

The analysis of nursing diagnoses determined by students for patients in rehabilitation units

Jeongeon Park^{1,2}, Sungmoon Jeong^{1,*}

¹Department of Medical Informatics, School of Medicine, Kyungpook National University, Daegu, Korea

²Department of Nursing, Kwangju Women's University, Kwangju, Korea

This study aimed to analyze nursing diagnoses determined by the nursing students for patients in rehabilitation unit. Data were collected from 190 case reports submitted by the nursing students who practiced in the rehabilitation unit, and analyzed on the basis of North American Nursing Diagnosis Association (NANDA) International, Inc. nursing diagnoses. Thirty different diagnoses were documented in rehabilitation unit. The most frequent nursing diagnosis was impaired physical mobility ($n=68$, 14.6%). The 30 diagnoses were grouped into 10 domains

and 20 classes of the NANDA International, Inc. human response patterns. The average quality of nursing statements corresponded to a score of 8.63, indicating relatively good quality. The results of this study will help to improve the quality of nursing process education and provide guidelines to improve the quality of nursing care for the rehabilitation nursing situation in Korea.

Keywords: Nursing diagnosis, Rehabilitation, Nursing process, Students

INTRODUCTION

Nursing is part of the healthcare system and includes activities for the maintenance and promotion of health status; prevention of disease; and care for individual, family, and community in all healthcare environments. To guarantee the adequacy of nursing care, nursing staff share the task of planning with healthcare professionals (Adamy et al., 2019; Azevedo and Cruz, 2021). While providing nursing care, nurses use the nursing process to solve a patient problem that includes assessments, diagnoses, plans/interventions, and evaluations (Alsadat Hosseini et al., 2021; Feo et al., 2018). The five sequential steps of the nursing process are essential for nursing education and practice because they help minimize mistakes or omissions by systematizing nursing through a dynamic and cyclical process to improve health status of the patients and guide nurses to patient-centered nursing care (Chang et al., 2021; Mousavinasab et al., 2020; Seçer and Karaca, 2021; Sezer and Şahin, 2021).

In Korea, since the 1980s, the nursing process has been actively

applied in clinical practice; nursing students receive education on major subjects and have the opportunity to clinically apply the nursing process. In particular, the nursing process helps them to accurately understand the health problems of patients in clinical practice and study scientific evidence. Thus, the Korean Accreditation Board of Nursing has set the nursing process as one of the major learning outcomes to be achieved before graduation. As nurses' ability to perform the nursing process leads to evidence-based practical competency, continuous attention to the nursing process is required in education and practice (Jung and Yoo, 2022; Koldestam et al., 2021; Song et al., 2019).

Despite the fact that the nursing process is an important indicator covering a high proportion of guidance and evaluation areas in clinical practice education, it is reported that nursing students still have difficulties in the clinical application of this process. In other words, the significance of the nursing process in clinical practice has been emphasized, but specific efforts for improvement remain insufficient (Bayram et al., 2022; Keiffer, 2018; Melin-Johansson et al., 2017; Parvan et al., 2021).

*Corresponding author: Sungmoon Jeong  <https://orcid.org/0000-0002-4579-3150>
Department of Medical Informatics, School of Medicine, Kyungpook National University, 680 Gukchaebosang-ro, Jung-gu, Daegu 41944, Korea
Email: jeongsm00@gmail.com

Received: July 18, 2022 / Accepted: August 24, 2022

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Therefore, it is necessary to review the nursing process written by nursing students in the undergraduate course first, as part of a specific effort to reduce difficulties of nursing students in applying the nursing process and to help them apply the nursing process correctly. For this, it is necessary to review the nursing course report that nursing students actually write after clinical practice. In particular, it is necessary to examine whether the nursing diagnosis, which is the essence of the nursing process, is being made correctly.

Nursing diagnosis is a statement that reflects whether nursing students well identified the patient's problem (signs or symptoms) and related/risk factors in the initial assessment stage. When a correct nursing diagnosis is made, it leads to correct nursing intervention and evaluation, but when a diagnosis is made incorrectly, the direction of intervention and evaluation is also wrong.

The ability to identify patient problems is a very important factor in patient care, and precise description of patient problems or demands in the statement of nursing diagnosis is also an important precondition to ensure quality patient care. Therefore, in order to analyze whether nursing students made the correct nursing diagnosis by properly selecting the defining characteristic and related/risk factors that are indicators of nursing diagnosis, it is necessary to closely examine the nursing diagnosis actually made by nursing students. In the review process, we used quality of nursing diagnosis (QOD), a quality evaluation tool for nursing diagnosis (Florin et al., 2005) to more objectively measure the accuracy and QOD.

