

Ineffective protection in patients undergoing hematopoietic stem cell transplantation: concept analysis

Proteção ineficaz em pacientes submetidos ao transplante de células-tronco hematopoiéticas: análise de conceito

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ABSTRACT

The objective was to analyze the “Protection” concept in patients undergoing hematopoietic stem cell transplantation and correlate it with elements of the “Ineffective Protection” nursing diagnosis proposed by NANDA-I. Integrative literature review based on the Concept Analysis model proposed by Walker and Avant and performed at the Virtual Health Library and CINAHL, SCOPUS, PUBMED/MEDLINE, LILACS and Web of Science databases within a five-year time frame. The final sample consisted of 16 articles and the identification of three defining attributes, 15 antecedents and 11 consequences. Conclusion: concept analysis can contribute to refine and improve the nursing diagnosis “Ineffective Protection”. It was possible to identify another definition, 10 antecedents and 10 consequences that are not included in NANDA-I, as well as the need to revise the definition and other components of the diagnosis proposed by the taxonomy.

Descriptors: Nursing Diagnosis; Protection; Hematopoietic Stem Cells.

RESUMO

Objetivou-se analisar o conceito de “Proteção” em pacientes submetidos ao transplante de células tronco hematopoiéticas e correlacionar com os elementos do diagnóstico de enfermagem “Proteção Ineficaz” proposto pela NANDA-I. Revisão integrativa da literatura, fundamentada no modelo de Análise de Conceito proposto por Walker e Avant. Realizada na Biblioteca Virtual em Saúde e as seguintes bases de dados: CINAHL, SCOPUS, PUBMED/MEDLINE, LILACS e Web of Science com recorte temporal de cinco anos. A amostra final foi composta por 16 artigos e pela identificação de três atributos definidores, 15 antecedentes e 11 consequentes. Conclusão: a análise de conceito pode contribuir para o refinamento e o aprimoramento do diagnóstico de enfermagem “Proteção Ineficaz”. Foi possível identificar uma outra definição, 10 antecedentes e 10 consequentes que não constam na NANDA-I, bem como a necessidade de revisar a definição e demais componentes do diagnóstico propostos pela taxonomia.

Descritores: Diagnóstico de Enfermagem; Proteção; Células-Tronco Hematopoiéticas.

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INTRODUCTION

Hematopoietic stem cell transplantation (HSCT) is a potentially curative treatment that can prolong the survival of many patients diagnosed with hematological neoplasms. This aggressive therapeutic modality is used for a set of inherited or acquired hematological and immunological cancers. Treatment is based on the intravenous infusion of hematopoietic progenitor cells to restore patients' medullary and immune function⁽¹⁻²⁾.

Hematopoietic stem cell transplants are classified as autologous when stem cells are from own patient; as allogeneic when stem cells are from HLA compatible donors, whether or not they are related to the recipient; and as syngeneic when stem cells are of an identical twin⁽³⁾. In 2019, 3,805 HSCTs were performed in Brazil, of which 2,377 were autologous and 1,428 allogeneic⁽⁴⁾.

Candidates for HSCT, usually have neoplastic and/or hematological disorders that leave the immune system deficient⁽⁵⁾. Treatment with the conditioning regime causes a virtually total ablation in the recipient's immune system to destroy the cells of the previous disease and in an attempt to avoid rejection of the transplanted progenitor cells. In addition, the use of immunosuppressive methods to prevent graft versus host disease (GvHD) may further delay immune reconstitution and immunocompetence⁽⁶⁾.

Given the compromise of the immune system, infections are a significant cause of morbidity and mortality after HSCT, in addition to the occurrence of several other complications in different organs and locations: gastrointestinal tract, liver, dermatological, ophthalmic, respiratory comorbidities, among others⁽⁷⁻⁸⁾. The performance of the nursing team is important for the prevention and treatment of these complications⁽⁹⁾.

The transplanted patient needs care to overcome the organic impairment caused by treatment. The nurse-patient relationship is the most extensive and closest of all health professionals involved in HSCT⁽¹⁰⁾. As transplanted patients are in a critical and unstable situation, nurses use specific knowledge to develop a detailed therapeutic plan with interventions that require specialized practice and training⁽¹¹⁾.

