

# WOUND DATA RECORD TO PRODUCE NURSING-SENSITIVE CARE INDICATORS

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**Abstract:** *In the field of healthcare quality by standardizing terminologies for interoperability between different health systems and countries, data quality is fundamental to progress in healthcare, helping healthcare professionals make informed decisions and improve the care provided. In wounds data quality, researchers stand out in understanding and improving data collection, analysis, and interpretation.*

*Comparing published data on minimum data set (MDS) and nursing-sensitive care indicators with wound assessment data and indicators in use in Portuguese healthcare institutions, it is concluded that, regarding wound assessment items, there is a failure in 4 items (shape, wound-related pain, signs and symptoms of systemic infection and management of the infection); Regarding nursing-sensitive care indicators, there is only similarity in 2 (healing time and patient satisfaction).*

*The importance of collecting and using data in wound management helps reform policies and practices in health systems around the world.*

**Keywords:** *Data accuracy; Healthcare patient; Outcome assessment; Quality indicators; Wounds and injuries.*

**Resumo:** *No campo da qualidade dos cuidados de saúde, através da padronização de terminologias para a interoperabilidade entre diferentes sistemas de saúde e países, a qualidade dos dados é importante para o progresso na área da saúde, ajudando os profissionais de saúde a tomar decisões informadas e a aprimorar os cuidados oferecidos. Na qualidade de dados em feridas, os investigadores destacam-se pela compreensão e melhoria da colheita, análise e interpretação de dados.*

*Comparando os dados publicados de resumo mínimo de dados e de indicadores sensíveis aos cuidados de enfermagem com os dados de avaliação de feridas e indicadores em utilização nas instituições de saúde portuguesas, conclui-se que relativamente aos itens de avaliação das feridas existe falha em 3 itens (forma, dor relacionada com a ferida, sinais e sintomas de infeção sistémica e gestão da infeção); relativamente aos indicadores sensíveis aos cuidados de enfermagem, só existe similitude em 2 (tempo de cicatrização e satisfação do paciente).*

*A importância da recolha e utilização de dados na gestão de feridas ajuda a reformar políticas e práticas nos sistemas de saúde em todo o mundo.*

**Palavras-chave:** *Avaliação de resultados; Cuidados de saúde ao paciente; Exatidão dos dados; Indicadores de qualidade; Feridas e lesões.*

## 1. INTRODUCTION

Healthcare is increasingly complex, involving several actors and the patient at the center of care and health systems. Wound management is a global public healthcare issue because it is a multifactorial problem that requires a multidisciplinary team (Tayyib and Ramaiah

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2021), high world prevalence rate, high expenditure of health systems budget, and a big burden for individuals with wounds and their families.

Quality healthcare is based on the management of processes involving information and communication (Cruz-Correia et al. 2009). Because nurses work 24 hours a day with the patient, they have an important role in the production, use, and exchange of information, and communication is a significant activity in the continuity, safety, and quality of care (Currell and Urquhart 2003). Nurses spend 13 to 28% of their total shift time recording the care provided and documentation is poorly explored or used (Fennelly et al. 2021).

The use of terminologies and scales or tools helps healthcare professionals classify nursing phenomena in a unified and universal way. For wound assessment, Coleman et al. built a generic wound care assessment minimum data set (MDS) with 6 dimensions and 37 items (Coleman et al. 2017), to support and guide nurses in this procedure and to develop assessment forms in electronic health record (EHR) systems.

Donabedian introduced the concept of the quality triad, to conceptualize and evaluate quality, emphasizing the importance of technical quality, interpersonal quality, and infrastructure quality in healthcare delivery. In wound care, this means that the technical quality of wound care must be complemented by effective communication with the patient (interpersonal quality) and the availability of appropriate resources and environments for treatment (infrastructure quality). Nursing-sensitive care indicators translate as «what nurses do that needs to be quantified and measured to justify funding and improve practice and patient outcomes» (Heslop and Lu 2014, pp. 2469-2470). Indicators are a valid and reliable means of supporting quality of care and measuring performance; are used as variables in research to test effects on nursing practice; and analysis of indicator databases can support health system reforms and health policy development. For these reasons, this work intends to have the effects of indicators used previously identified and compare the wound MDS with the necessary recorded wound data required or not yet unmet to produce nursing-sensitive outcomes, building a nursing minimum data set (NMDS).

