






Core Competencies for Nurse's Role in Bone Marrow Transplantation

Isabelle Ribeiro de Farias¹ , Marina de Jesus Leite¹ , Rafaela Vilela Alves dos Santos¹ ,
Filipi Utuari de Andrade Coelho , Priscilla Caroliny de Oliveira^{1,*} 

1. Hospital Israelita Albert Einstein  – São Paulo (SP), Brazil.

*Corresponding author: priscilla.caroliny@einstein.br

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ABSTRACT

Introduction: Bone Marrow Transplantation (BMT) replaces diseased or damaged bone marrow with another that normally functions. In Brazil, a nurse supervises nursing activities related to direct patient care, with other activities being exclusive to this profession. Due to the complexity of these patients, some BMT programs may choose to provide nursing care exclusively by registered nurses. **Objectives:** (i) To unveil nurses' perceptions regarding the competencies required during the care process for patients in the Bone Marrow Transplantation Unit; and (ii) to identify whether nurses recognize an increase in quality in BMT units that implement nursing care exclusively by registered nurses. **Methods:** A descriptive-exploratory study with a concurrent mixed-methods approach was conducted in a large hospital in the South Zone of São Paulo city with nurses working in BMT in 2023. **Results:** From the analysis of interviews, it was possible to categorize the results into three categories: a) the competencies required for nurses in BMT; b) BMT as a specialization for nursing; c) the relationship between exclusive nursing care and outcomes in BMT. **Conclusion:** Five core competencies were identified: clinical reasoning, decision-making, teamwork, health education, and leadership. Professionals recognize an increase in the quality of nursing care provided in BMT when exclusively performed by registered nurses.

Descriptors: Professional Competence; Bone Marrow Transplantation; Practice Patterns, Nurses.

Competências Essenciais para a Atuação do Enfermeiro no Transplante de Medula Óssea

RESUMO

Introdução: O transplante de medula óssea (TMO) é o processo de substituição de uma medula óssea doente ou lesada por outra com função normal. No Brasil, as atividades assistenciais relacionadas ao cuidado direto ao paciente são supervisionadas por um enfermeiro, sendo outras atividades privativas desse profissional. Devido à complexidade desses pacientes, alguns programas de TMO podem optar por prover o cuidado de enfermagem exclusivamente por enfermeiros. **Objetivos:** (i) Desvelar a percepção dos enfermeiros relativa às competências exigidas durante o processo de cuidado a pacientes na unidade de TMO e (ii) identificar se os enfermeiros reconhecem incremento da qualidade em unidades de TMO que implementam o cuidado de enfermagem exclusivamente por enfermeiros. **Métodos:** Estudo descritivo-exploratório com método misto concorrente realizado em um hospital de grande porte da Zona Sul da cidade de São Paulo com enfermeiros atuantes do TMO no ano de 2023. **Resultados:** A partir da análise das entrevistas, foi possível elencar os resultados em três categorias: a) as competências necessárias para atuação do enfermeiro no TMO; b) o TMO como especialização para a enfermagem; c) relação do cuidado exclusivo do enfermeiro com os resultados no TMO. **Conclusão:** Cinco competências centrais foram identificadas: raciocínio clínico, tomada de decisão, trabalho em equipe, educação em saúde e liderança. Os profissionais reconhecem o incremento da qualidade dos cuidados de enfermagem prestados no TMO quando realizados exclusivamente por enfermeiros.

Descritores: Competência Profissional; Transplante de Medula Óssea; Padrões de Prática em Enfermagem.

INTRODUCTION

Bone marrow transplantation (BMT) is the process of replacing a diseased or injured bone marrow with a bone marrow with normal function, characterized by the intravenous infusion of hematopoietic progenitor cells, intending to reestablish marrow function in patients with defective or damaged bone marrow¹. It is considered a complex therapy used on a large scale to treat onco-hematological diseases, sickle cell anemia and inborn errors of metabolism.²

Brazil is prominent in the BMT scenario, representing around 60% of transplants performed in Latin America. According to data from the Brazilian Transplant Registry (Registro Brasileiro de Transplantes-RBT), in 2021, the country performed 3,823 transplants, of which 2,279 were autologous. The treatment is available in 13 states of the federation, which have 107 teams accredited to carry out the procedure. The survival rate in the 1st year after BMT is 84% for autologous and 59% for unrelated allogeneic³.