Thus the importance of implementing the nursing process (NP), a mechanism used to put nursing knowledge into practice and organize and qualify the care provided⁽¹²⁾. The nursing diagnosis (ND), second phase of the NP, consists of making a clinical decision about the presence of a patient's response that requires an intervention; the diagnosis is essential to establish the care plan and expected outcomes⁽¹³⁾.

The NANDA International (NANDA-I) taxonomy is a classification system for nursing diagnoses used in Brazil and worldwide with a standard terminology in the field of nursing. According to NANDA-I, the nursing diagnosis "Ineffective protection" is in the health promotion domain and in the health management class; defined as a decrease in the ability

to guard self from internal or external threats, such as illness or injury. It has 17 defining characteristics, two related factors, one population at risk and five associated conditions⁽¹⁴⁾.

When establishing the "Ineffective Protection" diagnosis, difficulties in understanding some of its components and its definition are encountered. Related factors, associated conditions, populations at risk and defining characteristics in relation to the population undergoing HSCT are also absent. In view of the above and the reduced number of publications about the nursing work process on this topic and the mentioned population⁽¹⁵⁾, this study can contribute to improve the nursing diagnosis under study and offer elements for nurses' clinical practice in care.

Therefore, the objective of the study was to identify the attributes, antecedents and consequences of the "Protection" concept in patients undergoing HSCT and correlate these elements with the definition, related factors, associated conditions, populations at risk and the defining characteristics of the "Ineffective Protection" nursing diagnosis proposed by NANDA-I.

METHOD

This is a qualitative study aimed at analyzing the concept of "Protection" in patients undergoing HSCT. Concept analysis is a thorough and descriptive examination of a word or expression and its use in language together with its explanation and how it relates to other words or terms in the transmission of real and possible meanings. This methodological process characterizes the initial stage of validation studies⁽¹⁶⁻¹⁷⁾.

The model proposed by Walker and Avant was used to conduct the study⁽¹⁸⁾. It consists of eight steps that interact with each other: concept selection; determination of the objectives of the analysis; identification of possible uses of the concept; determination of critical or essential attributes; construction of a model case; identification of additional cases: borderline, related, contrary, invented and illegitimate; identification of antecedents and consequences; definition of empirical references of the concept studied⁽¹⁸⁾.

In this study, six steps were followed: choosing the concept; determining the purpose of the analysis; identification of possible uses of the concept; determination of attributes; identification of the model case; and identification of antecedents and consequences of the concept. The steps performed and their operationalization are described below:

- Concept selection: the "Protection" concept was chosen from the "Ineffective protection" ND of the NANDA-I taxonomy.
- Determination of objectives of the analysis: the objective was to clarify the vague or little expressive/accurate concept of the term "Protection" in the professional practice of nurses who assist patients

undergoing HSCT and compare it to the NANDA-I ND “Ineffective Protection”.

- Identification of possible uses of the concept: in this step, a bibliographic research, such as an integrative literature review, was carried out. By identifying the possible uses of the concept, it was possible to find out how it is being used and applied.
- Determination of critical or essential attributes: the set of attributes most frequently associated with the concept, which allows a broader view of the term, was identified.
- Construction of a model case: the model case helped to ratify the critical attributes. According to Walker and Avant, they can be real life examples, found in the literature or even built by the researcher. Additional cases oppose to the attributes and the construction is necessary only if the concept is unclear in the model case.
- Identification of antecedents and consequences: antecedents are events or incidents that precede the occurrence of the concept; consequences are the events or incidents that result from the occurrence of the concept⁽¹⁸⁾. Therefore, the antecedents that bring protection to patients undergoing HSCT and the consequences arising from this protection were identified through the literature review. These will be used to review the elements of the ND “Ineffective protection”.

An integrative literature review was necessary to perform the steps proposed by the model. The steps taken in the integrative literature review were: identification of the theme or question of the integrative review; sampling or literature search; categorization of studies; evaluation of studies included in the integrative review; interpretation of results; and synthesis of the knowledge acquired from the analyzed articles or presentation of the integrative review⁽¹⁹⁾.

The PICO strategy was used for the development of the research question⁽²⁰⁾, where P = Population (patients undergoing HSCT), I = Intervention (HSCT), C = Comparison, O = Outcome (protection). The acronym “C”, comparison, was not used because it is not part of the objective of this analysis. Thus, the following question was developed: What is the concept, attributes, antecedents and consequences of “Protection” in patients undergoing HSCT?