### **1.1. Health data**

Information is aggregated data, and this data is a source of knowledge that feeds an information and communication system. It is important to know, how data is stored and the knowledge that can be extracted from it. Health data consists of clinical and administrative information, that is relevant to current and future clinical decision-making, quality improvement, management, reimbursements, clinical research, and education (Cruz-Correia et al. 2009). The way they are collected and stored makes it difficult to use them for analysis and quality care assessment. Wound care is no exception and sometimes they may not even contain all the necessary clinical information, with missing

or discrepant values occurring or having large datasets with detailed wound information, insights, or outcomes that cannot be used for wound care assessment (Madu 2012).

Health information management (HIM) is «the practice of acquiring, analyzing, and protecting digital and traditional medical information vital to providing quality patient care» (Hussain and Babalghith 2013) and the appropriate secondary use of patient data (Fenton et al. 2017). Structured data recorded by healthcare practitioners in EHR can be used to identify variations in adherence to the treatment guidelines and establish new guidelines, generate real-world outcome data, develop predicted risk models to guide decision-making, do research based on registry data, to management the resources for patients with chronic wounds, and to get reimbursement about the care provided (Fife, Walker and Eckert 2018). Data quality (DQ) problems also affect EHR systems, which play an important role in daily clinical practice, enabling the collection, organization, and availability of access to health information. Due to the increasing use of EHRs and secondary use of health data, strategies, and tools have been adopted to ensure data quality (Hussain and Babalghith 2013; Fenton et al. 2017) through a comprehensive assessment of data quality, which allows for the efficiency of data collection instruments, reducing costs in preparing for data analysis, a clear interpretation of results and deepening knowledge about diseases and treatments (Ozonze, Scott and Hopgood 2023). In nursing practice, continuity of care plays an important role in the transmission of information and documentation of care, and the nursing information system has come to solve some of these problems, as well as allow the assessment of the quality of care (Pereira 2005).

The digital era brought promises of efficiently capturing digital data to improve decision-making. This has come into play in the era of Big Data and its inherent DQ issues because big data are analyzed in five important attributes: volume, variety, velocity, variability, and veracity (Woods et al. 2018). Digital health data is widely affected by accuracy and integrity concerns, and poor DQ can be detrimental to continuity of care, patient safety, productivity, and research. The authors of this review define DQ as a digital health measure that is «accessible, accurate, complete, contextually valid, and current», which summarizes the 6 dimensions of the Data Quality and Outcomes (DQ-DO) framework (clinical, business process, clinician, research-related, and organizational outcomes) (Syed et al. 2023, p. 2). DQ issues can be of social, technical, and organizational factors, like work pressures, staff rotations and workflow disruptions, inaccurate information of patients, indirect data collection and lack of standardized protocols for data collection, non-intuitive systems with prolonged or failed implementations, poor user's computational aptitude and inappropriate use of systems, issues that which result in low quality of captured health data (Ozonze, Scott and Hopgood 2023).

Data granularity is a complex problem that must be addressed to generate reliable data. It may also be related to uniform systems of clinical language, in this case referring to the level of detail or specificity of terms and codes used to describe medical

conditions, procedures, medications, and other aspects of healthcare. It plays a crucial role in the ability to accurately capture clinical information and interoperability between different healthcare information systems and diverse audiences, such as clinicians, researchers, healthcare administrators, and regulatory bodies, are met. Therefore, standardized clinical language systems must balance the need for detail with practicality and the ability to exchange information (Otero 2014).