The BMT process involves several steps and requires the work of a qualified multidisciplinary team. The nurse plays a central role in this process, assuming different roles and responsibilities⁴. Ongoing discussions are underway to establish and outline the fundamental standards and competencies for nurses' performance in various scenarios in the BMT.

The nurse is involved in all stages of BMT care, from the pre-transplant phase to the management of early and late post-transplant complications. This includes implementing interventions to prepare the donor and recipient, infusing stem cells during transplantation, and managing early and late complications. Therefore, your work requires specialized knowledge, complex decision-making skills in challenging situations and clinical skills to provide individualized assistance focused on the best results⁴.

With the increased scope of nurses' activity in the BMT internationally, the discussion on advanced nursing practices has evolved, making it imperative to define the necessary competencies for nurses in this specialty field. Competence can be defined as the individual's ability to articulate and mobilize three interdependent dimensions – knowledge, skills and attitudes – aiming to intervene in a given context and achieve the desired results⁵. The construction of skills favors the professional training process, and its application manifests itself in knowing how to act, wanting to act and being able to act⁶.

In Brazil, the first initiatives to define the scope of nurses' work in the BMT emerged with the regulation of the Federal Nursing Council (Conselho Federal de Enfermagem-COFEN 200/97), which standardized the role of the nursing team in the process of donating, harvesting and transplanting organs, tissues and cells. Since then, new regulations have been published, aiming to define the role of nursing professionals in the BMT⁷.

In BMT services in Brazil, care activities related to direct patient care are supervised by a nurse since some activities are exclusive to this professional and others can be delegated to other nursing team members. Due to the complexity of BMT patients, programs may choose to provide nursing care exclusively through nurses. This would make it possible to mitigate risks and achieve the best results in terms of clinical outcomes⁸⁻¹⁰.

Given the above, the following guiding question for this study emerged: From the perspective of nurses who work in the area, what competencies are required to develop the care process in the context of BMT?

Thus, this study aims to identify the core competencies of nurses who work in the BMT and reveal their perceptions of these professionals concerning the competencies required during the patient care process in the BMT unit.

METHODS

The present is a descriptive-exploratory study with a concurrent mixed method¹¹. The research was conducted in a large private hospital in São Paulo that began its BMT activities in 1987. In this institution, nurses directly assist patients during the transplantation process. The institution's BMT program is a national reference and was the first outside the United States to receive certification from the Foundation for the Accreditation of Cellular Therapy (FACT)¹².

The study sample was selected by convenience, including nurses from different hierarchical levels (full and senior) who performed their duties in the BMT unit. Nurses with at least three years of experience at the institution were invited to participate, and those on vacation, away or on leave during the data collection period were excluded.

Data collection took place in the first half of 2023 after the project was approved by the institution's ethics and research committee (approval number 6.014.053, CAAE 67359123.9.0000.0071).

Data were collected using a questionnaire prepared by the authors, following the American model of training and performance in advanced practice known as Clinical Nurse Specialist (CNS)¹³. The following references were used to develop the initial matrix with the core competencies of the BMT nurse: Competencies of the Clinical Nurse Specialist in Oncology¹⁴, Statement for Education and Practice of the Clinical Nurse Specialist¹⁵, Fundamentals of Doctoral Education for Advanced Nursing Practice¹⁶ and Registered Advanced Practice Nurse: Doctoral Level Skills¹⁷. The proposed model included six domains and 90 competencies, as detailed in Table 1.

Table 1. Core domains and competencies of clinical nurses working in BMT.

Domains	Number of competencies
D1 – Care management	35
D2 – Ethics and professional commitment	8
D3 - Leadership	13
D4 – Interprofessional collaboration	7
D5 – Evidence-based practice	12
D6 – Health education and research	5

Source: Elaborated by authors

The degree of agreement with the items proposed in the form was measured using the Likert scale with scores ranging from 1 to 3 (1 – I agree; 2 – I am not decided; and 3 – I disagree). When participants selected the “I’m not decided” option, they were encouraged to suggest changes concerning the competency. The data collection questionnaire was made available online through the Google Forms® platform.

After completing the electronic questionnaire, participants were interviewed following a structured question guide based on the following guiding question: “Describe your role in the bone marrow transplant unit”. The interviews were audio recorded and later transcribed verbatim. Participants permitted the use of interview recordings in the study.

Regarding data analysis, information from electronic forms was exported to the Excel program, and participants’ responses were evaluated in frequency. Correlations were also made with the suggestions provided by the nurses who participated in the study.

