BMJ Open

Prevalence of chronic wounds in hospitalized patients: a multicentre cross-sectional descriptive observational study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-095542
Article Type:	Original research
Date Submitted by the Author:	24-Oct-2024
Complete List of Authors:	López Jiménez, María Magdalena; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Romero-García, Marta ; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Adamuz, Jordi; Bellvitge University Hospital, Nursing Knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Berbis-Morelló, Carmen; Joan XXIII University Hospital Tarragona, Nursing Management Team Pons-Prats, Mònica; Tortosa Verge de la Cinta Hospital, Nursing Knowledge Management and Information Systems Department Tapia-Pérez, Marta; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; IDIBELL Zuriguel Pérez, Esperanza; Hospital Vall d'Hebron, Nursing Research Unit Castro-Navarro, Trinidad; University Hospital Germans Trias i Pujol, Nursing knowledge Management and Information Systems Department Juvé-Udina, Maria-Eulàlia; Catalan Institute of Health González-Samartino, Maribel; Hospital Universitari de Bellvitge, Nursing Management Team; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL
Keywords:	Prevalence, Wounds and Injuries, Hospitalization

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

ORIGINAL ARTICLE

Prevalence of chronic wounds in hospitalized patients: a multicentre cross-sectional descriptive observational study

María-Magdalena López-Jiménez, RN, MSN, PhD candidate[1,2,3], Marta Romero-García RN, MSN, PhD[2,3*], Jordi Adamuz, RN, MSN, PhD[1,2,3], Marta Tapia-Pérez, RN[1,3], Esperanza Zuriguel-Pérez, RN, MSN, PhD[4]; Carmen Berbis-Morelló, RN, MSN, PhD[5], Mònica Pons-Prats RN[6], Trinidad Castro-Navarro RN[7], Maria-Eulàlia Juvé-Udina, RN, MSN, PhD[3,8]. Maribel González-Samartino, RN, MSN, PhD[1,2,3,9].

[1]Nursing Knowledge Management and Information Systems Department, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

[2]Fundamental and Clinical Nursing Department, Faculty of Nursing, University of Barcelona, Barcelona, Spain.

[3]IDIBELL, Bellvitge Institute of Biomedical Research, Barcelona, Spain.

[4]Nurse Research Coordinator, VHIR, Vall d'Hebron Institute of Biomedical Research, Barcelona, Spain.

[5]Nursing Management Team, Joan XXIII University Hospital, Tarragona, Spain.

[6]Nursing Knowledge Management and Information Systems Department, Verge de la Cinta Hospital, Tortosa, Tarragona, Spain

[7]Nursing Knowledge Management and Information Systems Department, Germans Trias i Pujol University Hospital, Badalona, Spain.

[8]Catalan Institute of Health, Barcelona, Spain.

[9]Nursing Management Team, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

Word Count: 2954 words.

Corresponding Author: Marta Romero-García. Faculty of Nursing. Fundamental and Clinical Nursing Department, Feixa Llarga s/n, 08907, L'Hospitalet de Llobregat. Barcelona (SPAIN). E-mail: martaromero@ub.edu

ABSTRACT

Background: A few studies have described their overall prevalence and the characteristics of hospitalized patients. Knowing the profile of patients with chronic wounds in our environment can help improve follow-up and establish future improvement strategies in the management of care for these patients, improving the quality and safety of care and reducing associated costs. We aimed to determine the prevalence and sociodemographic profile of adult hospitalized patients with chronic wounds admitted to the 8 hospitals of the Catalan Institute of Health during the years 2016-2020.

Methods: A descriptive observational cross-sectional multicenter study was conducted from January 1, 2016 to December 31, 2020 in wards, step-down units, and home hospitalization services at eight health public hospitals to the Catalan Institute of Health, the main public healthcare provider in Catalonia, Spain. All patients over 18 years old, admitted with chronic wounds during the study period, in hospitalization units, intermediate care, and home hospitalization services. The main variables of the study were nursing diagnoses for the types of chronic wounds: pressure injuries, arterial ulcers, venous ulcers, mixed ulcers, and diabetic foot ulcers, recorded at the nurse's electronic health records. Secondary variables collected included: age, sex, reason for admission, admission unit, type of hospital, source of admission, and discharge destination (continuity of care). A descriptive and comparative analysis was performed.

Results: This study identified a prevalence of chronic wounds in hospitalized patients of 2.1% (16,935). The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of chronic wounds was observed during the period 2016-2020. The main reasons for admission of patients with chronic wounds were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more

venous ulcers. Additionally, patients with pressure injuries had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay, whereas patients with vascular ulcers required more continuous care after discharge than the rest of the chronic wounds. (p value < 0.05).