Standardized Terminology (ST) is a «compilation of terms used in the clinical assessment, management, and care of patients, which includes agreed definitions that adequately represent the knowledge behind these terms and link a standardized coding and classification system» (Fennelly et al. 2021, pp. 1-2). A universal ST has never been established, but there are several nursing-specific (North American Nursing Diagnosis Association – NANDA, International Classification of Nursing Practice – ICNP) and multidisciplinary standardized terminologies approved for clinical practice. Additionally, NMDS and other terminologies are being developed locally to meet specific requirements, leading to disparity in the collection of these data. NMDS has been developed by several countries in the last 2 decades and is based on core aspects of nursing that contribute to care, classified into a taxonomy (phenomena, interventions, and results) (Neela et al. 2006). Interoperability and continuity of data across disciplines and environments are widely recognized, necessitating the consideration of multidisciplinary ST, such as the Systematized Nomenclature of Medicine – Clinical Terms (SNOMED-CT) (Fennelly et al. 2021). If the problem is: «if we cannot name it, we cannot control it, finance it, research it, teach it or put it into practice» (Clark and Long 1992, p. 109 apud Neela et al. 2006), then classification systems and standardized language are important in information management and nursing-sensitive care indicators will be a valid means to support quality of care and performance measurement; used as variables in research to test effects on nursing practice and used to support health system reforms and health policy development (Neela et al. 2006). Nursing-sensitive outcomes/indicators is a «nursing-sensitive performance measure as processes and outcomes — and structural proxies for these processes and outcomes (e.g., skill mix and nurse staffing hours) — that are affected provided, and/or influenced by nursing personnel but for which nursing is not exclusively responsible» (Heslop and Lu 2014, p. 2471).

## 1.2. Wound care and data records

Wound care requires different centers of care and nursing challenges are developing clinical standardization, referral plans and consultations, evaluation treatment plans, knowledge, and competence professionals (Tayyib and Ramaiah 2021). In 2010, the World Health Organization defined competence as «connected with professional standards in health-care, patient safety, and quality of care» (Kielo-Viljamaa et al. 2022, p. 45). In Finland, registered nurses (RN) play an important role in acute wound care and wound prevention,

and the authors noted the need to deepen wound care competencies. The two main areas of competence for RNs in wound care are knowledge, skills, and performance in etiology and care, and wound management and assessment (Kielo-Viljamaa et al. 2022).

The wound care process included areas of intervention in the prevention, assessment, and treatment of all types of wounds, from acute wounds to chronic wounds. In the area of prevention, this care focuses on skin care, pressure ulcer prevention, and health education, among other topics (Bakker-Jacobs et al. 2022). The assessment process is very important because collects information about the appearance of the wound (such as type of wound, wound size, amount of exudate, etc.) that is essential to decision-making treatment and benchmarking (Goh et al. 2022). The treatment process encompasses several activities, from debridement and local wound care, pressure offloading, application of compression, pain management, skin substitutes, hyperbaric oxygen therapy, etc. (Cho et al. 2022).

Nurses record data related to wound care aimed at assessing the healing process, which is extremely important for the treatment decision. Those data refer to the various stages of the wound care process: prevention, assessment, and treatment; and are based on uniform classified language and tools or scales that describe wound characteristics in systematic form. Uniform classified language and assessment scales or tools are principles of NMDS. While there is no single, universally accepted NMDS used worldwide, several countries and regions have developed their own versions of NMDS to meet their specific healthcare needs, such as National Database of Nursing Quality Indicators (NDNQI) in United States of America, managed by the American Nurses Association; in Canada the NMDS that focuses on nursing practice and patient outcomes by the Registered Nurses' Association of Ontario; in Australia has established national registration standards and codes of conduct for nurses and midwives, which may involve nursing data collection and reporting by the Nurses and Midwives Board of Australia; the European Commission has initiated efforts to standardize nursing data collection across European Union (EU) member states to improve the quality and safety of healthcare and the development of the International Nursing Minimum Data Set (*i*-NMDS) through the collaborative effort of the International Medical Informatics Association, Nursing Informatics Special Interest Group (IMIA-NI), and the International Council of Nurses (ICN), which has held the ICNP, since 1999 (Neela et al. 2006). It is important to note that specific NMDS elements and standards may vary by country or region. Therefore, it is advisable to consult local nursing associations and regulatory bodies for the most up-to-date information about NMDS in a specific region.