The literature search included the Virtual Health Library and the following databases: Cumulative Index to Nursing & Allied Health Literature (CINAHL), SCOPUS, PUBMED/MEDLINE (National Library of Medicine and National Institutes of Health), LILACS (Latin American and Caribbean Health Sciences Literature) and Web of Science.

The descriptors were used from the vocabulary of the Medical Subject Headings (MeSH) of the U.S. National

Library of Medicine (NLM) and/or the Health Sciences Descriptors (DeCS), available from the VHL. Thus, ‘protection’ and ‘hematopoietic stem cell transplantation’ were used interconnected by the Boolean operator AND. The opposite term of the nursing diagnosis “Ineffective Protection” was used to identify its components, considering that according to NANDA-I, the focus of this diagnosis is the word protection. From the selected descriptors, crossings were performed for each database.

The five-year time frame was used as a strategy recommended by NANDA-I, since concepts are remodeled and time is one of the effects of this modulation⁽¹⁴⁾.

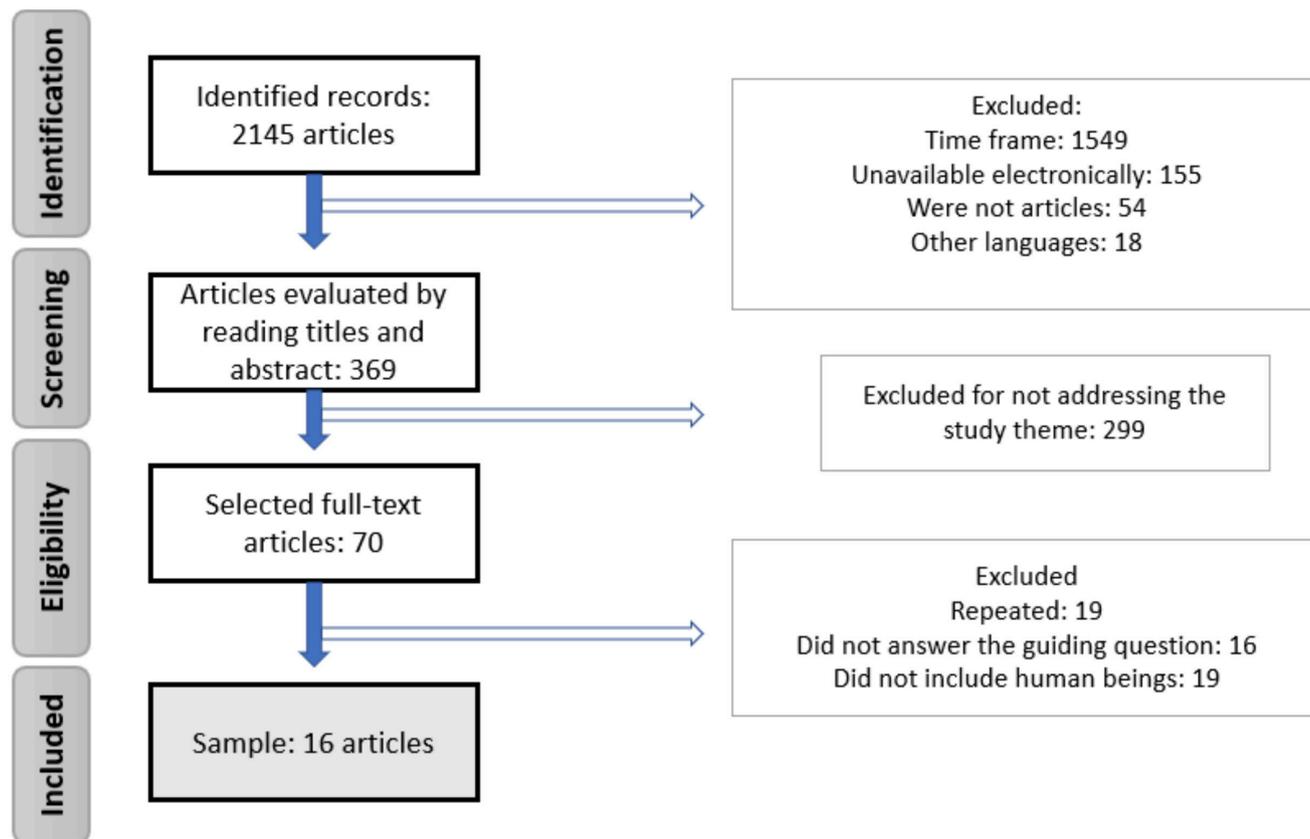
Then, the following inclusion criteria were applied to refine the search: complete articles available electronically in the selected databases; available in Portuguese, English or Spanish; portraying the relevant theme of the review. Theses, dissertations, abstracts, editorials, expert opinions and letters to the editor were excluded. The search was carried out in September 2019. The study selection process comprised reading the title, abstracts and, later, the full article. The final selection included 16 articles.