Conclusions: Chronic wounds remain an important health problem, so it is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care. Therefore, it would be interesting to study the relationship between patient care complexity and the chronic wounds they present.

Keywords: Prevalence, Chronic wounds, Ulcers, Hospitalized patients.

STRENGTHS AND LIMITATIONS

- It was a multicenter study and a large number of patients were included.
- All data were comprehensively collected from the clinical data warehouse and all patients included had a completed nurse's electronic health record.
- This study excluded patients directly admitted to and discharged from the ICU.
- All data regarding chronic wounds were recruited retrospectively from the nursing registry may be associated with under-registration.

BACKGROUND

Chronic wounds (CW) are a heterogeneous group of lesions that include vascular Ulcers (venous and arterial ulcers), diabetic ulcers, and pressure ulcers, among others (1–4). Sibbald et al. suggest that any wound persisting for more than six weeks is considered chronic in nature (1).

Numerous factors, both general and local, are associated with the slow healing of chronic wounds, such as age, certain medications, malnutrition, associated diseases, socio-familial situation, and inadequate wound treatment (5). Currently, the progressive increase in life expectancy is associated with an increase in the prevalence of chronic diseases, as well as chronic wounds. It is estimated that between 1% and 1.5% of the population in developed countries have some type of wound, and in Europe, between 2% and 4% of total healthcare expenditure is used for their treatment (3,6,7).

According to the National Consensus Conference on Lower Extremity Ulcer (8), 75-80% of lower extremity ulcers are of venous aetiology, representing a population prevalence of 0.5 to 0.8%. As for arterial ulcers or those of ischemic aetiology, the prevalence ranges between 0.2% and 2%. It is common that ulcers of neuropathic aetiology, in the context of diabetes mellitus, are referenced in the clinical concept of diabetic foot. Epidemiological data indicates a prevalence of diabetes mellitus of between 7% and 7.5%, and it is estimated that 15-25% of diabetic patients will develop a foot ulcer during their lifetime (8).

Pressure injuries (PI) are defined as skin and underlying tissue lesions caused when sustained pressure between a bony protrusion and a support surface results in blockage of the microcirculation at that level. As a result of tissue hypoxia in the area, rapid tissue degeneration occurs (9). PI prevalence rates have followed a steady trend in recent years, according to studies in Spain (10,11), standing at 0.043% in the latest study

from 2022. Far from a short-term solution, it is estimated that in the next 10 years, due to demographic changes and the upward trend of certain diseases such as diabetes or obesity, the incidence of chronic wounds will increase (3,4,12,13). During the last decade in Catalonia, nurses in public hospitals of the Catalan Institute of Health and other healthcare providers have been recording the nursing care process and its outcomes in the electronic health record system, using the ATIC standardized interface terminology data model (14). More than 200,000 care episode records are generated annually. The patient assessment, care plan - including nursing diagnoses and interventions - as well as the continuous evaluation of their progress, are routinely recorded in all centers. Nurses record the type of wound and the care interventions for each patient, based on the wound assessment, as well as the care products used.(15)

Although there are studies that have evaluated the prevalence of some of the described types of chronic wounds, few have described their overall prevalence and the characteristics of hospitalized patients. Knowing the profile of patients with chronic wounds in our environment can help improve follow-up and establish future improvement strategies in the management of care for these patients, improving the quality and safety of care and reducing associated costs. Therefore, the objective of this study was to determine the prevalence and sociodemographic profile of adult hospitalized patients with chronic wounds admitted to the 8 hospitals of the Catalan Institute of Health during the years 2016-2020.

METHODS

Setting and study design

A descriptive observational cross-sectional multicenter study was conducted from January 1, 2016 to December 31, 2020 in the hospitalization units, intermediate care, and home hospitalization services at eight health public hospitals to the Catalan Institute of

Health, the main public healthcare provider in Catalonia. These centers were classified into hospitals of high and low complexity (A1, A2, and A3 for high complexity; B1, B2, B3, B4, and B5 for low complexity). All episodes of patients over 18 years old, admitted with chronic wounds during the study period, in wards, step-down units, and home hospitalization services at eight health public hospitals were included. Excluded from the study were adult patients hospitalized in critical care units, short-stay units, or emergency observation units. Patients identified as close to the end of life were also excluded. The sampling technique used was non-probabilistic consecutive sampling.

