







## KNOWLEDGE OF UNDERGRADUATE NURSING STUDENTS ABOUT GENERAL WOUND CARE: OBSERVATIONAL STUDY

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### ABSTRACT

**Objective:** To identify nursing students' knowledge about general wound care. **Methods:** This is an observational-descriptive research conducted with final-year nursing undergraduate students from higher education institutions in the Cariri region, Ceara, Brazil. Data collection was developed through the sampling technique snowball or snowball sampling. The data were tabulated in Microsoft Excel Spreadsheet and later analyzed by simple descriptive statistics. **Results:** The sample included 211 nursing students, from the ninth (123) and tenth (88) semester, from public (50) and private (161) institutions. Among the students, 122 highlighted professors and scientific events as sources of searching for primary information about wounds, and that in their hospital internships they have skin assessment as part of the activities they perform (85.8%). About the knowledge, the data that showed the highest percentage are regarding aspects of wound assessment (98.6%), coverage (96.7%) and biological factors of healing (92.4%). The participants left to be desired in aspects of PU prevention (39.8%) and Braden scale, with 45% of correct answers. **Conclusion:** This study made it possible to identify the general knowledge about wounds of graduating nursing students.

**DESCRIPTORS:** Nursing care. Education, nursing, diploma programs. Students, Nursing. Wounds and injuries. Enterostomal therapy.

## CONHECIMENTOS DE CONCLUINTE DE GRADUAÇÃO EM ENFERMAGEM SOBRE CUIDADOS GERAIS COM FERIDAS: ESTUDO OBSERVACIONAL

### RESUMO

**Objetivo:** Identificar o conhecimento dos estudantes de Enfermagem sobre os cuidados gerais com feridas. **Métodos:** Trata-se de uma pesquisa observacional-descritiva realizada com estudantes do último ano do curso de graduação em Enfermagem de instituições de ensino superior, na região do Cariri, Ceará, Brasil. A coleta de dados desenvolveu-se por meio da técnica de amostragem *snowball sampling*, e os dados foram tabulados em planilha do Microsoft Excel e posteriormente analisados por estatística descritiva simples. **Resultados:** A amostra contou com 211 estudantes de Enfermagem, do nono (123) e do décimo semestre (88), de instituições públicas (50) e privadas (161). Dos alunos, 122 destacaram professores e os eventos científicos como fontes de busca de informações primárias acerca de feridas e que em seus estágios hospitalares têm a avaliação de pele como parte das atividades que executam (85,8%). Acerca do conhecimento, os dados que apontaram maior percentual foram em relação a aspectos da avaliação da ferida (98,6%), cobertura (96,7%) e fatores biológicos da cicatrização

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Section Editor: Juliano Teixeira Moraes 

Received: Oct. 17, 2022 | Accepted: Mar. 14, 2023

How to cite: Macedo LFR; Rodrigues JT; Lisboa KWSC; Pinto SL; Oliveira EG; Feitosa YS (2023) Knowledge of undergraduate nursing students about general wound care: observational study. ESTIMA, Braz. J. Enterostomal Ther., 21: e1323. [https://doi.org/10.30886/estima.v21.1323\\_IN](https://doi.org/10.30886/estima.v21.1323_IN)

(92,4%). Os participantes deixaram a desejar em aspectos de prevenção de lesão por pressão (39,8%) e escala de Braden, com 45% de acertos. **Conclusão:** Este estudo possibilitou identificar os conhecimentos gerais sobre feridas de estudantes concludentes do curso de Enfermagem.

**DESCRITORES:** Cuidados de enfermagem. Programas de graduação em Enfermagem. Estudantes de Enfermagem. Ferimentos e lesões. Estomaterapia.