Therefore, the purpose of this study was to identify the frequent nursing diagnosis applied to rehabilitation patients, and to identify the defining characteristics and related or risk factors of each diagnosis by reviewing case reports reported by nursing students during clinical practice in the rehabilitation unit. In addition, in order to evaluate the accuracy of nursing diagnosis described by students, the QOD is also evaluated.

MATERIALS AND METHODS

Research design

This was a retrospective study using the North American Nursing Diagnosis Association (NANDA) International, Inc. nursing diagnoses to analyze and identify the key nursing diagnoses in case reports submitted by 4th grade nursing students who had completed rehabilitation nursing practice.

Data collection

This study analyzed nursing diagnoses extracted from 190 case

reports submitted by 4th grade nursing students in the department of nursing at Kyungpook National University (approval number: 2022-0157) who had completed rehabilitation nursing practice from the first semester and the second semester from 2018 to 2019 (clinical practice for 8 weeks at one general hospital in Korea). Case reports that include nursing processes consisting of patient assessment and intervention data are the basis for nursing diagnoses recorded by students during the clinical practice period. Usually, students observe and provide nursing care to patients and then select one of them to write a case report focusing on the nursing process. Students are required to make at least one nursing diagnosis per patient.

Data analysis

Using the case reports recorded by nursing students, the researchers entered demographic information, code of selected NANDA International, Inc. nursing diagnoses, defining characteristics (symptoms or signs), and related/risk factors into Microsoft Access. The validity of the analysis process was secured by categorizing it based on opinions agreed upon through discussion between two researchers.

Data preprocessing

As preprocessing for the analysis, we refined the nursing diagnoses recorded in the students' case reports. Nursing students can make more than one diagnosis when multiple problems are identified in a patient. The diagnoses were reviewed, and in the case of different translations of English nursing diagnosis, the same type of diagnosis was unified according to the NANDA International, Inc. list (Herdman and Kamitsuru, 2018). If the students used the defining characteristic and related/risk factors suggested by NANDA International, Inc. but did not find the appropriate diagnosis, we were matched with the most appropriate diagnosis from the list of diagnoses. A small number of other medical diagnoses and nursing problems with ambiguous meanings were excluded from the analysis.

NANDA International, Inc. nursing diagnoses

A nursing diagnosis is a scientific decision of the response of individuals, families, or communities about actual/potential-health problems and processes of life. The NANDA International, Inc. nursing diagnoses included 244 diagnoses for clinical practice, test, and refinement. The diagnoses are classified with 13 domains and 47 classes. The domain is an area of interest (e.g., health promotion, nutrition, elimination/exchange, activity and rest, percep-

tion and cognition, self-perception, role of relationships, sexuality, coping and stress tolerance, life principles, safety and protection, and comfort) for nurses. The domains are classified into classes, which are groupings that share properties in common. The NANDA International, Inc. nursing diagnoses are submitted and reviewed by nurses based on evidence from various countries. The association is continuously revised and developed every 4 years with the approval of practicing nurses, nursing researchers, and nursing educators worldwide (Herdman and Kamitsuru, 2018; Zhang et al., 2021).

Appropriateness and quality of nursing diagnoses

When evaluating the adequacy of nursing diagnoses, it is important to note that just having a diagnosis or a list of diagnoses is not enough. As each nursing diagnosis has a definition and label, the researcher must know the diagnostic indicators. Thus, the appropriateness of nursing diagnoses was confirmed through a quantitative evaluation of the extent to which the defining characteristics of the diagnoses were reflected at the nursing assessment stage. Diagnostic indicators are the information used to distinguish different diagnoses and include defining characteristics, related or risk factors. Defining characteristics are observable clues that are categorized as signs or symptoms of a problem-focused or health-promotion diagnosis. Nursing assessments support the accuracy of the diagnosis by identifying a number of defining characteristics (De Groot et al., 2019; Zhang et al., 2021).

The quality of nursing diagnostic statements was assessed using the QOD tool. The QOD scale consists of four components and 14 criteria that evaluate diagnostic structure and relevance. The four components reflect the problem, etiology, and signs/symptoms (PES) format with an additional general component. Each criterion was given one point, with a maximum score of 14 points. Higher scores indicated better quality of the nursing diagnostic statements. The quality evaluation was performed by two experts with experience in clinical practice guidance. In a previous study, the Cronbach alpha value was reported as 0.86 (Florin et al., 2005), and the value derived from the Kuder–Richardson formula for this study was 0.80.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of Kyungpook National University (approval number: 2022-0157). The case reports used for data analysis were submitted and used in the study after deleting all personally identifiable information. The IRB approved the waiver of consent to access the data.