The description of searches and the selection of articles were based on the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA), as shown in the flowchart below (Figure 1). The level of evidence of the selected studies was assessed using the classification proposed by Melnyk and Fineout-Overholt⁽²¹⁾. The methodological rigor was assessed using the Critical Appraisal Skills Program (CASP)⁽²²⁾. The 16 articles were categorized and presented by the following variables: author, thematic area of the journal, year of publication, place and name of the journal, attributes, antecedents and consequences.

RESULTS

Throughout the reading of the selected material, the information that answered the guiding question was extracted. The results found in the literature indicated attributes, antecedents and consequences of the “Protection” concept.

After analyzing the articles, only one study developed by nurses was identified and 21.25% of articles were published in 2017, 25% (2018), 18.75% (2016), 12.5% (2015) and 6.25% (2014 and 2019). The level of evidence of the selected studies was assessed according to the classification proposed by Melnyk and Fineout-Overholt⁽²¹⁾, four articles were classified as level I (systematic review/meta-analysis), two as level II (well-designed randomized clinical trial), five as level III (well-designed controlled clinical trial without randomization), three as level IV (well-designed cohort or case-control studies), one as level V (review of descriptive or qualitative studies), no level VI (descriptive or qualitative

Figure 1. Flowchart of the sample of articles selected for concept analysis based on PRISMA.

Source: Prepared by the authors.

study). Thus, studies with strong evidence (I, II and III) and less strong evidence (IV, V and VI) were distributed equally.

Regarding the use of the concept, no study addressed the nursing diagnosis “Ineffective Protection” in patients undergoing HSCT, thereby confirming the need for the approach of the present study. Thematic areas were diverse: bone marrow transplantation (25%), immunology (12.5%), oncology (12.5%), hematology (12.5%), immunotherapy (12.5), virology (6, 25%), infectious diseases (6.25%), oral diseases (6.25%) and nursing (6.25%). The methodological rigor of all studies was classified in category A (6 to 10 points)⁽²²⁾, which means studies with good methodological quality and minimized bias (100.00%).

Of the articles analyzed, 43.75% presented the concept of protection as an efficient immune response directed against the installation and dissemination of pathogenic cells and agents; 31.25% as the absence of infectious agents in the body; and 25% as preserved immune barriers capable of combating infectious agents.

Chart 1 shows the results of the concept analysis, in which the attributes, antecedents and consequences of the “Protection” concept in patients undergoing HSCT were identified.

The most frequent terms associated with the concept were identified and then, the attributes were grouped and

identified, allowing a broader view of the “Protection” concept. In view of the attributes found, the definition of protection in patients undergoing HSCT emerged as Efficient immune response against the installation and spread of pathogenic cells and agents.

To define the nursing diagnosis in patients undergoing HSCT, the ineffective judgment was added to the attributes found: Inefficient immune response against cells and pathogens; Presence of infectious agents; Compromised immune barriers. Therefore, the following definition for “Ineffective protection” is suggested: Inefficient immune response against the installation and spread of pathogenic cells and agents.

In the concept analysis, 15 antecedents were evidenced, to which opposition terms were added in order to address the events preceding the occurrence of the “Ineffective protection” ND in patients undergoing transplantation. Therefore: Absence of drug prophylaxis, Non-adherence to medication therapy, Absence of cellular immunotherapy, Absence of immunological and virological monitoring, Absence of vaccines, Low degree of Human Leukocyte Antigen (HLA) matching, Deficient intestinal microbiota, Inadequate diet, Absence of oral cryotherapy, Absence of relaxation techniques, Immunocompromised individuals,

Chart 1. Distribution of attributes, antecedents and consequences of the “Protection” concept extracted from the selected articles. Recife, PE, Brazil, 2020.