## CONOCIMIENTOS DE LOS DIPLOMADOS EN ENFERMERÍA SOBRE LOS CUIDADOS GENERALES DE LAS HERIDAS: ESTUDIO OBSERVACIONAL

### RESUMEN

**Objetivo:** Identificar los conocimientos de los estudiantes de enfermería sobre el cuidado general de heridas. **Métodos:** Trata-se de uma pesquisa observacional-descritiva, realizada com estudantes do último ano do curso de graduação em enfermagem de instituições de ensino superior, na região do Cariri, Ceará, Brasil. La recogida de datos, desarrollada a partir de la técnica de muestreo "Snowball" o "Bola de Nieve", los datos fueron tabulados en hoja de cálculo Microsoft Excel y posteriormente analizados mediante estadística descriptiva simple. **Resultados:** La muestra incluyó 211 estudiantes de enfermería, siendo del noveno 123 y décimo 88 semestre, de instituciones públicas 50 y privadas 161. De los estudiantes, 122 destacaron profesores y eventos científicos como fuentes de búsqueda de información primaria sobre heridas, y destacaron que en sus prácticas hospitalarias tienen la evaluación de la piel como parte de las actividades que realizan (85,8%). Sobre los conocimientos, los datos que indicaron mayor porcentaje son en aspectos de valoración de heridas (98,6%), cobertura (96,7%) y factores biológicos de la cicatrización (92,4%). Dejaron que desear en aspectos de prevención de UPP (39,8%) y escala de Braden con (45,0%) de respuestas correctas. **Conclusión:** Este estudio permitió identificar los conocimientos generales sobre heridas de los estudiantes de enfermería graduados.

**DESCRIPTORES:** Atención de enfermeira. Programas de graduación en Enfermería. Estudiantes de Enfermería. Heridas y lesiones. Estomaterapia.

## INTRODUCTION

Wounds are injuries that cause changes in the integrity of the skin and devitalize its functions, and characteristic signs such as acute pain, heat, hematoma and redness can be observed. Every wound is classified according to its etiology and history, and it might be related to external or internal factors and associated conditions<sup>1</sup>.

Wounds can be classified as chronic or acute, requiring appropriate care according to their etiology. This classification stems from the evolution of the healing process and the needs of this injury. The presence of foreign bodies, necrotic tissue and infection delays healing, highlighting the need for appropriate management and conduct for a better response and the provision of specific follow-up so that the therapy has excellence<sup>2</sup>.

Therefore, wounds are a serious public health problem affecting populations worldwide. In addition, these damages are prevalent in individuals who are more financially vulnerable and need public services assistance. Because of the high demand for continuous care, public coffers are overloaded. These wounds can be uncomfortable, reducing the quality of life and resulting in possible limb amputation or death<sup>3</sup>.

According to the Resolution of the Federal Nursing Council (Conselho Federal de Enfermagem-Cofen) nº 567/2018, the nurse is qualified to manage wounds. Among its attributions is the evaluation, elaboration of protocols, choice and indication of new technologies in preventing and treating the patient with wounds<sup>4</sup>.

It is of great importance that the nurse is empowered by scientific knowledge and mastery over wound care. In a multidisciplinary team, they play a relevant role because they are in direct contact with the patients and because they are the primary professionals involved in this problem. The nurse has a holistic view, knowing how to handle and propose appropriate interventions. For this, it is necessary to have a vast understanding and constantly be updated on this ideal<sup>5</sup>.

During the graduation course, the Nursing student can learn about the discipline of Semiology and Semiotics, in which wound care issues are addressed. Aiming at the need for patient care and considering Resolution No. 567/2018 of Cofen<sup>4</sup>, higher education institutions seek to include disciplines that cover crucial issues regarding care for wounds and injured patients, aiming to train future nurses to develop such activity with a practical-scientific understanding<sup>6</sup>.

A study showed that nursing students' understanding of wounds could be improved, thus highlighting the need for continuous updating in this area<sup>7</sup>. Based on this question, the need arose to investigate how students understand the treatment of wounds in the region of Cariri, Ceará, Brazil.

Therefore, nursing students in their final year must be able to apply scientific and technical knowledge in managing patients with wounds.

This research is justified by the need to assess the knowledge of Nursing students in the Cariri region about general care for wounds, identify the knowledge acquired about practices and management of wounds in students in the last year of the Nursing course, evaluate the knowledge of nursing students about dressings and coverings and describe the sociodemographic profile of the study participants. Because as stated by Berghetti et al.<sup>8</sup>, nurses need all the knowledge acquired in their academic path for excellence in their care practice.

This study aimed to identify the knowledge acquired about practices and management of wounds in students in the last year of the Nursing course.

## METHOD

### Study design

The present cross-sectional, observational-descriptive study followed the recommendations of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)<sup>9,10</sup>.

### Study location

The study was conducted in four universities and university centers in the Cariri microregion of Ceará, covering the cities of Crato, Juazeiro and Barbalha, from March to December 2020.

### Population

The study population consisted of undergraduate Nursing students attending the ninth and tenth semesters (last year of graduation). They are students about to enter the job market who deal daily with general care and wounds in their internship supervision.

For the calculation of non-probabilistic sampling, a quantitative survey was carried out of students enrolled in higher education institutions who were enrolled in the ninth and tenth semesters of the undergraduate nursing course, with a total of 640 students enrolled.