RESULTS

General characteristics of the patients in rehabilitation units

The sample for the study composed of nursing records of patients in rehabilitation units. A total of 190 case reports were collected for analysis. The sample for research consisted of data from 108 men and 82 women with an average age of 62.2 and 63.4 years, correspondingly. Almost half of the patients were over 65 years old, and the age range was 22 to 82 years. The most prevalent medical diagnoses were stroke (n = 70, 36.8%), hemiplegia (n = 44, 23.2%), paraplegia or tetraplegia (n = 34, 17.9%), intracerebral hemorrhage (n = 11, 5.8%), intracranial injury (n = 9, 4.7%), spinal cord injury (n = 9, 4.7%), neuropathy (n = 6, 3.2%), cancer

Table 1. Characteristics of the included patients (n=190)

| Variable | Value |
|-----------------------------|------------|
| Sex | |
| Male | 108 (56.8) |
| Female | 82 (43.2) |
| Age (yr) | 62.8 |
| < 50 | 15 (7.9) |
| 50–64 | 85 (44.7) |
| ≥ 65 | 90 (47.4) |
| Medical diagnosis | |
| Stroke | 70 (36.8) |
| Hemiplegia | 44 (23.2) |
| Paraplegia and tetraplegia | 34 (17.9) |
| Intracerebral hemorrhage | 11 (5.8) |
| Intracranial injury | 9 (4.7) |
| Spinal cord injury | 9 (4.7) |
| Neuropathy | 6 (3.2) |
| Cancer | 5 (2.6) |
| Others | 2 (1.1) |
| Department of consultation* | |
| Neurology | 83 (45.4) |
| Internal medicine | 48 (26.2) |
| Orthopedics | 32 (17.5) |
| Family Medicine | 8 (4.4) |
| Neuropsychiatry | 6 (3.3) |
| Pain clinic | 6 (3.3) |
| Types of rehabilitation* | |
| Exercise therapy | 157 (32.1) |
| Thermotherapy | 143 (29.2) |
| Occupational therapy | 125 (25.6) |
| Speech therapy | 64 (13.1) |

Values are presented as mean or number (%).

*Multiple checks possible.

(n = 5, 2.6%), and others (n = 2, 1.1%). The collaboration departments most visited by rehabilitation patients were neurology (n = 83) and internal medicine (n = 48), followed by orthopedics (n = 32), family medicine (n = 8), neuropsychiatry (n = 6), and pain clinics (n = 6). The types of rehabilitation treatments were as follows: exercise therapy (n = 157), thermotherapy (n = 143), occupational therapy (n = 125), and speech therapy (n = 64) (Table 1).

The frequent nursing diagnoses

Thirty nursing diagnoses were decided by the nursing students. The most prevailing nursing diagnoses were impaired physical mobility (n = 68, 14.6%), activity intolerance (n = 63, 13.5%), deficient knowledge (n = 60, 12.9%), bathing self-care deficits (n = 34,

7.3%), risk for injury (n = 34, 7.3%), toileting self-care deficits (n = 31, 6.7%), chronic pain (n = 28, 6.0%), impaired comfort (n = 26, 5.6%), powerlessness (n = 15, 3.2%), and disturbed body image (n = 11, 2.4%). Ten nursing diagnoses constituted 79.5% of diagnoses for patients in rehabilitation units. Of these, the top five nursing diagnoses (impaired physical mobility, activity intolerance, deficient knowledge, bathing self-care deficit, risk for injury) constituted nearly 50% of diagnoses for patients in rehabilitation units (Table 2).

Thirty different nursing diagnoses selected by nursing students were distributed across 10 domains and 20 classes of the NANDA International, Inc. I human response patterns: health promotion (domain code (1), nutrition (2), elimination and exchange (3), ac-

Table 2. Frequencies of NANDA International, Inc. nursing diagnoses for patients in rehabilitation units