Coleman et al. (2017) developed a generic wound care assessment minimum data set (WCA-MDS) to address the lack of standardization and variable parameters used in wound assessment to enable more consistent wound care practices and help providers and wound managers develop and improve wound care services. This WCA-MDS has 6 domains (relating to general health information, baseline wound information, wound

assessment parameters, wound symptoms, infection, and specialists) and 37 items for generic wound assessment, that allow a wound assessment systematic approach and support providers and healthcare settings to improve patient outcomes (Coleman et al. 2017). The core of MDS of Portuguese nursing is available and is used to automatically produce clinical indicators for different settings and users (Ordem dos Enfermeiros 2007). EHRs are considered the ideal tool for evaluating healthcare, and monitoring healthcare professional performance due to the availability of stored computerized data, and this feature can enable automated quality assessment, avoiding auditing techniques being more expensive and time-consuming.

The concept of nursing-sensitive care indicators has evolved in recent times, but they allow us to quantify or measure what a nurse does to justify funding and improve practices and results (Heslop and Lu 2014). The indicators studied in wound care are based on data reported for nurses, but the indicators used by competent national and international entities are based on other aspects such as quality of care, patient safety, effectiveness of care, and epidemiological data.

Pruim and colleagues (2017) describe 48 indicators for wound care. In the pilot study, they identified the best 14 indicators (6 of structure, 3 of process, and 5 of outcome), which evaluate activities and improve the quality of care in the wound care centers (Pruim, Wind and Van Harten 2017).

In the healthcare context of the National Health Service, some tools produce clinical care indicators, based on lists that have not been updated for primary healthcare since 2017 (Portugal. Ministério da Saúde 2017) and recently updated with the DiOR grid (Diagnósticos de Desenvolvimento Organizacional), which aims to be a reference and simple instrument to monitor the improvement of organizational quality in all functional units of primary healthcare. At the level of hospital care, nursing-sensitive care indicators launched in the NMDS (Ordem dos Enfermeiros 2007), in 2007, and the Sistema Nacional de Avaliação em Saúde (SINAS) of the Entidade Reguladora da Saúde is being used, in the following dimensions that involve everyone care providers: Clinical Excellence, Patient Safety, Adequacy and Comfort of Facilities, Focus on the Client and Client Satisfaction. In a 20-year review (1997-2017) with 39 articles and distributing the most evaluated indicators by organizational-focused Structural Indicators, Nursing-Focused Process/Intervention Indicators, Nurse- and Patient-Focused Outcome Indicators, with the conditions of the nursing staff (such as a number of hours of care provision, proportion of RNs, experience, and education of these professionals), nosocomial infection and mortality were the most reported nursing-sensitive care indicators in all studies (Oner et al. 2021).

A new generation of indicators designed to assess patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) is being adopted to assess quality and performance in health services and systems (Bull et al. 2022), in terms of value-based healthcare, where the focus is on decision-making and achieving

the best results with the same resources or the same results at the lowest cost (Posnett 2022). To access these outcomes can use psychometrically robust and validated questionnaires or instruments but still face the challenge of quality assessment in some countries and organizations (Bull et al. 2022). Some instruments capture the process (experience) and the results of interest to the patient suffering from each type of wound but Wound-Q makes it possible to evaluate the results in the patient with any wound, whether in clinical practice or research. This instrument consists of 13 scales on the following themes: wound characteristics, health-related quality of life, care experience, and wound treatment (Klassen et al. 2021). The PREMs have the potential to improve patient involvement in care and treatment, making the patient the center of care, and increasing the efficiency and quality of care provided. Using the same instrument (Wound-Q) they identified 6 domains (care coordination, establishing/obtaining care, delivery of information, patient-provider interaction, and delivery of care), and 21 subdomains of the patient experience and healthcare process which impacted the quality of care for chronic wounds from the patient's perspective (Squitieri et al. 2020).

## 2. METHODS AND MATERIALS

An exploratory study of a qualitative nature was developed to better understand the phenomenon under study and propose solutions to improve the quality of care provided and the satisfaction of patients and professionals. The objectives of this work are: 1) Compare the wound assessment data framework used in Portuguese EHR with the wound care assessment minimum data set (WCA-MDS) described in the literature; 2) Compare the list of indicators applied in wound care reference centers with the indicators issued by Portuguese health entities; and 3) Establish a NMDS for wound care to apply in daily nursing practices in hospitals and community settings to measure wound care quality services.

