and rest/Cardiovascular and pulmonary responses	Defining characteristics: alteration in skin characteristics; capillary refill time > 3 seconds; decrease in peripheral pulses; decrease in blood pressure in extremities.	100
	Hypotension; hypoxemia; risk for cardiac arrest; sepsis; systemic inflammatory response syndrome	Risk for shock	Safety and protection/Physical injury	Associated conditions: hypotension; hypoxemia; infection; sepsis; systemic inflammatory response syndrome.	80
	Acute coagulopathy; hemoptysis; cerebral hemorrhage; gastrointestinal bleeding	Risk for venous thromboembolism	Safety and protection/Physical injury	Populations at risk: admission to Intensive Care Unit.	80
		Risk for bleeding	Safety and protection/Physical injury	Associated conditions: inherent coagulopathy; gastrointestinal condition.	80
	Dizziness; acute coagulopathy; ventricular/atrial fibrillation; encephalitis	Risk for ineffective cerebral tissue perfusion	Activity and rest/Cardiovascular and pulmonary responses	Associated conditions: coagulopathy; atrial fibrillation.	80
	Hypovolemia; hypoxemia	Risk for decreased cardiac tissue perfusion	Activity and rest/Cardiovascular and pulmonary responses	Associated conditions: hypovolemia; hypoxemia	100
	Arrhythmias; increase in intracranial pressure	Risk for unstable blood pressure	Activity and rest/Cardiovascular and pulmonary responses	Associated conditions: cardiac arrhythmia; increase in intracranial pressure.	100
Neurological regulation	Agitation; confusion	Acute confusion	Perception and cognition/ Cognition	Defining characteristics: agitation; alteration in level of consciousness.	100
	Brain hemorrhage; hypotension; encephalitis; increase in intracranial pressure	Decreased adaptive capacity, intracranial	Coping and stress tolerance/ neurobehavioral stress	Associated conditions: systemic hypotension with intracranial hypertension; brain injury.	100
Oxygenation	Oxygenation (≤ 300 mm mercury - mmHg); dyspnea; tachycardia (HR>125bpm); agitation; hypoxemia	Impaired spontaneous ventilation	Activity and rest/Cardiovascular and pulmonary responses	Defining characteristics: increase in heart rate; decrease in arterial oxygen saturation; decrease in partial pressure of oxygen; dyspnea; restlessness.	100
	Dyspnea; tachypnea (FR>30 irpm); fatigue	Ineffective breathing pattern	Activity and rest/Cardiovascular and pulmonary responses	Defining characteristics: Abnormal breathing pattern dyspnea; tachypnea. Related factor: fatigue; hyperventilation.	100
	Oxygenation (≤ 300 millimeters of mercury - mmHg); confusion; dyspnea; hypoxemia; agitation; tachycardia (HR>125bpm)	Impaired gas exchange	Elimination and exchange/ Respiratory function	Defining characteristics: confusion; dyspnea; hypoxemia; hypoxia; restlessness; tachycardia. Associated conditions: Alveolar-capillary membrane changes; ventilation-perfusion imbalance.	100
	Tachypnea (FR>30irpm); fatigue; agitation; confusion; tachycardia (HR>125bpm); hypoxemia; dyspnea;	Dysfunctional ventilatory weaning response	Activity and rest/Cardiovascular and pulmonary responses	Defining characteristics: respiratory distress; moderate increase in respiratory rate over baseline; fatigue; restlessness; increase in heart rate from baseline (> 20 mmHg); decrease in level of consciousness.	100
Hydrosaline regulation	Pulmonary edema; acute renal failure	Excessive fluid volume	Nutrition/Hydration	Defining characteristics: pulmonary congestion; electrolyte imbalance; edema; oliguria.	100
Skin integrity	Skin injuries; acroischemia; dry gangrene	Impaired skin integrity	Safety and protection/ Physical injury	Defining characteristics: altered skin integrity. Associated conditions: impaired circulation.	100
		Impaired tissue integrity	Safety and protection/ Physical injury	Defining characteristics: tissue damage; destroyed tissue. Associated conditions: impaired circulation.	100
		Risk for pressure injury	Safety and protection/ Physical injury	Associated conditions: impaired circulation; decrease in tissue oxygenation; decrease in tissue perfusion.	100

Continue...

Continuation.

BNH	Diagnostic clues	Diagnostic title*	Domain/Class*	Corresponding diagnostic indicators**	%
Thermal control	Fever; convulsion; chills; tachycardia (HR >125 bpm); tachypnea (FR>30 irpm); hypotension	Hyperthermia	Safety and protection/ Thermoregulation	Defining characteristics: Tachycardia; tachypnea; convulsion; skin warm to touch; hypotension.	100
Pain perception	Self-report of: muscle pain; headache; sore throat; chest pain; abdominal pain/ discomfort	Acute pain	Comfort/ physical comfort	Defining characteristics: change in physiological parameter; self-report of intensity using standardized pain scale; self-report of pain characteristics using standardized pain instrument; expressive behavior.	100
Locomotion	Ataxia; muscle atrophy	Impaired physical mobility	Activity and rest/ Activity and exercise	Defining characteristics: uncoordinated movement; decrease of fine and gross motor skills. Related factors control, strength and decreased muscle mass. Associated conditions: musculoskeletal impairment; neuromuscular impairment.	100

BHN - Basic Human Need; HR - Heart rate; RR - Respiratory rate; bpm – beats per minute; irpm – respiratory incursions per minute; *NANDA-I® Taxonomy; ** Defining characteristics, related and risk factors, associated conditions or population at risk according to NANDA-I® Taxonomy

nostic clues such as dyspnea; tachypnea; tachycardia; agitation; hypoxemia; fatigue and confusion are identified in critically ill patients with COVID-19.