| Domain (code) | Class (code) | Nursing diagnoses (diagnosis code) | No. (%) |
|------------------------------|--|---|-----------|
| Health promotion (1) | Health management (2) | Ineffective health management (00078) | 5 (1.1) |
| Nutrition (2) | Ingestion (1) | Imbalanced nutrition: less than body requirements (00002) | 3 (0.6) |
| | | Impaired swallowing (00103) | 6 (1.3) |
| Elimination and exchange (3) | Urinary function (1) | Impaired urinary elimination (00016) | 4 (0.9) |
| | Gastrointestinal function (2) | Reflux urinary incontinence (00018) | 3 (0.6) |
| | | Constipation (00011) | 7 (1.5) |
| Activity/rest (4) | Activity/exercise (2) | Risk for disuse syndrome (00040) | 4 (0.9) |
| | Cardiovascular/pulmonary responses (4) | Impaired physical mobility (00085) | 68 (14.6) |
| | Self-care (5) | Activity intolerance (00092) | 63 (13.5) |
| | | Feeding self-care deficit (00102) | 9 (1.9) |
| | | Bathing self-care deficit (00108) | 34 (7.3) |
| | | Dressing self-care deficit (00109) | 7 (1.5) |
| | | Toileting self-care deficit (00110) | 31 (6.7) |
| Perception/cognition (5) | Attention (1) | Unilateral neglect (00123) | 4 (0.9) |
| | Cognition (4) | Deficient knowledge (00126) | 60 (12.9) |
| | Communication (5) | Impaired verbal communication (00157) | 8 (1.7) |
| Self-perception (6) | Self-esteem (2) | Situational low self-esteem (00120) | 6 (1.3) |
| | Body image (3) | Disturbed body image (00118) | 11 (2.4) |
| Role relationship (7) | Family relationships (2) | Dysfunctional family processes (00063) | 5 (1.1) |
| | Role performance (3) | Ineffective role performance (00055) | 3 (0.6) |
| Coping/stress tolerance (9) | Coping responses (2) | Ineffective coping (00069) | 7 (1.5) |
| | | Anxiety (00146) | 6 (1.3) |
| | | Powerlessness (00125) | 15 (3.2) |
| Safety/protection (11) | Physical injury (2) | Risk for injury (00035) | 34 (7.3) |
| | Thermoregulation (6) | Risk for aspiration (00039) | 3 (0.6) |
| | | Risk for impaired skin integrity (00047) | 3 (0.6) |
| | | Hyperthermia (00007) | 1 (0.2) |
| Comfort (12) | Physical comfort (1) | Chronic pain (00133) | 28 (6.0) |
| | Environmental comfort (2) | Impaired comfort (00214) | 26 (5.6) |
| | Social comfort (3) | Social isolation (00053) | 2 (0.4) |
| Total | | | 466 (100) |

NANDA, North American Nursing Diagnosis Association.

tivity/rest (4), perception/cognition (5), self-perception (6), role relationship (7), coping/stress tolerance (9), safety/protection (11), and comfort (12). The domains most often chosen by the nursing students were activity/rest (46.4%), perception/cognition (15.5%), comfort (12.0%), safety/protection (8.7%), self-care (17.4%), activity/exercise (15.5%), cardiovascular/pulmonary responses (13.5%), and cognition (12.9%) (Table 2).

Top two defining characteristics related to the top ten nursing diagnoses

The defining characteristics of the top ten nursing diagnoses are listed in Table 3. The most prevalent defining characteristics for each NANDA International, Inc. diagnoses were (a) decrease in gross motor skills for impaired physical mobility, (b) fatigue for activity intolerance, (c) insufficient knowledge for deficient knowledge, (d) impaired ability to access bathroom for bathing self-care deficit, (e) impaired ability to complete toilet hygiene for toileting self-care deficit, (f) proxy report of pain behavior/activity changes for chronic pain, (g) discontent with situation for impaired com-

fort, (h) dependency for powerlessness, and (i) alteration in body function for disturbed body image.

Top two related or risk factors related to the top ten nursing diagnoses

The related or risk factors to the top 10 nursing diagnoses are listed in Table 4. Activity intolerance was most frequently used for impaired physical mobility, physical deconditioning for activity intolerance, insufficient information for deficient knowledge, environmental barrier for bathing self-care deficit, physical barrier for risk for injury, impaired mobility for toileting self-care deficit, injury agent for chronic pain, insufficient environmental control for impaired comfort, anxiety for powerlessness, and alteration in self-perception for disturbed body image.

The quality of nursing diagnostic statements for the top five nursing diagnoses

The average quality of the nursing diagnosis statements written by the students is shown in Table 5. The average score for the nurs-

Table 3. Top two defining characteristics associated with the Top ten NANDA International, Inc. nursing diagnoses