Data collection

The data source used was Business Objects and the Minimum Basic Data Set (MBDS), the data warehouse of electronic health record systems in centers under study. For nursing record data, the extraction was performed annually from 2016 to 2020, by unit, center, and in aggregate. The data were pseudo-anonymized. These data were coded and reviewed to detect potential inconsistencies in a data collection sheet created with Microsoft Excel 2010. In the database, no identifying data of all included patients was present, as a consecutive numerical code was used to identify each patient. Study approval was granted by the institutional research ethics committee (PR185/21). Informed consent was waived due to the study's retrospective design.

Variables

The main variables of the study were nursing diagnoses for the types of chronic wounds: pressure injuries (PI), arterial ulcers (AU), venous ulcers (VU), mixed ulcers (MU) and diabetic foot ulcers (DFU), recorded at the nurse's electronic health care records. Secondary variables collected included: age, sex, reason for admission (AP-GRD), admission unit, type of hospital, source of admission, and discharge destination (continuity of care).

Statistical analysis

The analysis strategy primarily included descriptive statistics, using the mean, standard deviation, and minimum and maximum values for variables that follow a normal distribution, while for variables that do not follow a normal distribution, the median, 25th and 75th percentiles, and minimum and maximum values were used for analyzing the sociodemographic characteristics of the study population and the prevalence of chronic wounds. For the comparative analysis of sociodemographic differences according to the types of chronic wounds, to detect significant differences between types of chronic wounds, the chi-square test or Fisher's exact test was used for categorical variables, and the t-test or Mann-Whitney U test for continuous variables. Statistical significance was established at a bilateral $p<0.05$. This analysis was conducted using SPSS statistical software version 23 (Chicago, Illinois).

RESULTS

Prevalence

During the years 2016-2020, 796,698 patients were admitted to the participating centers. Of these, 16,935 had some type of chronic wound, meaning a global incidence of chronic wounds of 2.1%: 9,667 (1.21%) pressure ulcers episodes, 5,080 (0.64%) arterial ulcers episodes, 1,167 (0.15%) generic ulcers episodes, 1,139 (0.14%) venous ulcers episodes, 1,105 (0.14%) diabetic foot ulcers episodes, and 190 (0.02%) mixed ulcers episodes. When analyzing pressure ulcers according to the stage, the results were as follows: 34.6% in stage I, 64.1% in stage II, 17.7% in stage III, and 7.2% in stage IV, with stage II pressure ulcers being the most prevalent.

Regarding the global incidence by center, we can observe that high-complexity hospitals have a prevalence of 2.39%, compared to a 1.81% in low-complexity hospitals.

The centers with the highest prevalence are center A1 (3.57%), B5 (3.25%), A2 (2.69%), and B2 (2.40%), while those with the lowest incidence are centers B3 (2.03%), B4 (1.94%), A3 (1.58%), and B1 (0.82%).

The prevalence during the study years of the different types of chronic wounds showed a downward trend in pressure injuries, venous ulcers, and diabetic foot ulcers. However, mixed and arterial ulcers remained stable over the 5 years' study period. (**Table1**).

Clinical and Sociodemographic Characteristics

The clinical and sociodemographic characteristics of the study populations were analyses are presented in **Table 2**. The mean age was 75.5 years and 61.8% (10,472) were male. Regarding clinical characteristics, the mean of length of stay was 13 days (interquartile range [IQR]: 7-16). Regarding the type of admission, 78.2% (13,243) were episodes admitted via emergency, while 21.8% (3,692) were scheduled patients. Of the patients' episodes treated with chronic wounds, 76.2% (12,900) came from their homes or social residences, 10.8% (1,833) were referred from acute hospitals, and 9.4% (1,591) were referred from primary care centers. The main reasons for admission of the studied patients were cardiocirculatory disease (34.5%), musculoskeletal/connective tissue (15.2%), and respiratory disease (12.5%). Only 12.1% (2,050) required admission to the ICU, and 53.6% (9,083) were discharged home, 27.3% (4,626) to another hospital, 11.3% died (1,906), and 7.5% (1,272) were admitted to home hospitalization.

Analyzing the relationship between the types of wounds and the sociodemographic characteristics of studied patients, we can observe that the mean age was significantly higher in patients with pressure injuries and venous ulcers (pvalue<0.001). Additionally, differences in gender were observed, with a higher frequency of men among patients with arterial ulcers (74.2% vs. 25.8%) and diabetic foot

ulcers (70% vs. 30%) compared to the total study population (pvalue<0.001). In contrast, venous ulcers were more prevalent in women, significantly increasing compared to the prevalence in the studied population (pvalue<0.001).