Bibliographical research was used in the EBSCOhost Research Databases interface (CINAHL Complete; MEDLINE Complete; Nursing & Allied Health Collection: Comprehensive; Cochrane Central Register of Controlled Trials; Cochrane Database of Systematic Reviews; Cochrane Methodology Register; Library, Information Science & Technology Abstracts; MedicLatina; Cochrane Clinical Answers) and web pages of competent international (Organization for Economic Co-operation and Development, Agency for Healthcare Research and Quality, National Health Service, etc.) and national (Entidade Reguladora da Saúde, Direção-Geral da Saúde, Ordem dos Enfermeiros, etc.) entities that issue guidelines in the area of system quality assessment health, with the following descriptors: Wounds and injuries and primary healthcare or hospitals and clinical indicators and nursing outcomes and nursing minimum data set and quality of healthcare. There was a need to reject articles that addressed the topic of Trauma, which in other international realities has a relevant frequency, but does not fit within this research and work.

Data analysis was based on a textual and comparative analysis of the information obtained through research and bibliographic analysis. Donabedian's model is linear and has a dynamic cycle, which assumes that structure influences processes and, therefore, affects results (Oner et al. 2021). The structure component covers the human, physical, and financial resources used in the provision of healthcare, as well as the organizational arrangements and financing mechanisms for these resources. The process component refers to the activities that constitute healthcare and involve the interaction of healthcare professionals and the assisted population. The outcomes component concerns changes in the health status of the population, promoted by the care received (Oner et al. 2021; Crisóstomo 2000).

The indicators were classified into structure, process, and result indicators according to Donabedian's model, and Holzemer's matrix was used to organize them in this classification and relation to the client, care provider, and settings and thus use a classification framework universally known and accepted.

### 3. RESULTS AND DISCUSSIONS

The delivery of healthcare encompasses the provision and documentation of care, as a form of clinical record for the history of health/illness, continuity of care, for legal and ethical purposes, and for collecting data across different healthcare settings. Health records produce countless data, and their quality overcomes a set of challenges and problems, overcome using standardized language, the adoption of information systems, and MDS that help both the recording systems and professionals to be effective in recording the necessary and essential health data for the continuity of healthcare and assistance. Wound healthcare involves nurses in various areas, from prevention to treatment and rehabilitation, and assessing the quality of this care is important for the patient, healthcare professionals, and the health system.

Wound care assessment is a fundamental aspect of healthcare, and standardizing the information collected is essential for effective communication and decision-making among healthcare professionals. The WCA-MDS includes 6 dimensions (general health information, wound history, and basic information, wound assessment parameters, wound systems, infection, and specialized information) through 37 assessment items (Coleman et al. 2017). General health information is found in the patient's EHR and the initial nursing assessment. The history of the wound and its basic information are found in the initial nursing assessment and care plan. The remaining dimensions are included in the assessment and monitoring grid of a wound in the patient's EHR with a wound. Even though there is no international consensus on which items or scale to use in the assessment of a wound, when we compare the WCA-MDS with the chronic wound assessment scale in use in Portuguese EHR systems (Figure 1), only 4 items are missing: the shape of the wound, assessment of wound-related pain, systemic signs of infection



and management of the infection. It will be important to include these items in the wound assessment parameters in a way that is more targeted to the context of a patient with a wound.

Fig. 1. Sheet for recording wound data in the nursing information system, in health institutions of the National Health Service  
Source: ACSS 2013

Nursing-sensitive care indicators play a crucial role in evaluating the quality of healthcare delivery, directly impacting patient outcomes. From the review by Pruim and colleagues (2017), 48 indicators emerged and after application in the pilot benchmarking study, experts from 8 reference centers in wound care identified 14 reliable indicators to measure and improve the quality of care in wound centers (Pruim, Wind and Van Harten 2017). The 14 indicators are shown in bold in Table 1 and 4 indicators are structure, 4 are process and 6 are outcomes. Comparing the list of 14 indicators from the review and works by Pruim and colleagues (2017) with the different lists of health indicators in Portugal, we only have 2 common indicators: healing time and patient satisfaction. The most frequent outcome indicators found in the literature are the prevalence of pressure ulcers, wound infection, patient satisfaction, patient and nurse education, and healing time. There is a need to gather more consensus to establish a list of clinical indicators to measure and evaluate the quality of wound care.