| Nursing diagnoses | Defining characteristics | No. (%) | Cum % ^{a)} |
|-------------------------------------|--|-----------|---------------------|
| Impaired physical mobility (00085) | Decrease in gross motor skills | 34 (50.0) | 50.0 |
| | Spastic movement | 15 (22.1) | 72.1 |
| Activity intolerance (00092) | Fatigue | 24 (38.1) | 38.1 |
| | Generalized weakness | 20 (31.7) | 69.8 |
| Deficient knowledge (00126) | Insufficient knowledge | 32 (53.3) | 53.3 |
| | Inappropriate behavior | 13 (21.7) | 75.0 |
| Bathing self-care deficit (00108) | Impaired ability to access bathroom | 15 (44.1) | 44.1 |
| | Impaired ability to wash body | 10 (29.4) | 73.5 |
| Risk for injury (00035) | Undeveloped ^{b)} | - | - |
| Toileting self-care deficit (00110) | Impaired ability to complete toilet hygiene | 14 (45.2) | 45.2 |
| | Impaired ability to sit on toilet | 10 (32.3) | 77.5 |
| Chronic pain (00133) | Proxy report of pain behavior/activity changes | 14 (50.0) | 50.0 |
| | Alteration in sleep pattern | 6 (21.4) | 71.4 |
| Impaired comfort (00214) | Discontent with situation | 9 (34.6) | 34.6 |
| | Uneasy in situation | 7 (26.9) | 61.5 |
| Powerlessness (00125) | Dependency | 6 (40.0) | 40.0 |
| | Frustration about inability to perform previous activities | 4 (26.7) | 66.7 |
| Disturbed body image (00118) | Alteration in body function | 3 (27.3) | 27.3 |
| | Negative feeling about body | 2 (18.2) | 45.5 |

NANDA, North American Nursing Diagnosis Association.

^aCumulative percent for each diagnosis. ^bAccording to the NANDA International, Inc., the risk for diagnosis does not include defining characteristics.

Table 4. Top two related or risk factors for the top ten NANDA International, Inc. nursing diagnoses

| Nursing diagnoses | Related or risk factors | No. (%) | Cum % ^{a)} |
|-------------------------------------|--|-----------|---------------------|
| Impaired physical mobility (00085) | Activity intolerance | 32 (47.1) | 47.1 |
| | Physical deconditioning | 20 (29.4) | 76.5 |
| Activity intolerance (00092) | Physical deconditioning | 27 (42.8) | 42.8 |
| | Immobility | 19 (30.2) | 73.0 |
| Deficient knowledge (00126) | Insufficient information | 22 (36.7) | 36.7 |
| | Insufficient knowledge of resources | 19 (31.7) | 68.4 |
| Bathing self-care deficit (00108) | Environmental barrier | 10 (29.4) | 29.4 |
| | Weakness | 7 (20.6) | 50.0 |
| Risk for injury (00035) | Physical barrier | 12 (35.3) | 35.3 |
| | Insufficient knowledge of modifiable factors | 10 (29.4) | 64.7 |
| Toileting self-care deficit (00110) | Impaired mobility | 9 (29.0) | 29.0 |
| | Weakness | 7 (22.6) | 51.6 |
| Chronic pain (00133) | Injury agent | 10 (35.7) | 35.7 |
| | Nerve compression | 8 (28.6) | 63.3 |
| Impaired comfort (00214) | Insufficient environmental control | 13 (50.0) | 50.0 |
| | Insufficient situational control | 6 (23.1) | 73.1 |
| Powerlessness (00125) | Anxiety | 4 (26.7) | 26.7 |
| | Ineffective coping strategies | 3 (20.0) | 46.7 |
| Disturbed body image (00118) | Alteration in self-perception | 7 (63.6) | 63.6 |
| | Spiritual incongruence | 2 (18.2) | 81.8 |

NANDA, North American Nursing Diagnosis Association.

^aCumulative percentage for each diagnosis.

Table 5. The quality of nursing diagnostic statements for the top five NANDA International, Inc. nursing diagnoses

| Component | Impaired physical mobility | Activity intolerance | Deficient knowledge | Bathing self-care deficit | Risk for injury | Total |
|----------------|----------------------------|----------------------|---------------------|---------------------------|-----------------|-----------|
| Problem | 2.74±0.13 | 2.71±0.11 | 2.75±0.22 | 2.53±0.37 | 2.69±0.29 | 2.77±0.19 |
| Etiology | 2.34±0.25 | 2.20±0.41 | 2.31±0.24 | 2.45±0.28 | 2.46±0.31 | 2.41±0.29 |
| Signs/symptoms | 1.04±0.62 | 1.22±0.14 | 1.86±0.31 | 1.78±0.41 | 2.01±0.41 | 1.64±0.47 |
| General | 3.24±0.28 | 3.43±0.67 | 4.04±0.32 | 3.83±0.44 | 3.35±0.64 | 3.47±0.36 |
| Total | 8.23±1.28 | 9.12±1.61 | 10.41±1.32 | 10.02±1.14 | 9.21±1.83 | 8.63±1.74 |

Values are presented as mean ± standard deviation.

NANDA, North American Nursing Diagnosis Association.

ing problem component was 2.77 ± 0.19 , etiologic component 2.41 ± 0.29 , signs/symptoms component 1.64 ± 0.47 , and general component 3.47 ± 0.36 .