Regarding the length of stay, a longer hospital stay was observed in patients with pressure ulcers compared to the global study population (median: 16 vs. 13 days), while it was slightly lower in patients with venous ulcers (median: 10 vs. 13 days). It was also observed that among patients with arterial ulcers, the frequency of scheduled admissions was higher than in the overall population (30.5% vs. 21.8%) (pvalue<0.001). Regarding the source of studied episodes, no differences were observed among the different types of wounds.

However, it was identified that patients with pressure injuries had a higher frequency of ICU admissions (17.9% vs. 12%) (pvalue<0.001). In terms of discharge destination, the mortality rate was higher in patients with pressure injuries than in the overall study population (15.2% vs. 11.3%), whereas the mortality rate was lower in patients with arterial ulcers (5.2% vs. 11.3%) (pvalue<0.001). Additionally, patients with venous, arterial, and diabetic foot ulcers required greater care continuity from primary care (pvalue<0.001).

Finally, it is worth noting that although the main reason for admission among the studied patients was cardiovascular problems, this reason was more prevalent among patients with arterial ulcers than in the overall study population (65.7% vs. 34.5%) (pvalue<0.001). Additionally, a higher frequency of admission due to respiratory problems was observed in patients with pressure injuries (18.2% vs. 12.5%) (pvalue<0.001).

DISCUSSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of chronic wounds was observed during the period 2016-2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more venous ulcers. Additionally, patients with PI had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay, whereas patients with vascular ulcers required more continuous care after discharge than the rest of the CW. These results help highlight that CW remain an important health problem, so it is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care.

It is estimated that 1-2% of the population in developed countries will have a chronic wounds during their lifetime (16), slightly below the global prevalence results of this study. It should be noted that there are few similar studies in hospitalized patients with which to compare the global prevalence data obtained. Ahmajärvi et al, in their 2016 study, observed a prevalence of 0.08% of CW in hospitalized patients (17). Three studies in Spain show a prevalence of chronic CW ranging between 0.11% and 7.8% (18–20) but do not include hospitalized population. Regarding the downward trend observed in the prevalence of chronic wounds over the years studied (2016-2020), there are national prevalence studies that inform us of a sustained trend, although only in PI and dependency-related injuries (DRL) (10,21). This data concourse with our results. Conversely, a previous study by Yao et al., analysing the trend over 5 years (2014-2018), as in the present study, shows an upward trend of CW in China (22). It is possible that

these results are related to the improvement in the quality of care in the different centers in our study.

According to the aetiology of CW in this study, pressure injuries are the most prevalent (1.21%). Previous studies conducted in hospitalized patients show similar results (23,24). Reviews conducted in Europe show a 10.8% prevalence of PI, with a wide variability depending on the countries, between 1.1% and 27.2% (25,26). Another systematic review conducted demonstrated a 0.2%-29.6% prevalence of PI (27). The last national prevalence study conducted in Spain in 2022 (21) established a 7.7% prevalence of PI in hospitalized patients. In the field of primary care, previous studies show a prevalence approximately 0.1% (18–21), quite below the results obtained in studies of hospitalized patients, which may be due to the fact that hospitalized patients are more at risk of developing PI due to compromised mobility (25). As for the stage of PI, the most prevalent in our study were stage II PI, which is consistent with the fifth national prevalence study in hospitalized patients (10). Amir et al., in 2016 observed a 8% prevalence of PI, of which 42.3% were stage III-IV (28). The prevalence of venous ulcers was estimated at approximately 0.09%. Internationally, other studies establish a 0.05% prevalence of VU in hospitalized patients(21). In primary care, the result was 0.04% (18,19). Both studies are consistent with the results obtained in our study. According to diabetic foot ulcers, our study shows a prevalence of 0.09% in hospitalized patients. Internationally, we find that the range of prevalence is wide, between 1.2% and 20.4% (26). A systematic review conducted in Australia established a 2.6%prevalence of DFU. Other studies in primary care show prevalence of 0.01% (18,19). As for arterial ulcers, which in our study accounted for 0.42%, in a previous systematic review, the prevalence of AU was estimated between 0.7% and 10.9% (29). Graves et al, in their narrative review found that data on AU prevalence are scarce, and those that they found concluded

prevalence of 0.01% in primary care services (25). This is consistent with the prevalence of other studies (0.012-0.005%) (18,19), probably because they are studies in the field of primary care.