### Data collection

For data collection, a questionnaire was chosen, translated and adapted into Portuguese, divided into two sessions. At first, there were questions regarding student demographic data and sources of updates on the subject. The second session dealt with general information about nursing students' knowledge and practice in caring for patients with wounds, totaling 19 items<sup>11</sup>.

Data collection was carried out using the snowball sampling technique, or snowball sampling, due to the Covid-19 pandemic, which established the need to adopt preventive measures to avoid the spread of this new coronavirus, with emphasis placed mainly on physical distancing of people, frequent hand washing and the use of masks<sup>12</sup>. This research proves the possibility of carrying out studies in times of crisis, and it is up to the researcher to adapt to the moment.

The snowball sampling technique is used in situations where the participants are unknown. It was necessary to contact some academic class leaders (seed participants) via WhatsApp and ask them to share the research instrument with their peers (students in their final year of nursing graduation) or indicate possible participants. In this way, individuals who expressed a desire to participate in the survey received a link to access Google Forms. It contained the Informed Consent Form (TCLE), to be signed in virtual format, and the subsequent survey questionnaire.

Access to the complete form was only possible if the student met the following criteria:

- Provide an email address;
- Indicate gender, age and whether they had trained in a technical course in Nursing;
- Indicate the teaching institution and be in the ninth or tenth semester of the undergraduate nursing course;
- Respond to all items referring to the source of updates, knowledge and practice regarding caring for patients with wounds.

## Participant eligibility criteria

Inclusion criteria: to be a student attending the last year of the undergraduate nursing course, corresponding to the ninth and tenth semesters, and to be duly enrolled in one of the four higher education institutions in this research of the Cariri region.

Exclusion criteria: one being away or on leave from academic activities during the collection period or not having access to the internet.

## Organization and statistical analysis of data

Data were tabulated and organized into spreadsheets in Microsoft Office Excel 2013 for analysis. Therefore, this was done by calculations of simple statistics, relative and absolute frequency. The variables and data were presented in tables for better contextualization, followed by the discussion, which was categorized based on the literature capable of explaining and comparing the results found.

## Ethical aspects

The research was developed based on the principles of Resolution nº 466, of December 12, 2012, of the National Health Council<sup>13</sup>, and obtained a favorable opinion from the Research Ethics Committee of the responsible institution, according to opinion No. 4,112,506.

## RESULTS

Responses were obtained from 211 nursing students. The data (Table 1) showed a higher prevalence of females (173; 82%) aged 20–29 years (178; 84.4%) without training in the technical course in Nursing (75.8%), studying and graduating in nursing at private higher education institutions (160; 76.3%) and in the ninth semester (123; 58.3%).

**Table 1.** Distribution of sociodemographic data of nursing students in Cariri, Crato, Ceará, Brasil, 2020 (n = 211).

Sociodemographic variables	n	%
<b>Gender</b>		
Female	173	82
Male	38	18
<b>Age range (years)</b>		
20–29	178	84.4
30–39	23	10.9
40–49	10	4.7
<b>Nursing Technician</b>		
Yes	51	24.2
No	160	75.8
<b>Educational institution</b>		
Public	50	23.7
Private	161	76.3
<b>Semester</b>		
Ninth	123	58.3
Tenth	88	41.7
<b>Total</b>	<b>211</b>	<b>100</b>

Regarding knowledge sources (Table 2), ten options were made available, among which students chose the ones they use most frequently. Searching for information with professors and scientific events was the first way in which students thought of seeking information on the subject (102; 48.3%) (both), followed by searching for information with nurses (82; 48.3%); 38.9%) and databases, websites, etc. (76; 36%).

Regarding the sources used “sometimes” by the students, the reading of scientific articles related to wounds stood out (154; 73%), followed by library searches (132; 62.6%) and university extension courses and databases. Data, websites, among others (122; 57.8%).

Concerning sources “never” used by students, subscriptions to journals predominated (99; 46.9%), followed by seeking information from physicians (96; 45.5%) and study groups. (57; 27%).