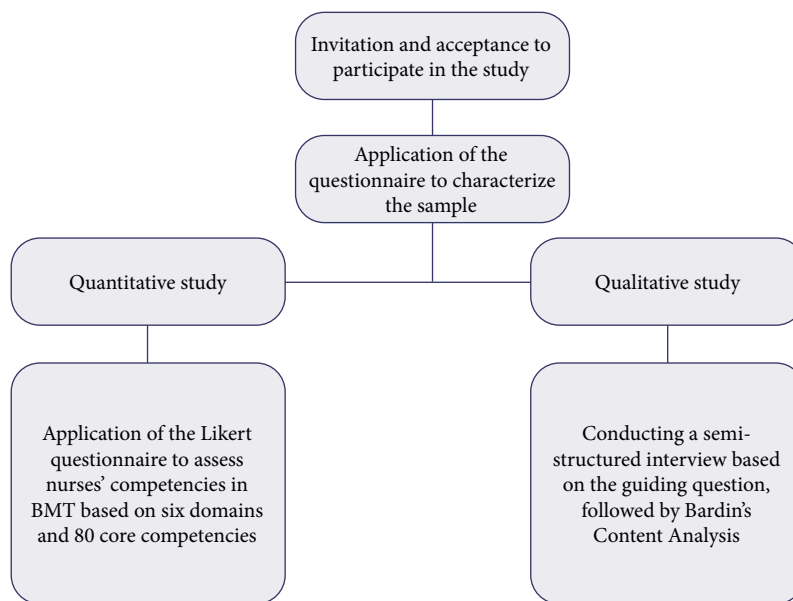
The agreement index by domain and by competence was calculated by dividing the number of responses that agreed with the statement proposed by the competence description by the total number of respondents.

The competence disagreement index was calculated similarly.

The interviews were transcribed, and the data were analyzed through content analysis in thematic mode, respecting the stages of pre-analysis, material exploration and data interpretation¹⁸.

In the pre-analysis, the researchers highlighted the central ideas of the statements during the initial reading of the material¹⁸. When exploring the material, repeated readings were carried out to identify the meaning cores and the meanings emitted by the participants. Based on the analysis of the meaning cores, the data were reinterpreted to give systematic content to the categories that represent the condensation of the semantic content emitted by the participants¹⁸.

When presenting the results, excerpts from the statements were edited to follow the standard, maintaining the original meaning of the statements. Terms in brackets were added when necessary for the reader to understand the statement better. Interviewees were identified by the letter “E” followed by an Arabic number, according to the chronological order of the interviews¹⁸. The operationalization of data collection is detailed in Fig. 1.



Source: Elaborated by authors

Figure 1. Operationalization of study collection with mixed method.

RESULTS

21 nurses were invited to participate in the study, and the final sample consisted of 19 participants, ages 26 to 52 years. Of these, 12 worked day shifts and the other seven worked night shifts. Two nurses held a senior position, while the others were full nurses (Table 2).

Table 2. Profile of nurses working in the BMT unit (n = 19).

Variable	n (%)
Gender	
Male	4 (21)
Female	15 (79)
Educational level	
<i>Lato sensu</i> postgraduate	18 (95)
<i>Stricto sensu</i> postgraduate	1 (5)
Time working at BMT (years)	
Up to 5	4 (21)
6 to 10	4 (21)
11 to 15	7 (37)
Over 15	4 (21)

Source: Elaborated by authors

80 skills were presented to nurses for analysis, reflection and expression of opinions.

The agreement rate achieved in domain 1 was 93.9%. The agreement rates in the following domains were 97.65, 100, 99.1, 96.35% and 93.75% in domain 6 (Table 3).

Table 3. Distribution of agreement rates between the mapped domains and competencies.

Index of minimum agreement (%)	Index of medium agreement (%)	Index of agreement > 80% (%)	Domain
68,75	93,90	68,75	1- Care management
87,50	97,65	100,00	2 - Ethics and professional commitment
100,00	100,00	100,00	3 - Leadership
93,75	99,10	100,00	4 - Interprofessional collaboration
87,50	96,35	100,00	5 - Evidence-based practice
87,50	93,75	100,00	6 - Health education and research

Source: Elaborated by authors

In domain 1 (care management), competencies that did not exceed 80% agreement were identified. The lowest agreement rates were obtained in three competencies in this domain, all with 68.75% agreement among respondents, namely: a) evaluates the indication criteria for insertion of the patient in the Brazilian Registry of Bone Marrow Donors (Registro Brasileiro de Doadores de Medula Óssea-REDOME); b) evaluates and uses epidemiological, biostatistical, environmental and other scientific data related to the disease; c) works to promote health and prevent hematological disease throughout the care continuum, as well as carrying out screening and early detection of hematological disease according to recommendations/protocols.