Focusing on sociodemographic characteristics and in line with other studies, the prevalence of CW increases with age, consistent with results obtained in previous research(10,19,20). Older people with chronic diseases and multiple comorbidities are at greater risk of developing CW. Age increases not only the risk of developing a wound, but also the delay in its healing (17). Males predominate with 56% of cases, consistent with other studies in the hospital setting (10,20), unlike the results found in primary care, where females prevail (18–20,30). In terms of patient profiles, there are studies that coincide with ours (23) in which the most common pathologies were cardiorespiratory. Finally, our study shows that ICU stays increase the prevalence of PI compared to the rest of the CW. These data are consistent with previous studies showing that prolonged ICU admission is associated with poorer health outcomes (31). Finally, regarding discharge destinations, it is observed that patients with vascular ulcers required more care from primary care. This may be due to the fact that many of these patients have a type of chronic injury that requires a multidisciplinary approach led by advanced practice nurses or expert nurses who are precise in the diagnosis and recording of the specificity of CW (14), improving their approach, management, and follow-up. Standards and structured data allow better management of treatment, involve patients in their own care, and reduce the possibility of omitting necessary parameters to describe and understand wound progression. Increasing comorbidities are variables that impact the complexity of patients treated in hospitals. Responding to this complexity requires significantly more dedication time and often causes a lack of time to address care (29) so that the figure of the advanced practice nurse in CW in hospitalized patients could help reduce this omission.

Strengths and limitations

The strength of this research are that it was a multicenter study and a large number of patients were included. All data were comprehensively collected from the clinical data warehouse and all patients included had a completed nurse's electronic health record. However, there are some limitations that should be acknowledged. This study excluded patients directly admitted to and discharged from the ICU, because the type of chronic wound is not identified with the ATIC nursing terminology in their electronic health records. We relied on compliance in completing the electronic health records and administrative data; however, since electronic health records are completed voluntarily, some caution is required regarding interpretation. Furthermore, the high volume of patients included impeded a detailed review of their healthcare history. It should be noted that the retrospective data collection from the nursing registry of CW may be associated with under-registration.

CONCLUSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of CW was observed during the period from 2016-2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more venous ulcers. Additionally, patients with pressure injuries had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay; whereas patients with vascular ulcers required more continuous care after discharge than the rest of the CW. These results help highlight that chronic wounds remain an important health problem. It is important to

consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care, based on nursing diagnoses that allow us a high level of specificity.

LIST OF ABRREVIATIONS

AP-DRG, Diagnosis Related Groups

AU, arterial ulcers

CW, chronic wounds

DFU, diabetic foot ulcers

DRL, dependency-related injuries

ICU, intensive care units

IQR, interquartile range

MBDS, Minimum Basic Data Set

MU, mixed ulcers

PI, pressure injuries

VU, venous ulcers

DECLARATIONS

Ethics approval: This study was approved by the Clinical Research Ethics Committee of the Bellvitge University Hospital (PR185/21). Informed consent was waived due to the study's retrospective design. Ethical and data protection protocols related to anonymity and data confidentiality (access to records, data encryption and archiving of information) were complied with throughout the study.

Patient consent for publication: Not required.

Data availability statement: All data relevant to the study are included in the article or uploaded as supplemental information.

Competing interests: We declare that we have no competing interests.

Funding:

- Funded by the COIB (PR-553/2022) as part of the Nurse Research Projects Grants.
- Funded by the Departament de Recerca i Universitats de la Generalitat de Catalunya - AGAUR (grant number 2021 SGR 00929).

Author contributions: All authors had full access to all study data and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: MMLJ, JAT, MGS. Team coordination: MMLP, MGS. Acquisition of data: MMLJ, MTP, MPP, TCN, EZP, CBM. Analysis and interpretation data: MMLJ, MGS, JAT, MRG. Drafting of the manuscript: MMLJ, JA, MGS. Critical revision of the manuscript for important intellectual content: MRG, MTP, MPP, TCN, EZP, CBM. Statistical analysis: MMLJ, JAT. Obtained funding: MMLJ. Administrative, technical and material support: MTP, MPP, TCN, EZP, CBM. Study supervision: MGS, MRG.

Acknowledgements: We thank the CERCA Programme/Generalitat de Catalunya for institutional support.