**Table 2.** Knowledge sources of nursing students in Cariri, Crato, Ceará, Brasil, 2020 (n = 211).

Knowledge sources	Always		Sometimes		Never	
	n	%	n	%	n	%
Journal subscription	13	6.2	99	46.9	99	46.9
Reading scientific articles	47	22.3	154	73.0	10	4.7
Databases, websites, among others	76	36.0	122	57.8	13	6.2
Library search	42	19.9	132	62.6	37	17.5
University extension courses	60	28.4	122	57.8	29	13.8
Study Groups	46	21.8	108	51.2	57	27.0
Scientific events	102	48.3	105	49.8	4	1.9
Searching for information with teachers	102	48.3	98	46.5	11	5.2
Information search with nurses	82	38.9	108	51.2	21	9.9
Searching for information with medical doctors	22	10.4	93	44.1	96	45.5
<b>Total</b>		<b>211</b>			<b>100</b>	

As for the knowledge and practice aspect of nursing students (Table 3), most of them stated that in their hospital internship fields, skin assessment is part of the activities they perform for all patients (181; 85.8%), as well as the presence of norms about wound care (170; 80.6%) – such as protocols, manuals, etc. – and the use of special mattresses to prevent pressure injuries (140; 66.4%).

It was observed in the presentation of the data that the students demonstrated to obtain good knowledge about general care with wounds, specifically in the items' ability to identify the four stages of pressure injury (204; 96.7%), ability to apply a compression bandage (146; 69.2%) and sufficient learning about chronic wounds (109; 51.7%).

**Table 3.** Knowledge and practice of nursing students in Cariri, Crato, Ceará, Brasil, 2020 (n = 211).

Knowledge and practice	Yes		No	
	n	%	n	%
In your internship field, are there norms about wound care?	170	80.6	41	19.4
Can you identify the four stages of pressure injury in the patients you care for?	204	96.7	7	3.3
Are special mattresses used to prevent pressure injuries in your hospital internship field?	140	66.4	71	33.6
Do you know how to apply a compressive bandage?	146	69.2	65	30.8
In your clinical practice in the internship field, is skin assessment part of your activities for all the patients you care for?	181	85.8	30	14.2
Did you receive enough information about chronic wounds in your Nursing graduation?	109	51.7	102	48.3
<b>Total</b>	<b>211</b>		<b>100</b>	

Concerning knowledge regarding the care of patients with wounds (Table 4), the highest number of correct answers is in the following items: wound assessment is a cumulative process that comprises observation, data collection and evolution (208; 98,6%); the selection of wound coverage should be based on the characteristics of the bed (204; 96.7%); and enzymes are effective in removing devitalized tissue from chronic wounds (195; 92.4%).

It was also observed, in these items, a more significant number of errors: the first stage of the pressure ulcer is easily identified in people with dark/black skin (127; 60.2%); the Braden scale is an instrument used to assess the risk of the patient developing vascular ulcers (116; 55%); and wet therapy is the gold standard for treating chronic wounds (95; 45%).

**Table 4.** Knowledge of Nursing students from Cariri regarding caring for patients with wounds, Crato, Ceará, Brasil, 2020 (n = 211).

Knowledge regarding the care of patients with wounds	Hits		Misses	
	n	%	n	%
Wet therapy is the gold standard for treating chronic wounds. (T)	116	55	95	45
Wound pain should be assessed by the healthcare professional, not the patient. (F)	156	73.9	55	26.1
Wound assessment is a cumulative process comprising observation, data collection and evolution. (T)	208	98.6	3	1.4
The Braden scale is an instrument used to assess a patient's risk of developing vascular ulcers. (F)	95	45	116	55
Classic signs of infections may not be present in patients with chronic wounds or in those who are immunosuppressed. (T)	125	59.2	86	40.8
In chronic wounds, the only good bacteria is the one that is dead. (F)	126	59.7	85	40.3
The wound dressing selection should be based on the characteristics of its wound bed. (T)	204	96.7	7	3.3
The first stage of pressure ulcers is easily identified in people with dark/black skin. (F)	84	39.8	127	60.2
Enzymes are effective in removing dead tissue from chronic wounds. (T)	195	92.4	16	7.6
<b>Total</b>	<b>211</b>		<b>100</b>	

T: true; F: false.

## DISCUSSION

There was a reasonable search for knowledge about the sources of updates on the subject of wounds, with greater emphasis on the search for information with teachers and scientific events (48.3%), followed by the search for information with nurses (38.9 %) and the use of databases, websites, etc. (36%).

Knowledge must be permeated in academia through various sources of knowledge as long as they are safe and reliable. It is known that the teacher's relationship plays a fundamental role in training, and he is expected to stand out from primary sources in the search for information for security and trust in the professional<sup>11,14</sup>.