Origin and classification of health data is an essential task in the field of healthcare management and research, and it can be approached in various ways, depending on the specific context and goals. Thereby, the data that originate from the indicators in this list can be classified into clinical, administrative, management, and quality assessment data. The resources where this data can be found are patient health and wound records, clinical audit records, human resources, and information from the quality and financial departments.

**Table 1.** Distribution of wound indicators, according to the Donabedian model and the Holzemer matrix

<b>Holzemer's Matrix</b>	<b>Inputs</b>	<b>Processes</b>	<b>Outcomes</b>
<b>Client</b>		<p><b>4: Number of different wound types</b></p> <p>5: number of unique patients treated in the wound center</p> <p>15: Patient participation in wound care</p> <p>16: Informing patients</p> <p>17: Self-management of patients</p>	<p>43: 3-month healing rate</p> <p><b>44: Healing time</b></p> <p><b>45: 1-year recurrence rate</b></p> <p><b>46: number of complications</b></p> <p><b>47: Patient satisfaction score</b></p> <p><b>48: Patient quality-of-life score</b></p>
<b>Provider</b>	<p><b>7: Medical disciplines involved</b></p> <p>8: Fulltime-equivalent staff attributed to the wound center</p> <p>9: Fulltime-equivalent supportive staff</p> <p>10: Fulltime-equivalent coordinator</p> <p>11: Fulltime-equivalent nurses with more than 5 years' experience in treating</p> <p>12: Nursing hours from the wound centre</p> <p>13: Absenteeism of staff</p> <p>14: Staff satisfaction</p> <p><b>30: Number of multidisciplinary meetings per month</b></p> <p>34: Use of EHR</p> <p>35: Documentation of data</p> <p><b>36: Number of structured evaluations</b></p> <p>37. Number of internal audits</p>	<p>6: Number of consultations provided in the wound center</p> <p>18: Person who initiates the treatment plan, which contains a plan</p> <p>23: Contact moment with the specialist</p> <p>26: Assessment of a pain protocol</p> <p><b>31: Referral time</b></p> <p><b>32: Standardized referral process of patients</b></p>	
<b>Settings</b>	<p>A: Features of the wound centre</p> <p>27: Wound care products – most used, number of suppliers, standardized list</p> <p>28: Collaboration in the wound care pathway</p> <p>Coordination in the wound care pathway</p> <p>33: Marketing of the wound centre by partners in the wound care pathway</p> <p>38: Research activities</p> <p><b>39: Education policy</b></p> <p>40: Financing of care provided in the wound care</p> <p>41: Cost of providing wound care</p> <p><b>42: Total costs of the wound centre</b></p>	<p>19: Waiting time in days for admission to the wound centre</p> <p>20: Time of diagnosis</p> <p><b>21: Treatment time</b></p> <p>22: Average time in minutes of a consultation</p> <p>24: Number of home care consults provided by the wound centre</p> <p>25: Accessibility of the wound centre by technologies</p>	

Source: Authors' own elaboration

Comparing with the literature available in various international entities, it would be necessary to stratify the outcome indicator 46 (number of complications), into the main complications related to acute and chronic wounds, as wound infection is commonly referred to as an outcome indicator. Another wound complication that should be presented separately is wound dehiscence. The healing rate at 3 or 12 months is an indicator frequently found in the literature and used to measure the efficiency of treating a chronic wound.

Indicator definitions must include a description of the numerator and denominator and some definition criteria. The definitions of the concepts and data that constitute the indicator are very important. For example, to be defined, the wound infection indicator needs to define the data that will constitute it, which could be the medical diagnosis code and set of symptoms of local or systemic infection. It will be necessary to define how many of the local or systemic symptoms must be present to diagnose a wound infection. In a review of indicators, they concluded that the variables of the nursing team and the lack of standardization in definitions led the authors to suggest the adoption of a common standardized language and focus on the variables of the nursing team as a strategy to resolve these observed inconsistencies (Oner et al. 2021) and, thus, a single and universal language could be adopted for all health information, such as SNOMED-CT. There is other lack indicators in this set selected, such as the level of continuity of care and the patient-report experience measurement, which contribute to the assessment of the quality of the services provided.