REFERENCES

1. Gary Sibbald R, Goodman L, Reneeka P. Wound bed preparation 2012. J Cutan Med Surg. 2013;17(SUPPL.1).
2. Li D. Design and implementation for wound measurement application. Prim Intent Aust J Wound Manag. 2006;14(2):56–8.
3. Batas R. Community nursing care for chronic wounds: A case study of optimal home treatment of a venous leg ulcer. Gastrointest Nurs. 2019;17(June):S32–9.
4. Heyer K, Herberger K, Protz K, Glaeske G, Augustin M. Epidemiology of chronic wounds in Germany: Analysis of statutory health insurance data. Wound Repair Regen. 2016;24(2):434–42.
5. Cacicedo González R, Castañeda Robles C, Cossío Gómez F, Delgado Uría A, Fernández Saíz B, Gómez España MV, et al. Manual de Prevención y Cuidados Locales de Heridas Crónicas. Servicio Cántabro de Salud. 2011. 51–94 p.
6. Samaniego-Ruiz M-J, Llatas FP, Jiménez OS. Valoración de las heridas crónicas en el adulto: una revisión integrativa. Rev da Esc Enferm da USP. 2018;52(0):1–10.
7. Lindholm C, Searle R. Wound management for the 21st century: combining effectiveness and efficiency. Int Wound J. 2016;13:5–15.
8. Marinel Roura J, Verdú Soriano J. C.O.N.U.E.I 2018 [Internet]. Conferencia Nacional de consenso sobre las Úlceras de la Extermidad Inferior (C.O.N.U.E.I). 2018. 37–50 p. Available from: https://www.aeev.net/guias/CONUEI2018AEEVH.pdf
9. Mata M, Cos FX, Morros R, Diego L, Barrot J, Carrera T, et al. Direcció clínica Guies de pràctica clínica.
10. Pancorbo Hidalgo P, García Fernández F, Pérez López C, Soldevilla Agreda J.

Prevalencia de lesiones porpresión y otras lesiones cutáneasrelacionadas con la dependenciaen población adulta en hospitalesespañoles: resultados del5º Estudio Nacional de 2017. Gerokomos. 2019;30(2):76–86.

11. Dolores López-Franco M, Soldevilla-Agreda JJ, Enric Torra-Bou J, Pancorbo-Hidalgo PL, Martínez Vázquez S, García-Fernández FP. Prevalencia de las lesiones cutáneas relacionadas con la dependencia en centros de atención primaria de salud de España: resultados del 6.º Estudio Nacional del GNEAUPP 2022. Gerokomos. 2023;34(4):260–8.

12. Pedro García Fernández F, Javier Soldevilla Ágreda J, Luis Pancorbo Hidalgo P, Verdú Soriano J, Rodríguez Palma M, Gómez TS. Manejo Local de las Úlceras y Heridas [Internet]. 2018. 1–53 p. Available from: https://gneaupp-1fb3.kxcdn.com/wp-content/uploads/2018/11/GNEAUPP.DT03.Tratamiento.pdf

13. Goudy-Egger L, Dunn KS. Use of continuing education to increase nurses' knowledge of chronic wound care management. J Contin Educ Nurs. 2018;49(10):454–9.

14. Juvé-Udina M. ATIC Eje diagnostico. Ed. Naaxpot SLU, editor. Barcelona; 2016.

15. Juvé-Udina M, Adamuz-Tomás J. Nursing Knowledge Tools and Strategies to Improve Patient Outcomes and the Work Environment. In: Rollins N, Hafsteinsdóttir TB, editors. Mentoring in Nursing through Narrative Stories Across the World. Portland: Springer; 2023. p. 211–22.

16. Gupta S, Sagar S, Kisaka T, Tripathi S, Gupta S, Care I, et al. Chronic wounds: magnitude, socioeconomic burden and consequences. Wounds Asia. 2021;4(1):8–14.

17. Ahmajärvi KM, Isoherranen KM, Mäkelä A, Venermo M. A change in the prevalence and the etiological factors of chronic wounds in Helsinki metropolitan

area during 2008-2016. Int Wound J. 2019;16(2):522–6.

18. Díaz-Herrera MÁ, Martínez-Riera JR, Verdú-Soriano J, Capillas-Pérez RM, Pont-García C, Tenllado-Pérez S, et al. Multicentre study of chronic wounds point prevalence in primary health care in the southern metropolitan area of Barcelona. J Clin Med. 2021;10(4):1–11.

19. Alayeto CL, Lozano SA. Prevalencia de heridas crónicas y lesiones cutáneas relacionadas con la dependencia en atención. 2023;34(2):134–7.

20. Ferrer-Solà M, Chirveches-Pérez E, Molist-Señé G, Molas-Puigvila M, Besolí-Codina A, Jaumira-Areñas E, et al. Prevalencia de la heridas crónicas en una comarca de la provincia de Barcelona. Enferm Clin. 2009;19(1):4–10.

21. García-Fernández FP, Soldevilla-Agreda JJ, Pancorbo-Hidalgo PL, Enric Torra-Bou J, Dolores López-Franco M. Prevalencia de las lesionescutáneas relacionadas conla dependencia en adultoshospitalizados en España:resultados del 6.º EstudioNacional del GNEAUPP 2022. Gerokomos. 2023;34(4):250–9.