As for "Impaired physical mobility", whose diagnostic clues were the manifestations of ataxia and muscle atrophy,[19,21,22] it is known that given the clinical profile of critically ill patients, they tend to remain restricted to bed. This is a limitation imposed by the pathology itself and the treatments needed to recover from pulmonary impairment, in addition to the use of sedatives and vasoactive drugs.[18] The identification of this ND is essential, as it is associated with planning interventions capable of preventing other possible NDs resulting from motor impairment, such as "Impaired skin integrity" and "Impaired tissue integrity".

Regarding the NDs in the safety/protection domain, such as "Risk for bleeding" and "Risk for venous thromboembolism", the literature established acute coagulopathy as the main diagnostic clue.[18] Coagulation disorders in patients with COVID-19 are associated with increased levels of D-dimer and fibrinogen, in addition to lymphopenia and thrombocytopenia. It is suggested that endothelial dysfunction also plays an important role that contributes to increased thrombin and blocking fibrinolysis, which leads to hyper coagulopathy.[41] Therefore, it is essential that nurses monitor hemoglobin/hematocrit levels and coagulation tests, including prothrombin time, partial thromboplastin, fibrinogen, among other factors.[41]

Gastrointestinal manifestations can affect between 3% and 79% of patients with COVID-19, being more common in severe cases.[42,43] Among the possible ND, we can mention "Diarrhea" and "Nausea". It is noteworthy that, in many cases, in the absence of respiratory symptoms, diarrhea can be the first symptom before the disease is diagnosed.[28] The mechanisms involved in the development of gastrointestinal symptoms are still unknown, but the cause is probably the epithelial damage caused by the virus.[28]

As for "Imbalanced nutrition: less than body requirements", the main diagnostic clues described in the literature were ageusia/dysgeusia and anosmia/hyposmia.[19,21,22] It is known that the loss or decrease in smell and taste are characteristic chemosensory changes in COVID-19, even in the absence of nasal congestion. Although the mechanism associated with these symptoms is not completely elucidated, in relation to taste, the virus can bind to sialic acid receptors, increasing the degradation of glycoproteins that transport taste molecules. Impaired olfactory perception, in turn, is associated with direct damage from early neural death induced by exacerbated release of inflammatory factors.[44]

The identification of "Acute pain", especially when dealing with critically ill patients, is important to attenuate subsequent physical and psychological complications. Specifically in the context of ICU, patients unable to communicate, undergoing sedation, invasive mechanical ventilation or with acute confusion are at increased risk for untreated pain. Physiological parameters, such as heart and respiratory rate and blood pressure, could be used to assess pain; however, they are nonspecific

elements and are highly vulnerable to the effects of drugs.[45] Thus, it is reinforced that, although the diagnostic clues identified in this study are based on self-report of pain, it is important that nurses have other methods of pain assessment, including objective indicators that can be verified without verbal communication.[45]

It is noteworthy that the studies included in this review did not find diagnostic clues associated with psychosocial and spiritual aspects. However, it should not be overlooked that patients with COVID-19 admitted to ICU are susceptible to problems related to communication, social isolation, anxiety, fear and spiritual suffering, and, therefore, they require the identification of NDs.[46]

Among the limitations presented in this study, the inclusion of some medical diagnoses, such as pulmonary edema, cardiac insufficiency, acute renal failure, systemic inflammatory response syndrome, as diagnostic clues. The choice to maintain these medical diagnoses for the survey of ND was based on the fact that they were described by the studies included in the review as important clinical manifestations in critically ill patients with COVID-19. Furthermore, it is noteworthy that these are associated conditions described by NANDA-I®.

Another limitation of this study is based on the survey of diagnostic clues based on secondary data from review studies. The choice for such a strategy is based on the fact that it is a newly discovered infectious disease, whose clinical aspects are being elucidated. However, the diagnostic clues listed in the studies allowed to reflect the reality experienced in clinical practice in different countries, which minimizes this limitation.

Conclusion

This study allowed us to identify diagnostic clues present in critically ill adult patients with COVID-19 and to verify their equivalence with 26 NANDA-I® diagnostic titles. In clinical practice, the identified ND may support the construction of instruments for collecting nursing data for patients with COVID-19 hospitalized in ICU, in addition to favoring the creation of software to support the nursing process recording. Studies on classifications with standardized languages in Brazil, including NANDA-I®, still focus primarily on the development of terminology; however, it is necessary to advance, including its documentation in electronic records so that the data can be analyzed, evidencing nursing care in practice.

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Collaborations

Azevedo C, Moura CC, Salgado PO, Mata LRF, Domingos CS, Ercole FF, Chianca TCM and Toledo LV contributed to study design, data analysis and interpretation, article writing, relevant critical review of intellectual content and approval of the version final to be published.

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