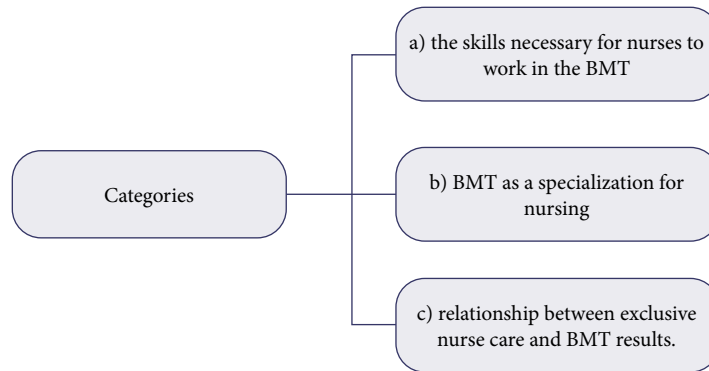
Only two comments were recorded on the form. Regarding the suggestions for adjustments presented by the respondents, it was highlighted that the clinical nurse does not work directly with the donor for ethical reasons, which led to disagreement regarding their participation in the donor's registration process in the National List of Essential Medicines (Relação Nacional de Medicamentos Essenciais-REREME). Another respondent highlighted that the inpatient unit nurse has little control in working with "survivors" and the long-term effects of the outpatient, thus disagreeing with the competence "association of long-term survival assessment and the management of the effects late treatment in the care plan".

Of the 80 competencies mapped, only 11 (14%) showed disagreements between respondents. No divergences were reported in domains 3 and 4.

Regarding the results of the interviews, from the content analysis, three categories emerged: a) the skills necessary for nurses to work in the BMT; b) BMT as a specialization for nursing; c) the relationship between the nurse's exclusive care and the BMT results (Fig. 2).

a) The skills necessary for nurses to work in the BMT

Five skills were listed: clinical reasoning, decision-making, teamwork, health education and leadership. Next, each of the skills will be presented.



Source: Elaborated by authors

Figure 2. Categorization of results.

Clinical reasoning

Clinical reasoning emerged as a crucial aspect during interviews about essential competencies in BMT. Some expressions in the nurses' statements showed the importance of clinical reasoning and its direct relationship with the quality of care offered to the patient, such as:

"Clinical reasoning is fundamental in any unit, but in bone marrow transplant patients, they become unstable from night to day, from morning to afternoon" (E2).

Decision making

Another skill mentioned by participants was decision-making. Nurses associated decision-making with autonomy and professional empowerment within the multidisciplinary team, in addition to considering it an essential skill for developing care plans based on prioritizing diagnoses and assertive interventions:

"We have to have that very different look at the patient and make decisions, carry out nursing implementations where you can achieve what was planned, achieve the goals you plan there when assisting your patients" (E3).

Teamwork

Teamwork was a skill mentioned by all participants, highlighting the nature of interdisciplinary care in BMT. It was related to better outcomes, the organization of the work process and the complexity of patients:

"Here we work a lot as a team, although we have nurses, each nurse is responsible for two, three patients, I never work alone" (E3);

"Teamwork, because it's a very multidisciplinary team effort, we depend on each other all the time, right? Doctor, nutritionist, physiotherapist, in short, we work a lot together because it's a very complex treatment; they are very weak, so teamwork is essential" (E4).

Health education

Health education emerges as an essential competency for nurses working in BMT, highlighting the relevance of this competency to care practice.

When the patient has doubts, the first person they will ask is sometimes not even the medical team; it is their reference nurse. It has happened several times that I am in the room, the doctor gives instructions, and so, it is an exchange of looks: he looks at the doctor, then he looks at me, he looks at the doctor, then he looks at me. And the question is always, what do you think of what he said? It is a very peculiar development in the sector (E17).