22. Yao Z, Niu J, Cheng B. Prevalence of Chronic Skin Wounds and Their Risk Factors in an Inpatient Hospital Setting in Northern China. Adv Ski Wound Care. 2020;33(9):1–10.

23. Samaniego MJPF. Prevalencia e incidencia de heridas crónicas en atención primaria. Revista SEHER. Rev Soc Española Heridas SEHER. 2020;10(2171–8644):18–26.

24. Raeder K, Jachan DE, Müller-Werdan U, Lahmann NA. Prevalence and risk factors of chronic wounds in nursing homes in Germany. Int Wound J. 2020;17(5):1128–34.

25. Graves N, Phillips CJ, Harding K. A narrative review of the epidemiology and economics of chronic wounds. Br J Dermatol. 2022;187(2):141–8.

26. Graves N, Zheng H. The prevalence and incidence of chronic wounds: a literature review. Wound Practice & Research: Journal of the Australian Wound Management Association. J Aust Wound Manag Assoc [Internet]. 2014;22(1):14–9. Available from: https://search.informit.org/doi/abs/10.3316/INFORMIT.272162994803134

27. Mccosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T. Chronic wounds in Australia : A systematic review of key epidemiological and clinical parameters. 2019;(August 2018):84–95.

28. Amir Y, Lohrmann C, Halfens RJG, Schols JMGA. Pressure ulcers in four Indonesian hospitals: prevalence, patient characteristics, ulcer characteristics, prevention and treatment. Int Wound J. 2017;14(1):184–93.

29. McCosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T, Graves N, et al. Chronic wounds in Australia: A systematic review of key epidemiological and clinical parameters. Int Wound J. 2019;16(1):84–95.

30. Vieira CPDB, de Araújo TME. Prevalence and factors associated with chronic wounds in older adults in primary care*. Rev da Esc Enferm. 2018;52:1–8.

31. Adamuz J, Juve-Udina ME, Gonzalez-Samartino M, Jimenez-Martinez E, Tapia-Perez M, Lopez-Jimenez MM, et al. Care complexity individual factors associated with adverse events and in-hospital mortality. PLoS One. 2020;15(7 July):1–16.

Table 1. Distribution of Chronic Wounds by Year

	2016		2017		2018		2019		2020		TOTAL
	n	%	n	%	n	%	n	%	n	%	
Pressure Injury	2404	24.9%	2023	20.9%	1907	19.7%	1893	19.6%	1440	14.9%	9667
Arterial Ulcer	1042	20.5%	1032	20.3%	1044	20.6%	1092	21.5%	870	17.1%	5080
Venous Ulcer	282	24.8%	281	24.7%	225	19.8%	211	18.5%	140	12.3%	1139
Diabetic Foot Ulcer	233	21.1%	298	27.0%	254	23.0%	182	16.5%	138	12.5%	1105
Mixed Ulcer	30	15.8%	40	21.1%	44	23.2%	38	20.0%	38	20.0%	190