Attributes
Absence of infectious agents ⁽²³⁻²⁷⁾
Efficient immune response against cells and pathogens ^(23,25-26,28-31)
Preserved immune barriers ⁽³²⁻³⁵⁾
Antecedents
Adherence to medication therapy ^(27-28,34,36)
Drug prophylaxis ^(24-25,27-30,32,37)
Relaxation techniques ⁽³⁸⁾
Cellular immunotherapy ^(23,25-28,31)
Immunological and virological monitoring ⁽²⁴⁾
Vaccines ⁽³⁰⁾
HLA compatibility ⁽³⁰⁾
Preserved intestinal microbiota ⁽³²⁻³³⁾
Adequate diet ⁽³³⁾
Oral cryotherapy ⁽³⁵⁾
Immunocompetent individuals ^(24-26,31)
Absence of comorbidities ^(25,30,38)
Absence of chemotherapy ^(23-25,27,32,34-37)
Normal blood profile ^(24,32,38)
Hematological Cancer ^(27,30,34,36,38)
Consequences
Absence of infection ^(24-25,27-33)
Increase in quality of life ^(26,34,36-37)
Reduction in hospital stay ⁽²⁶⁾
Reduction in the number of medications ⁽²⁶⁾
Preserved gonadal function ⁽³⁶⁾
Absence of nausea ⁽³⁷⁾
Absence of vomiting ⁽³⁷⁾
Absence of infectious diarrhea ⁽³²⁾
Integrity of preserved oral mucosa ⁽³⁴⁻³⁵⁾
Dysphagia reduction ⁽³⁴⁻³⁵⁾
Fatigue reduction ⁽³⁸⁾

Source: Prepared by the authors.

People with comorbidities, Chemotherapy, Abnormal blood profile, Hematological cancer.

Among the antecedents found in the concept analysis, five are correlated with terms also described in NANDA-I: inappropriate nutrition, cancer, immune disorder, abnormal blood profile, pharmaceutical agent⁽¹⁵⁾ (Chart 2).

Opposition terms were also added to the consequences evidenced in the concept analysis in order to contemplate the

events resulting in the occurrence of the nursing diagnosis “Ineffective protection” in patients undergoing HSCT, which resulted in: Infection, Lower quality of life, Longer length of hospital stay, Higher amount of medication, Gonadal dysfunction, Nausea, Vomiting, Infectious diarrhea, Oral mucositis, Dysphagia and Fatigue.

Among the consequent terms identified, only one is correlated with defining characteristics found in NANDA-I: fatigue⁽¹⁵⁾ (Chart 3).

A model case that will show the representation of the concept was identified. **Model case:** J.M.S, 22 years old, male, single, diagnosed with Acute Myeloid Leukemia six months earlier, undergoing HSCT. According to the reports and exams in the medical record and the patient’s own verbal report, he is well and without complaints.

Chart 2. Relationship of equivalence of antecedents with opposite terms found in the concept analysis of Protection and of related factors, population at risk and associated conditions of the nursing diagnosis Ineffective protection from the NANDA International 2018-2020. Recife, PE, Brazil, 2020.

Antecedents from the integrative literature review	Related Factors, Population at Risk and Associated Conditions of NANDA-I
Absence of drug prophylaxis	No correspondent
Non-adherence to medication therapy	No correspondent
Absence of cellular immunotherapy	No correspondent
Absence of immunological and virological monitoring	No correspondent
Absence of vaccines	No correspondent
Low degree of HLA compatibility	No correspondent
Deficient intestinal microbiota	No correspondent
Inadequate diet	Inadequate nutrition
Absence of oral cryotherapy	No correspondent
Absence of relaxation techniques	No correspondent
Hematological cancer	Cancer
Immunocompromised individuals	Immune disorder
People with comorbidities	No correspondent
Abnormal blood profile	Abnormal blood profile
Chemotherapy	Pharmaceutical agent

Source: Prepared by the authors.

Chart 3. Relationship of equivalence of consequences with opposite terms found in the concept analysis of Protection, and of the defining characteristics of the nursing diagnosis Ineffective protection present in the NANDA International 2018-2020. Recife, PE, Brazil, 2020.