The Portuguese NMDS produced by the Ordem dos Enfermeiros, in 2007 consists of 10 indicators (Table 2), which add another classification to the Donabedian model, which are the epidemiological indicators. On the identity card for primary health care (BI-CSP – Bilhete de Identidade dos Cuidados de Saúde Primários), there are 8 indicators related to the production or care of chronic wounds (Table 3) defined in the Master Data System (SDM – Sistema de Dados Mestre). In the DiOr-USF grid, 6 indicators related to the organizational development of family health units related to wound care are referenced (Table 2).

Indicators must be defined by current practices and recommendations and in a way that reflects the provision of care in each context. However, it is important to standardize the language, with the creation of a NMDS and nursing-sensitive care indicators in wound care.

**Table 2.** Indicators classified according to the Donabedian model available and defined by national entities and in Portuguese information and management systems

<b>Holzemer's Matrix</b>	<b>Inputs</b>	<b>Processes</b>	<b>Outcomes</b>	<b>Epidemiological</b>
<b>Portuguese NMDS</b>	S1: Hours of nursing care provided/day S3: Nursing satisfaction	P1: Risk diagnostic effectiveness rate	O1: Effectiveness rate in preventing complications O2: Positive change in nursing diagnosis status (real) O3: Possible/expected gains effectiveness rate O4: Patient satisfaction	Ep1: Incidence rate Ep2: Prevalence rate Ep3: Relative frequency rate (episode)
<b>BI-CSP</b>		SDM 414: adequate monitoring rate for PU	SDM 285: PU prevention effectiveness rate SDM 286: UP healing rate SDM 377: the proportion of ulcers improved	SDM 261: proportion of patients with diabetes, with risk of ulceration recorded in the last year SDM 265: % diabetics with a commitment to surveillance, with a registered risk of foot ulceration SDM 266: % monitored diabetics with active foot ulcers SDM 287: Incidence rate of UP during ECCI integration
<b>DIOr-USF grid</b>	Home visits Multidisciplinary team meetings Records audits	Waiting time before the appointment Referral system (internal and external)	Patient Satisfaction	

Source: Authors' own elaboration

## CONCLUSIONS

The MDS offers a standardized foundation in wound care assessment, ensuring consistency and comparability across healthcare settings. The classification of health data often involves a combination of domain knowledge, statistical methods, and machine learning techniques. It's important to consider the specific context and objectives of the classification task when selecting the appropriate methods and models. In the era of big data, it is important to correctly classify data and know its origin to generate results and predictive and clinical decision support models as close as possible to the real care context. Integrated data and knowing its granularity in information systems are our objectives so that the data extraction process is facilitated in new information systems to be created.

The research resulted in the collection of data sets and indicators that classify wound care. It was possible to compare a minimum of data specific to wound care, consisting of 6 domains and 37 items, and a list of 48 indicators ideal for measuring activity in a

specialized wound center. Thus, from the ideal recording of wound care to the actual and possible recording, considering the standardized languages and information systems used, there is a discrepancy, which boils down to a MDS to produce 14 wound care indicators tested in a pilot study. Comparing these works with the data and indicators used in wound care practice in Portugal, the discrepancy is minimal about the data collected, but very poor regarding nursing-sensitive care indicators. While healing time and patient satisfaction are well-established nursing-sensitive care indicators, the literature highlights a significant gap in the exploration of indicators like infection and continuity of care. Addressing these gaps is crucial for developing a more comprehensive understanding of nursing-sensitive care and improving patient outcomes. Future research should focus on these critical areas to enhance the overall quality of nursing care delivery.

It can be concluded that the information required to be recorded will be necessary for the continuity of care or treatment, which supports financing and serves to measure the quality of services provided and the impact on the patient. This information cannot be limited to just the two main types of wounds that have the greatest burden on health-care systems, which are pressure ulcers (PU) and diabetic foot ulcers (DFU), but to all types of wounds.

As future work, we would like to show healthcare entities the need to create reference centers for the treatment of wounds based on a reimbursement system or evaluation of results in the provision of patient care, supported by NMDS data oriented towards measurement of nursing-sensitive care indicators in the treatment of wounds. Prepare a national consensus document on the NMDS in wound assessment and nursing-sensitive care indicators in wound care with a description of the indicators in the form of an identity card or standard operating procedure to be issued by the entities' national health guidelines.

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