Leadership

Leadership is a fundamental skill for nurses who seek to know and get involved in decision-making processes to promote comprehensive and quality care throughout the patient's treatment in the BMT:

"Leadership, we have to be at the forefront of everything; we are the ones who are here every day, every time, and the nurses who know the patient and care for them as a whole" (E13).

b) BMT as a specialty for nursing

Specialization in the area emerges as a necessity to work in the BMT context due to its specificities of treatment. The importance of training was highlighted both for strengthening direct patient care and for managing processes in the unit. The risk of providing specialized care without the necessary knowledge and skills to ensure quality and safe care was also discussed:

"I think that the generalist nurse would be able to deal with the daily issues of transplantation, but perhaps they would lack a bit of that clinical reasoning that I think the nurses here have. Chemotherapy itself is a particular issue" (E2);

"I honestly believe that they do not {do not consider that a generalist nurse has the skills and abilities to work in the BMT} because there are many particularities in our sector. It's from the catheter, the care we take with the catheter to avoid infection because these are immunosuppressed patients" (E4).

c) Relationship between nurses' exclusive care and BMT results

When carried out exclusively by nurses, the professionals established a relationship between improving the quality of care provided to patients in the BMT. The systemic vision, care management and decision-making were highlighted as differentiators of these professionals. The impact of care indicators, such as the infection rate, was also mentioned, which is essential in this care context:

"[...] we have technicians with absurd competence, but nurses have a vision beyond that. They have more preparation in their undergraduate studies and more clinical reasoning than technical reasoning" (E15);

"We look at the indicators. When we compare ourselves with international benchmarking, we realize that the bloodstream infection rate, adherence rate, and hand hygiene are excellent here, even much better than specialized services in the United States. I consider that this is a lot for the work of nursing" (E8).

DISCUSSION

A partial correspondence was observed between the domains proposed in the quantitative stage and the skills that emerged from the interviews in the qualitative research stage. The domains of evidence-based practice, care management ethics, and commitment were not mentioned in the interviews, even though the average agreement rate was greater than 90% in the quantitative analysis.

The results of this study made it possible to characterize the competencies required for nurses to work in BMT from the perspective of the professionals themselves, contributing to the construction of their advanced practice competencies in this scenario in Brazil. Additionally, professionals recognized the increased quality of nursing care provided in the BMT when performed exclusively by nurses.

In the qualitative stage, six categories emerged when nurses responded freely about the skills they considered necessary to work in the BMT: clinical reasoning, decision-making, teamwork, health education, leadership and care management.

Similarities and divergences were identified by comparing the proposed domains with the acceptable level of agreement with the categories that emerged from the interview. Leadership, teamwork, and health education skills corresponded to domains 3, 4 and 5. However, the domains of evidence-based practice, care management ethics and commitment should have been mentioned in the interviews.

The nurses highlighted the importance of specializing in onco-hematology to work in the BMT unit due to the high complexity of patients undergoing the procedure¹⁷. The difference in the fact that the team is composed exclusively of nurses who are specialists in the field was highlighted, highlighting a positive perception of the quality of care associated with this characteristic.

The performance of specialist nurses in BMT demonstrates that the best clinical outcomes are related to the control and management of symptoms, improvement in the quality of life and survival of patients, psychological support to reduce concerns related to the disease and/or treatment, guaranteeing patient satisfaction patient and shared decision making. Therefore, it is understood that the competencies of advanced practice nurses in oncology directly reflect their professional performance, which is evident in their impactful clinical outcomes¹⁷.

Health education emerges as an essential skill for nurses to work in the BMT. Nurses are often responsible for answering questions, providing procedure instructions and cultivating solid bonds with patients and their families¹⁶. The nurse in the BMT is responsible for leading the health education process in patient and family care, requiring specific knowledge and skills to adapt strategies to different applicable contexts¹⁸.

Careful analysis of the narratives reveals that the nurse involved in the BMT context can provide patient care. This is due to the inherent high complexity of this scenario, which requires refined clinical judgment¹⁶.

Interprofessional collaboration should be considered a core competency of nurses working in this context since therapeutic plans in the BMT are notably interprofessional. The nurse coordinates teamwork harmoniously, aiming to minimize conflicts and improve patient outcomes¹⁹.

The leadership role of nurses associated with teamwork is also noted. They act as central communicators for all team members, demonstrating skills for improving team and participatory management. Furthermore, nurses must cultivate good relationships with other multidisciplinary team members, as care should be cohesive, especially in a context as complex as the BMT. Therefore, professionals must be willing to develop healthy professional relationships, aiming for humanized care¹⁹.

Nurses play a leadership role, and this competence is gradually developed throughout their academic training. However, the perception of leadership is often associated with managerial roles, while those who perform caring roles should also recognize their role as leaders. In the results obtained, only one nurse who holds a senior position in the unit mentioned leadership as a primary competence for working in the BMT. Furthermore, many highlighted their decision-making competence, which gives them the autonomy and leadership necessary to implement the actions considered relevant at the moment²⁰.