Consequences from the integrative literature review	Defining characteristics of NANDA-I
Infection	No correspondent
Decreased quality of life	No correspondent
Longer length of hospital stay	No correspondent
Increase in the amount of medication	No correspondent
Gonadal dysfunction	No correspondent
Nausea	No correspondent
Vomiting	No correspondent
Infectious diarrhea	No correspondent
Oral mucositis	No correspondent
Fatigue	Fatigue

Source: Prepared by the authors.

After the conditioning regime, followed by the infusion of hematopoietic stem cells, he presented medullary grafting forming an efficient and targeted immune system capable of combating the installation and spread of pathogens.

DISCUSSION

Attributes

According to NANDA-I, the nursing diagnosis must have an evidence-based definition and a list of defining characteristics (signs/symptoms) and related factors (etiological factors), along with additional data supporting the diagnosis, such as populations at risk and associated conditions⁽¹⁵⁾. The attributes that give a new definition for the “Ineffective Protection” ND were identified through the concept analysis.

It is highlighted in the literature that hematopoietic progenitor cell transplant recipients develop immunodeficiency that varies in severity and duration, which compromises their protection. It is important to recover a competent immune system capable of defending against pathogens. However, some complications occurring after transplantation can interfere with the immune recovery of the recipient and take three years or more until the complete recovery of immunity⁽³⁹⁻⁴⁰⁾.

In a study from 2019⁽⁴¹⁾, it was found that microbiota colonize humans and interact with the immune system to

influence health, but that HSCT treatment tends to weaken its composition and function, and make the individual vulnerable. The host-microbiota dyad contributes to immune development, homeostasis and maintenance of normal function. Microbiota influence several processes, including hematopoiesis, immune system function, efficacy of chemotherapy and radiation, toxicity, risk of DESH and overall survival in patients with hematological neoplasms.

NANDA-I brings a broad sense of “Ineffective Protection” with use of the term “internal and external agents such as diseases and injuries”, although it is difficult to measure and understand. The concept analysis enabled the development of a scientific definition based mainly on immunology by emphasizing the susceptibility of the immune system when the organism is affected by infectious cells and agents, in addition to the impact on immunological barriers responsible for preserving the body system homeostasis.

Antecedents

During the entire hematopoietic cell transplantation process, adherence and rigor in medication therapy are necessary to avoid aggravation and failure of the procedure. The transplant phase is subdivided into two stages: conditioning and infusion of the bone marrow. Conditioning consists of the infusion of high doses of chemotherapy to eliminate malignant cells and induce immunosuppression with a view to reduce the risk of graft rejection, thereby also reducing the risk of recurrence of the underlying cancer disease⁽⁴²⁻⁴³⁾.

In this phase, drug treatment with antiemetics, analgesics, immunosuppressants and antimicrobials is also initiated with the purpose of avoiding, reducing or alleviating unwanted effects or even preventing complications resulting from antineoplastic drugs (chemotherapy). In the bone marrow infusion phase, drugs such as corticosteroids, antihistamines and anxiolytics are also introduced to prevent transfusion complications⁽⁴⁴⁾.

In a case-control study performed in Japan⁽³⁷⁾, the effectiveness of a new aprepitant drug with the purpose of generating protection in patients undergoing transplantation and reducing or ending nausea was assessed; the results were promising for the use of the drug. Another study, also conducted in Japan⁽³⁴⁾, included the formulation of a polaprezinc tablet and the evaluation of the clinical effect for prevention of oral mucositis. The results showed high efficacy of the tablet as a protection and prevention mechanism for moderate to severe oral mucositis in patients who received high-dose chemotherapy for HSCT.

Still in relation to medication therapy as an effective protection mechanism, a 2017 study reported that the administration of GnRHa (gonadotropin-releasing hormone agonist) before the start of standard chemotherapy decreased the risk of gonadal dysfunction and infertility, which generates

ovarian protection in patients undergoing transplantation. Women undergoing treatment should be advised about the benefits of hormone therapy⁽³⁶⁾.