A possible justification for this result is that students have more significant contact with professors in the classroom and internship fields. Nurses are considered a second option for learning about general wound care, especially subjects related to the practice of simple and complex dressings. A study points to realistic practice as a tool to increase teacher-student proximity, as it favors the apprehension of theoretical knowledge and transfer to clinical practice.

Scientific articles (73%), libraries (62.6%), university extension courses and databases, websites, etc. (57.8%) stood out as sources of updating that student sometimes use. These data allow a suggestive alert, while such references should be used more frequently, to the point of complementing the classes attended in graduation. In a way, most academics present better learning through active methodologies, in which they are constantly stimulated by critical thinking and still assume the position of priority agents in the learning process<sup>15,16</sup>.

In the case of a search for knowledge through journal subscriptions, the response of this research is comprehensive, as the lack of financial resources among students, mainly in Brazil, favors non-adherence to this model. It is worth mentioning that the open access model for subscription to specific journals in Brazil is in decline, even among professors<sup>14</sup>.

With this, it is essential to highlight the role of research groups as sources of knowledge during graduation because, among the many purposes of these groups, the intention to establish a connection between updated scientific knowledge and care practice is emphasized. However, for this to happen, it is necessary to adopt facilitative and integrative methodologies to guarantee the active involvement of the members and, thus, favor the formation of future nurses with a professional profile that meets the social demands<sup>17,18</sup>.

Still, in this same perspective, research groups stand out as the first contact with scientific research, bringing unique opportunities that favor intellectual aptitudes' construction, improvement and performance. In addition, the development of professional and personal skills is considered – resulting from the great responsibility demanded by the activities –which contributes to the insertion of academics in other modalities of the scientific community, such as university extension courses, scientific events (conferences, symposiums, lectures, among others), extension projects, research and monitoring. Therefore, knowledge update sources are linked to these modalities: subscription to journals, reading scientific articles, databases, websites, and libraries, and searching for information with teachers, nurses and doctors<sup>17</sup>.

Concerning the student's knowledge and practice, the undergraduates stated that they had sufficient knowledge in terms of identifying the stages of pressure injuries (96.7%), which is considered a very positive point, whereas such an injury is responsible for characterizing a severe public health problem, directly influencing the length of hospital stay and the evolution of the patient<sup>2</sup>. The entire process of identifying, planning and implementing measures to prevent pressure injuries is the responsibility of the nurse, while other activities are also associated with the same purpose: assessment of the risk of developing pressure injuries, management of hydration and the state of nutrition, changing position, and skin inspection and evaluation<sup>19</sup>.

Another positive point was that most students confirmed the strong presence of norms about wound care (80.6%) and skin assessment (85.8%) in the internship fields. According to Gonçalves et al.<sup>20</sup>, the standardization of the procedures to be performed is essential, judging by the adoption of norms and protocols that avoid the propagation of wrong information and friction between nurses. In this sense, the promotion of team assistance occurs in a more fluid and standardized way. Another study<sup>21</sup> points out the indispensability of using instruments that assess the skin and the different aspects of the wounds – they should be used daily and given priority to regions with bony prominences –highlighting their correct use according to the etiology and frequency of the wounds.



A little more than half of the participants stated that in hospital internship camps, special mattresses are used to prevent pressure injuries (66.4%). This result showed some concern, as such material is considered helpful for many patients in a prolonged period of hospitalization or with impaired physical mobility<sup>11</sup>.

Half of the students stated that they did not receive enough information about chronic wounds during graduation (51.7%), bringing another worrying data since a specific theme is one of the most frequent in the population attended by nurses. In a study carried out by Almeida et al.<sup>4</sup>, there was a similar result, in which it was also evident that concerning topical therapy for chronic wounds and taking into account essential data for the clinical decision of therapeutic choice, the students presented a performance lower than 50%, thus emphasizing the imminent need to reinforce the mentioned theme to improve assistance to a large part of the population.

Just over half of the academics said that they know how to apply a compressive bandage (69.2%), thus characterizing reasonable data, given that the ideal would be for most of them to understand how to apply it; after all, this therapy is also recommended for the treatment of venous wounds<sup>21</sup>.

Regarding knowledge about caring for patients with wounds, there were three items with the highest number of correct answers: wound assessment (98.6%), proper dressing selection (96.7%) and enzyme action (92.4%). These subjects become essential in the sense that they are often present in clinical practice and, therefore, when applied in clinical cases and simulations, they can bring closer to the actual scenario and improve student learning - especially the clinical reasoning - about the constituent aspects in the proper assessment and treatment of wounds<sup>11</sup>.