DISCUSSION

The study aimed to analyze nursing diagnoses using NANDA International, Inc. nursing diagnoses to identify the key nursing diagnoses in case analysis reports submitted by 4th grade nursing students who have completed rehabilitation nursing practice. Based on the analysis results, we suggest a specific and rational direction for the nursing process applied in clinical practice, in addition to evaluating the appropriateness of clinical reasoning and diagnosis and the quality of diagnosis focusing on the key nursing diagnosis. The following discussion is based on the data obtained from the study results.

First, the most frequent nursing diagnoses in the nursing process made by the nursing students were “impaired physical mobility,” “activity intolerance,” and “deficient knowledge,” in that order. In a study analyzing the physical function and immobility problems of stroke patients in the rehabilitation ward, it can be seen that “body mobility impairment” appears as a priority problem that must be solved (McGlinchey et al., 2020). In this study, it seems that the frequency of diagnosis related to physical mobility was high as stroke, paraplegia/tetraplegia, and hemiplegia patients accounted for 80%. In this regard, a previous study also reported that “impaired physical mobility” was a common nursing diagnosis for patients with cerebral vascular disease, and it was included as a necessary nursing diagnosis for stroke patients in previous studies (Granel and Bernabeu-Tamayo, 2020; McGlinchey et al., 2020; Pizzol et al., 2019). The high frequency of these nursing diagnoses is justified by the fact that cerebrovascular disease is a motor neuron disease that can lead to loss of voluntary movement control. As motor neurons in the cerebral hemispheres cross over in the brainstem, voluntary motor control disorders on one side of

the body reflect motor neuron lesions on the other side of the brain, which can lead to disorders such as hemiplegia (Clark et al., 2021; Skidmore and Shih, 2022). Since the nursing process in clinical case studies is also applied according to priority among the health problems of the patients, nursing diagnoses with high priority, such as impaired physical mobility, should be given importance. In other words, nursing educators need to keep track of nursing processes that are frequently applied in practice, such as impaired physical mobility, and conduct research so that the latest knowledge can be implemented in clinical practice.

Second, according to the results found in this research, the top five nursing diagnoses were distributed in the activity/rest (4), perception/cognition (5), and safety/protection (11) domains. The domain distribution of these diagnoses reflects the fact that patients in the rehabilitation unit experience mobility impairment among disabilities, and in terms of functionality, they are considered unable to move freely. In addition, analysis of the top five domains in which diagnoses were distributed and the classes by domain revealed that the diagnoses were distributed in classes 2 (activity/exercise) and 5 (self-care) in domain 4 (activity/rest), class 4 (cognition) in domain 5 (perception/cognition), class 2 (physical injury) in domain 11 (safety/protection), class 1 (physical comfort) and 2 (environmental comfort) in domain 12 (comfort), and class 3 (body image) in domain 6 (self-perception). These findings suggest that physical restrictions may appear abruptly or slowly, depending on their severity and duration, but may also contribute to health problems, ranging from lack of self-management to impaired social interaction. Most of the other nursing diagnoses found in this study (such as bathing self-care deficit, toileting self-care deficit, risk for injury, impaired comfort, powerlessness, disturbed body image, impaired swallowing, impaired verbal communication, and constipation) also occurred due to motor impairment, indicating that disability affects the entire life of rehabilitation patients. It can also be seen that nursing students reflected not only the physical problems of rehabilitation patients, but also psy-

chosocial problems in the nursing process. According to the preceding literature, the occurrence of self-care deficit after stroke is usually aftereffects of cerebral hypoperfusion (Everard et al., 2021; Oliveira-Kumakura et al., 2020; Oliveira-Kumakura et al., 2021), and nursing diagnosis associated with self-care deficits also show an association with motor and sensorial aftereffects.

Third, it is necessary to examine the diagnostic indicators that includes defining characteristics, related/risk factors of each nursing diagnosis that nursing students select for rehabilitation patients. Defining characteristics are used to make a nursing diagnosis and are one of the diagnostic indicators used to distinguish different diagnoses. They are observable clues that are categorized as signs or symptoms of a problem-focused or health-promotion diagnosis. Related or risk factors are essential elements of all problem-based diagnoses and etiologies, which have some type of relationship with nursing diagnoses (Chang et al., 2021; Sezer and Şahin, 2021). A review of patients' history is helpful in identifying related or risk factors. The signs and symptoms related to the top 10 diagnoses are described in Table 3. Most nursing students are educated to follow the PES format for problem-focused or health-promotion diagnosis when stating a nursing diagnosis (Burucu and Arslan, 2021; Florin et al., 2005). Problems refer to the response of the patients, etiology refers to the related or risk factor that causes nursing problems, and signs or symptoms are specific responses that occur in a patient, supporting that the cause is related to the nursing problem (Bayram et al., 2022; Karaca and Aslan, 2018; Ozkan et al., 2021). For example, with the statement "impaired physical mobility related to activity intolerance," it is difficult to clearly ascertain the evidence for making the diagnosis. However, if the statement is revised to "impaired physical mobility related to activity intolerance with a decrease in gross motor skills," the rationale for the diagnosis will be more clearly understood. However, the disadvantage of the PES format is that the sentences are long and can be more complicated; therefore, the two-part nursing diagnosis is more common. In addition, in the case of a risk nursing diagnosis in which the patient does not show symptoms, three-part nursing diagnosis cannot be used. Therefore, since most two-part nursing diagnoses consist only of related factors and problems without mentioning signs or symptoms, it is also necessary to check the signs and symptoms, which are mostly confirmed in the assessment data in the form of defining characteristics. The PES format is recommended for nursing students who are not skilled in diagnosis because the problem statement is more descriptive, containing symptoms and signs to provide the basis for making a diagnosis.