Although not found in the articles of the integrative review, in addition to medication therapy, other measures are important to generate protection, such as: systematic hand washing and use of personal protective equipment (PPE) by health professionals; specific care regarding the insertion and handling of the central venous catheter; restriction of visits during the period of neutropenia; special attention to symptoms presented by the team and visitors for infectious diseases; vaccination of the health team and companions; and preparation of medications in a laminar air flow cabinet⁽⁴⁵⁾.

Recipients of HSCT have a significant risk of infectious complications. A study conducted in Germany reports that prophylaxis and preventive antiviral therapy guided by regular quantitative real time surveillance of CRP and the monitoring of the immune response of specific CD8 + T cells are well-established strategies to generate protection and prevent significant reactivation of infections⁽²⁴⁾. The absence of virological and immunological monitoring makes it difficult to estimate the individual risk of reactivation of infection after transplantation and adjust antiviral treatment, and favors the use of unnecessary toxic drug therapies^(24,37).

Six studies describe clinical experiments in immunotherapy with genetically modified T cells with the aim to express antigenic receptors against neoplastic cells and show satisfactory results when applied in the treatment of oncohematological diseases^(23,25-26,28-29,31). The use of immunotherapy allows for greater specificity, as it affects only the target cells and protects the others, thereby reducing adverse effects. Therapeutic practice is able to selectively deplete neoplastic cells by the cytotoxicity mechanism and generate a protective immune response in the long term⁽⁴⁶⁾.

After transplantation, all patients experience a temporary state of combined immunodeficiency. In long-term follow-up after HSCT, severe infections, relapses or new neoplasms may be directly related to the persistent immune deficiency⁽²⁵⁾. Several components of the defense mechanisms are harmed, including mucous barriers, granulocytes, natural killer cells and T-cells. Thus the need to establish the individual's immune system with effective defense cells⁽⁴⁷⁾.

Loss of immune memory appears to depend on patients' immune strength before the HSCT and the donor's immune status. The immunodeficiency state puts the recipient at higher risk for infections caused by a variety of microorganisms, some of which can be prevented by vaccination⁽⁴⁸⁻⁴⁹⁾. Given the facts, a study⁽³⁰⁾ indicates the importance of the revaccination program after HSCT for an effective protection for both allogeneic and autologous recipients. Furthermore, if the patient is not revaccinated, antibody titers for preventable

diseases will decrease over a one to ten-year period after HSCT.

In NANDA-I, Inadequate Nutrition is used as a related factor for the diagnosis of ineffective protection. In the concept analysis, the Inadequate diet antecedent was found. A study⁽³³⁾ reported that diet plays an important role in regulating rapid changes in the taxonomic composition of the intestinal microbiota after grafting, and an adequate diet, leading to homeostatic microbiota, is an important factor in treatment. Another study⁽⁵⁰⁾ confirms that poor oral intake soon after HSCT may be associated with a higher risk of developing DESH and proposes an elemental diet (ED) for post-transplant patients because it produces a beneficial effect of protection and stability of the intestinal microbiota.

Several damages caused by oral mucositis affect individuals undergoing HSCT⁽⁵¹⁾. An article⁽³⁵⁾ narrates the importance of cryotherapy as a protection mechanism for epithelial cells of the oral mucosa and reduction of pain, as it prevents the onset of toxic damage caused by the conditioning phase of the transplant. The results demonstrate that cryotherapy significantly improves oral mucositis, decreases the length of hospital stay and use of opioids, and increases the quality of life.

Another antecedent found in the concept analysis were relaxation techniques. The study portrayed the use of Benson's relaxation technique as a way of protecting against fatigue, stress and other factors caused by the fragility of the immune system and the long period of hospitalization⁽³⁸⁾. A review study on complementary therapies for fatigue after HSCT ratifies the importance of using the techniques of music therapy, relaxation therapy, intervention based on mindfulness and therapeutic massage in this population⁽⁵²⁾.

The extremes of age are among the populations at risk found in NANDA-I for the ND in question. Through concept analysis, the following populations were identified: immunocompromised individuals and those with comorbidities. The articles indicated that immunocompromised individuals are associated with ineffective protection due to compromised immunity conditions resulting from hematological cancer and/or severe chemotherapy treatment^(24-26,29,31). Other articles portray that older individuals with comorbidities are more susceptible to ineffective protection and the consequent development of Herpes Zoster (HZ)⁽²⁶⁾ and cytomegalovirus (CMV)⁽³⁰⁾.