Concerning the issue of pressure injuries, there was a discrepancy in the answers of the academics. Previously, they had claimed to have sufficient knowledge in identifying the stages of pressure injury (96.7%). However, a certain lack of understanding on the part of these individuals was demonstrated concerning the stages of pressure injury in people with dark/black skin, according to the presented data: more than half (60.2%) of the students missed the item that addressed the theme. A study<sup>11</sup> points out that it is considered challenging to identify PI in black people - the skin has a structure that varies with color - because they have greater compaction in the stratum corneum layer, ensuring greater resistance to external injuries due to humidity and friction.

Further, there was also considerable divergence regarding knowledge of pressure injuries, as more than half of the students missed an item related to the function of the Braden scale (55%). The Braden scale is an instrument of great importance for nursing professionals and a risk predictor for pressure injuries, given that it emphasizes the application of continuous assessment and the establishment of measures aimed at the early prevention of pressure injuries<sup>7,8</sup>.

Another vital piece of data was that, despite the higher number of correct answers (73.9%), just over a quarter of students (26.1%) missed an item related to the assessment of pain in the wound. Notoriously, pain is characterized as a very subjective symptom. That is, only the person with the wound can give meaning to that pain, but different instruments in the field of nursing give the classification. Tissue injury is responsible for causing pain, and the intensity of this pain depends on the patient, the type of wound and the amount of external stimuli. Pain, in turn, is capable of causing many changes in the patient's quality of life, such as impaired locomotion, altered mood and impaired sleep<sup>1</sup>.

Concerning knowledge about chronic wounds, just over half of the students got the two items on the subject right (55 and 59.7%), which is considered reasonable data, as such wounds are present most of the time in their routine as primary health care nurses.

Finally, the students demonstrated a sufficient number of correct answers (59.2%) regarding the classic signs of infection in wounds of immunosuppressed patients. These patients, sometimes, must receive special attention since they have a deficiency in their immune system, thus leading to a high risk of developing infections. It is necessary to follow a hospitalization flowchart for immunosuppressed patients that prioritizes attention regarding the presence of signs of infection in the wound so that it is quickly treated with the help of the nurse (who must be equipped with the knowledge, and knows how to identify these signs, emphasizing the patient's history of immunosuppression and consider the relationship to an infection)<sup>21</sup>.

The application of the research in the online format stands out as a limitation. It assesses knowledge of content that participants can quickly search online and answer, becoming a research bias.



## CONCLUSION

This study made it possible to identify the general knowledge about wounds of students concluding the graduation course in Nursing in the Cariri region of Ceará, enabling the judgment of considerable knowledge about general care with wounds. The answers showed a higher percentage of knowledge of aspects of wound evaluation, coverage and biological factors of healing. Participants demonstrated confidence in topics such as stages of pressure injury, application of compressive bandages, and chronic wounds. Based on the data collected, the students' correct answers regarding the treatment of wounds were reasonable, and greater encouragement is needed in the search for knowledge from the most diverse sources available.

Among the responses, the search for information with teachers and nurses and the use of databases and websites, among others, stand out as the primary source of updating the most used knowledge.

Finally, the study can contribute to future research, aiding the development of new works on the subject and making it possible to compare groups of students. It is worth noting that this study is essential for Nursing professors in the Cariri region of Ceará, as it favors identifying knowledge points and weaknesses about general care for wounds since it united all universities that offer the Nursing course in the microregion.

## AUTHORS' CONTRIBUTION

**Formal Analysis:** Rodrigues JT and Lisboa KWSC; **Conceptualization:** Macedo LFR; Lisboa KWSC and Feitosa YS; **Data Cure:** Rodrigues JT; Lisboa KWSC and Pinto SL; **Methodology:** Macedo LFR; Lisboa KWSC and Pinto SL; **Writing - First Version:** Rodrigues JT and Oliveira EG; **Writing – Review and Editing:** Macedo LFR and Lisboa KWSC; **Supervision:** Lisboa KWSC; **Validation:** Feitosa YS; **Visualization:** Macedo LFR; Rodrigues JT; Lisboa KWSC; Pinto SL; Oliveira EG and Feitosa YS.

## DATA AVAILABILITY STATEMENT

All data are available in this study.

## FUNDING

Fundação Cearense de Apoio ao Desenvolvimento Científico e Tecnológico  
<https://doi.org/10.13039/501100005283>

Universidade Regional do Cariri

## ACKNOWLEDGMENTS

Not applicable.

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