Fourth, as a result of evaluating the quality of nursing students'

nursing diagnosis statements to identify the accuracy of the diagnoses, the average quality was 8.63 out of 14 points. Although direct comparison is difficult because there are no preceding studies evaluating the QOD statements among nursing students, compared with the results of 8.8 points in a nursing course education intervention study for nurses (Florin et al., 2005), the quality of nursing students' nursing diagnosis statements in this study is relatively good. In conclusion, it can be seen that the rehabilitation nursing unit is a special unit, and nursing diagnoses reflecting the characteristics of rehabilitation patients are mainly selected by students. It can be confirmed that the definitions of characteristics for each major nursing diagnosis and related factors or risk factors differ from those of other nursing units. Therefore, considering that nursing students can appropriately select clinically applicable diagnoses through theoretical and practical education, efforts are needed to establish a continuous curriculum and feedback through which nursing students can identify and review procedural errors in the usage of the nursing process. In addition, in the process of deriving a nursing diagnosis, the practice field leader or academic advisor should allocate sufficient time for practice guidance to provide feedback and make an effort to review the improvements.

Based on these results, this study intends to make the following proposals: This study analyzed the nursing diagnosis statements written by the nursing students and evaluated the accuracy and quality of the nursing diagnoses. The key nursing diagnoses were impaired physical mobility, activity intolerance, deficient knowledge, risk for injury, bathing self-care deficit. And defining characteristics, related or risk factors were analyzed together. However, the study is limited in that it is difficult to generalize the characteristics of the nursing process because data were collected from a single nursing college. In addition, the evaluation based on the opinions of experts is limited as no tools have yet been prepared to evaluate errors in the nursing process. Therefore, future research should aim to develop a tool that can objectively evaluate and quantify errors in the nursing process. Furthermore, in order to generalize the research results, we propose repeated research for nursing students in different regions in consideration of variations in conditions such as the learning environment and university location as well as nursing practice involving children, women, and psychiatric nursing practice.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGMENTS

The authors received no financial support for this article.