Consequences

Regarding consequences, nine articles of the review discuss the risk and presence of infection resulting from immunosuppression in patients undergoing HSCT. Viral infections continue to be a major cause of morbidity and mortality^(24-25,27-33).

A cohort study on HZ sought to determine the incidence and risk factors for this infection in 1,000 patients. During a five-year period after autologous HSCT, 194 patients developed at least one episode of HZ with a cumulative incidence of 21%. A second episode of HZ occurred in 31 out of 194 (16%) patients. In addition to the discontinuation of prophylaxis, advanced age has also been shown to be an important risk factor for ineffective protection⁽²⁷⁾.

Another study⁽³¹⁾ also corroborates CMV and Epstein-Barr (EBV) infections after transplantation. The cause is explained by ineffective protection associated with the inability of the host's depressed immune system to limit viral replication and spread, in addition to the loss of T-cell function.

In a study conducted in 2017⁽³²⁾, bacterial colonizers that provide protection against *Clostridium difficile* after grafting were identified. Clostridium infection is a frequent complication that causes infectious diarrhea, as the treatment significantly disturbs the intestinal microbiota. The results emphasize the need to adopt a careful selection of antibiotics that do not affect the intestinal protective bacteria and restore dead communities through targeted replenishment of specific groups.

In the concept analysis process, the consequences correlated to the defining characteristics, longer length of hospital stay and prolonged use of medications emerged during an ineffective protection experienced by patients undergoing transplantation⁽²⁶⁾.

In a study, 1,832 patients with non-Hodgkin's lymphoma undergoing HSCT were evaluated, and complications occurred in more than 70% of patients. The presence of one or more complications was associated with an increase in hospital stay and costs, 46% in autologous HSCT and 81% in allogeneic HSCT. The most common complications (~40%) were mucositis, febrile neutropenia and infection⁽⁵³⁾. Another study emphasized the longer hospital stay and use of medications by patients who developed DESH and the importance of advancing the prevention and treatment of this complication, both to improve patient survival and reduce the use and costs of hospital resources⁽⁵⁴⁾.

Regarding quality of life (QoL), the therapeutic trajectory tends to reduce patients' quality of life. In addition, the onset of complications resulting from immune weakness and the side effects of drug therapy mitigate this fact^(26,34,36-37). Fatigue is another characteristic that also compromises patients' coping status⁽³⁸⁾ and prevails during the first 100 days after HSCT⁽⁵⁵⁾. A study⁽⁵⁶⁾ developed in a hospital in Curitiba with 55 participants allowed to highlight the changes in QoL domains and some symptoms. Pain and lack of appetite were statistically relevant, although 69% of patients in the sample have recovered their QoL after the first six months of HSCT.

Authors indicate that 80% of patients compromise their protection due to high-dose conditioning chemotherapy

and develop oral mucositis characterized by pain, erythema, swelling of the mucosa, xerostomia and ulcerations; in addition to other signs and symptoms such as dysphagia, nausea and vomiting^(34-35,37).

Study limitations

The limitations of this study correspond to weaknesses in the study of this theme and the authors' subjectivity in identifying the indicators, a fact that may have influenced the collection of elements and the interpretation of concepts. Another limiting factor refers to the need to use the "Protection" focus with the aim to facilitate the search for studies, and later transposition of the concept to the "ineffective" judgment for a better understanding of the nursing diagnosis.

CONCLUSION

The performance of this study can contribute to refine and improve the nursing diagnosis "Ineffective Protection" through the identification of new attributes, ten antecedents and ten consequences that are not included in NANDA-I. Based on this, changes in the definition and other components of the diagnosis proposed by the taxonomy are proposed. However, further studies on this theme should be conducted to deepen and disseminate knowledge, as well as for the validation by experts and clinical validation to confirm the results. In addition, the results were obtained in a specific population and studies in other populations should be conducted to confirm the possible components of the diagnosis.

After this work, it is expected that the "Ineffective Protection" nursing diagnosis will be better used by nurses for recognizing the health status of patients undergoing HSCT. The identification of the correct diagnosis and the design of appropriate therapeutic plans tend to generate better rehabilitation and quality of life for patients, and reduce the possibility of conditions arising from the disease and/or treatment.

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