In addition to being a nurse's competency, leadership is an essential value in BMT. The hospital in which the study was carried out is recognized by Magnet, and one of its premises is to train nurses in different stages of the work process, allowing them to exercise their role as leaders fully. The Magnet Recognition Program is the highest recognition of excellence in nursing practices and strategies in a hospital institution. Among its five pillars is transformational leadership, which "evaluates the promotion of transformations based on vision, influence, clinical knowledge and strong expertise concerning professional nursing practice"²¹. Therefore, a professional considered a transformational leader must constantly be aware of the context and challenges of his unit, guiding his team and seeking excellent assistance²².

The nurse's role in BMT involves direct patient care issues and other activities that encompass collaboration, coordination and supervision of activities with different levels of complexity²³. Care is not limited to techniques such as catheter management and medication administration; the importance of encouraging self-care and promoting the active participation of the patient and their family in the therapeutic process is emphasized²³.

According to category B, regarding the role of generalist nurses in the BMT unit, all interviewees agreed that specialization in the area is essential to carry out their activities with excellence. The generalist nurse has the skills to assist in general, but only the BMT unit specialist can deal with this area's specificities. It must be considered that therapies have particularities and that there are laboratory tests and clinical signs that differ from those seen in a medical clinic, for example²⁴. The professionals who work in the BMT perform several activities, such as evaluating adverse reactions to the proposed treatment and/or the disease, supporting the patient's self-management of symptoms, guidance/education, support in adaptive processes resulting from the treatment and/or disease, plan of care incorporating actions linked to palliative care, assessment of barriers and facilitators of the family context and support networks and care planning following other members of the health team.

Respondents also highlighted, in category C, that the exclusive composition of the team with nurses contributes to improving the quality of care offered to patients. In this context, since care for post-transplant patients is exclusively provided by nurses, clinical thinking is more advanced. The same professional is responsible for administering medications, collecting exams, monitoring therapeutic interventions daily, and managing adverse events. Therefore, with this comprehensive approach to the patient, the assistance provided becomes more dynamic, targeted and less fragmented²⁵.

It should be noted that mapping nurses' competencies and adequate training and regulation of these professionals constitutes one of the strategies for expanding universal health coverage. Innovative solutions are essential to face the challenges of different professional areas and specialties, especially in the onco-hematology scenario, due to global estimates of the incidence and prevalence of cancer and the high complexity of care in BMT. It is necessary to expand debates on skills-based professional training methods, create and/or adapt teaching programs for advanced levels and restructure curricula and pedagogical projects. With expanded training and practice, these nurses can effectively promote significant changes and resolutions in the care provided to this population²⁶.

A limitation of this study was the difficulty in obtaining direct contact with professionals during the workday, which may have influenced the responses. There were also limitations related to the number of participants and bias caused by the convenience of obtaining information from nurses who work in only one BMT program. In this sense, there is a need to expand this study to other realities.

The competencies mapped in this research outline the essential role of nurses who work in the BMT, covering the set of activities developed by these professionals in the care of patients diagnosed with previous, current or potential cancer, from prevention to the end of life, in collaboration with the interdisciplinary health team. These core competencies guide nurses' clinical practice and establish a distinct professional performance profile, expanding the limits of the scope of practice to impact the health of individuals, families and communities positively.

We understand that research of this nature contributes to studies on advanced practice nursing, particularly in the context of oncology, and can serve as a reference for educational institutions, associations, organizations and health institutions. This would enable the standardization and improvement of the professional training model for nurses who work in the BMT. However, future studies are necessary to validate the competencies identified in this preliminary study.

CONCLUSION

The study used mixed-method research to identify the core competencies required for nurses to perform while caring for patients in the BMT unit.

The results showed that care management, ethics and professional commitment, leadership, interprofessional collaboration and teamwork, evidence-based practice, health education and research, clinical reasoning and decision-making are essential skills for this professional's performance in the BMT scenario.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Oliveira PC, Santos RVA; **Conception and design:** Oliveira PC; **Data analysis and interpretation:** Oliveira PC, Santos RVA; **Article writing:** Farias RI, Leite MJ; **Critical revision:** Coelho FUA; **Final approval:** Oliveira PC.

DATA AVAILABILITY STATEMENT

All dataset were generated or analyzed in the current study.

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