REFERENCES

- Adamy EK, Zocche DAA, Almeida MA. Contribution of the nursing process for the construction of the identity of nursing professionals. *Rev Gaucha Enferm* 2019;41:e20190143.
- Alsadat Hosseini F, Parvan K, Jasemi M, Parizad N, Esmaili Zabihi R, Aazami S. Using newly developed software to enhance the efficiency of the nursing process in patient care: a randomized clinical trial. *Comput Inform Nurs* 2021;39:696-703.
- Azevedo OA, Cruz DALMD. Quality indicators of the nursing process documentation in clinical practice. *Rev Bras Enferm* 2021;74:e20201355.
- Bayram A, Özsaban A, Durgun H, Aksoy F, Turan N, Köktürk Dalcalı B, Oksay Şahin A. Nursing students' perceptions of nursing diagnoses, critical thinking motivations, and problem-solving skills during distance learning: a multicentral study. *Int J Nurs Knowl* 2022;33:304-311.
- Burucu R, Arslan S. Nursing students' views and suggestions about case-based learning integrated into the nursing process: a qualitative study. *Florence Nightingale J Nurs* 2021;29:371-378.
- Chang YY, Chao LF, Xiao X, Chien NH. Effects of a simulation-based nursing process educational program: a mixed-methods study. *Nurse Educ Pract* 2021;56:103188.
- Clark B, Whitall J, Kwakkel G, Mehrholz J, Ewings S, Burridge J. The effect of time spent in rehabilitation on activity limitation and impairment after stroke. *Cochrane Database Syst Rev* 2021;10:CD012612.
- De Groot K, Triemstra M, Paans W, Francke AL. Quality criteria, instruments, and requirements for nursing documentation: a systematic review of systematic reviews. *J Adv Nurs* 2019;75:1379-1393.
- Everard G, Luc A, Doumas I, Ajana K, Stoquart G, Edwards MG, Lejeune T. Self-rehabilitation for post-stroke motor function and activity-a systematic review and meta-analysis. *Neurorehabil Neural Repair* 2021;35:1043-1058.
- Feo R, Kitson A, Conroy T. How fundamental aspects of nursing care are defined in the literature: a scoping review. *J Clin Nurs* 2018;27:2189-2229.
- Florin J, Ehrenberg A, Ehnfors M. Quality of nursing diagnoses: evaluation of an educational intervention. *Int J Nurs Terminol Classif* 2005;16:33-43.
- Granel N, Bernabeu-Tamayo MD. Mapping nursing practices in rehabilitation units in Spain and the United Kingdom: a multiple case study. *Nurs Health Sci* 2020;22:521-528.
- Herdman TH, Kamitsuru S. NANDA international nursing diagnoses: definitions & classification 2018-2020. 11th ed. New York: Thieme; 2018. p. 86-97.
- Jung YM, Yoo IY. Career education needs of Korean nursing students and professionals: a cross-sectional survey. *Nurse Educ Today* 2022;108:105209.
- Karaca T, Aslan S. Effect of 'nursing terminologies and classifications' course on nursing students' perception of nursing diagnosis. *Nurse Educ Today* 2018;67:114-117.
- Keiffer MR. Engaging nursing students: integrating evidence-based inquiry, informatics, and clinical practice. *Nurs Educ Perspect* 2018;39:247-249.
- Koldestam M, Broström A, Petersson C, Knutsson S. Model for improvements in learning outcomes (MILO): development of a conceptual model grounded in charitable caring aimed to facilitate undergraduate nursing students' learning during clinical practice (Part 1). *Nurse Educ Pract* 2021;55:103144.
- McGlinchey MP, James J, McKevitt C, Douiri A, Sackley C. The effect of rehabilitation interventions on physical function and immobility-related complications in severe stroke: a systematic review. *BMJ Open* 2020;10:e033642.
- Melin-Johansson C, Palmqvist R, Rönnberg L. Clinical intuition in the nursing process and decision-making-A mixed-studies review. *J Clin Nurs* 2017;26:3936-3949.
- Mousavinasab ES, Rostam Niakan Kalhorri S, Zarifsanaiy N, Rashaan M, Ghazisaeedi M. Nursing process education: a review of methods and characteristics. *Nurse Educ Pract* 2020;48:102886.
- Oliveira-Kumakura ARS, da Silva KCR, Sousa CMFM, Biscaro JA, Spagnol GS, Morais SCRV. Content validation of clinical evidence related to self-care deficits of patients with stroke. *Rehabil Nurs* 2020;45:332-339.
- Oliveira-Kumakura ARS, Sousa CMFM, Biscaro JA, Silva KCRD, Silva JLG, Morais SCRV, Lopes MVO. Clinical validation of nursing diagnoses related to self-care deficits in patients with stroke. *Clin Nurs Res* 2021;30:494-501.
- Ozkan CG, Kurt Y, Kilinc KO, Altun EC, Ozturk H. Determination of perception levels of student nurses about nursing diagnosis. *J Pak Med Assoc* 2021;71:843-848.
- Parvan K, Hosseini FA, Jasemi M, Thomson B. Attitude of nursing students following the implementation of comprehensive computer-based nursing process in medical surgical internship: a quasi-experimental study. *BMC Med Inform Decis Mak* 2021;21:10.
- Pizzol FLFD, Vieira LF, Bierhals CCBK, Azzolin KO, Paskulin LMG, Low G, Rosa NGD, Lucena AF. Relationship between elderly stroke patient caregivers scale and nursing diagnoses. *Rev Bras Enferm* 2019;72:251-258.

- Seçer S, Karaca A. Evaluation of nurses' perceptions of nursing diagnoses and their opinions regarding the application of nursing process. *Florence Nightingale J Nurs* 2021;29:229-238.
- Sezer H, Şahin H. Faculty development program for coaching in nursing education: a curriculum development process study. *Nurse Educ Pract* 2021;55:103165.
- Skidmore ER, Shih M. Stroke rehabilitation: recent progress and future promise. *OTJR (Thorofare N J)* 2022;42:175-181.
- Song CE, Kim WG, Lim YJ. An analysis of evidence-based practice courses in Korean nursing education systems. *Heliyon* 2019;5:e02650.
- Zhang T, Wu X, Peng G, Zhang Q, Chen L, Cai Z, Ou H. Effectiveness of standardized nursing terminologies for nursing practice and healthcare outcomes: a systematic review. *Int J Nurs Knowl* 2021;32:220-228.