Table 2. Sociodemographic and Clinical Characteristics

	Total patients n=16.935		*Pressure Injury n=9.967*		*Arterial Ulcer n=5.080*		*Venous Ulcer n=1.139*		*Diabetic Foot Ulcer n=1.105*		*Mixted Ulcer n=190*		*Ulcer (generic) n=1.167*	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Sociodemographic Characteristics														
Median Age (IQR)	75	(65-84)	77	(67-85)[a]	72	(63-81)[a]	77	(69-85)[a]	71	(62-80)[a]	77	(69-85)[b]	76	(65-84)
Gender														
Male	10.472	(61.8)	5.495	(56.8)[a]	3.769	(74.2)[a]	554	(48.6)[a]	774	(70.0)[a]	106	(55.8)	667	(57.2)[b]
Female	6463	(38.2)	4.172	(43.2)[a]	1.311	(25.8)[a]	585	(51.4)[a]	331	(30.0)[a]	84	(44.2)	500	(42.8)[b]
Clinical Characteristics														
Median Length of Hospital Stay (IQR)	13	(7-26)	16	(8-32)[a]	11	(6-20)[a]	10	(6-16)[a]	13	(7-25)	12	(7-25)	13	(7-24)
Admission Type														
Emergency	13.243	(78.2)	7.969	(82.4)[a]	3.532	(69.5)[a]	959	(84.2)[a]	881	(79.6)	146	(76.8)	903	(77.4)
Planned	3.692	(21.8)	1.698	(17.6)[a]	1.548	(30.5)[a]	180	(15.8)[a]	224	(20.4)	44	(23.2)	264	(22.6)
Source														
Home/Social Residence	12.900	(76.2)	7.276	(75.3)[b]	3.948	(77.7)[b]	866	(76.0)	860	(77.7)	133	(70.0)[b]	902	(77.3)
Acute Hospital	1.833	(10.8)	1.100	(11.4)[b]	503	(9.9)[b]	118	(10.4)	128	(11.5)	20	(10.5)	117	(10.0)
Primary Care Center	1.591	(9.4)	934	(9.7)	431	(8.5)[b]	122	(10.7)	86	(7.8)[b]	20	(10.5)	113	(9.7)
Transfer within Same Center	499	(2.9)	275	(2.8)	178	(3.5)[b]	26	(2.3)	27	(2.4)	14	(7.4)[a]	28	(2.4)
Socio-Health Center	108	(0.6)	80	(0.8)[a]	19	(0.4)[b]	6	(0.5)	6	(0.5)	3	(1.6)	7	(0.6)
Outpatient Consultations	4	(0.1)	2	(0.0)	1	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)
ICU stay														
YES	2.050	(12.1)	1.734	(17.9)[a]	164	(3.2)[a]	71	(6.2)[a]	96	(8.7)[a]	13	(6.8)[b]	112	(9.6)[b]
NO	14.885	(87.9)	7.933	(82.1)[a]	4.916	(96.8)[a]	1.068	(93.8)	1.009	(91.3)[a]	177	(93.2)[b]	1.055	(90.4)[b]
Discharge Destination														
Home (Continuity of Care with PC)	9.083	(53.6)	4.488	(46.4)[a]	3.086	(60.7)[a]	687	(60.3)[a]	689	(62.4)[a]	110	(57.9)	644	(55.2)
Other Health Center	4.626	(27.3)	3.295	(34.1)[a]	960	(18.9)[a]	241	(21.2)[a]	250	(22.6)[a]	48	(25.3)	294	(25.2)
Voluntary Discharge	48	(0.3)	15	(0.2)[a]	26	(0.5)[b]	4	(0.4)	5	(0.5)	0	(0.0)	4	(0.3)
Death	1.906	(11.3)	1.472	(15.2)[a]	266	(5.2)[a]	134	(11.8)	79	(7.1)[a]	21	(11.1)	129	(11.1)
Home Hospitalization	1.272	(7.5)	396	(4.1)[a]	741	(14.6)[a]	73	(6.4)	82	(7.4)	11	(5.8)	96	(8.2)
Patient Profile														
Cardiovascular	5.843	(34.5)	1.832	(19)[a]	3.339	(65.7)[a]	397	(34.9)	429	(38.8)[b]	63	(33.2)	333	(28.5)[a]
Musculoskeletal/Connective Tissue	2.577	(15.2)	1.229	(12.7)[a]	1.120	(22.0)[a]	99	(8.7)[a]	208	(18.8)[b]	22	(11.6)	198	(17.0)
Respiratory	2.113	(12.5)	1.759	(18.2)[a]	70	(1.4)[a]	157	(13.8)	90	(8.1)[a]	35	(18.4)[b]	125	(10.7)
Neurological	1.212	(7.2)	994	(10.3)[a]	53	(1.0)[a]	67	(5.9)	55	(5.0)[b]	14	(7.4)	70	(6.0)
Renal and Urinary Tracts	1.093	(6.5)	864	(8.9)[a]	53	(1.0)[a]	85	(7.5)	70	(6.3)	13	(6.8)	83	(7.1)
Digestive	982	(5.8)	782	(8.1)[a]	43	(0.8)[a]	87	(7.6)[b]	52	(4.7)	8	(4.2)	86	(7.4)[b]

[a] **p-value<0.001**

[b] **p-value between 0.05 and 0.001**

BMJ Open

Prevalence of chronic wounds in hospitalized patients in Catalonia, Spain: a multicentre cross-sectional descriptive observational study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-095542.R1
Article Type:	Original research
Date Submitted by the Author:	11-Apr-2025
Complete List of Authors:	López Jiménez, María Magdalena; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Romero-García, Marta ; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Adamuz, Jordi; Bellvitge University Hospital, Nursing Knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Berbis-Morelló, Carmen; Joan XXIII University Hospital Tarragona, Nursing Management Team Pons-Prats, Mònica; Tortosa Verge de la Cinta Hospital, Nursing Knowledge Management and Information Systems Department Tapia-Pérez, Marta; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; IDIBELL Zuriguel Pérez, Esperanza; Hospital Vall d'Hebron, Nursing Research Unit Castro-Navarro, Trinidad; University Hospital Germans Trias i Pujol, Nursing knowledge Management and Information Systems Department Juvé-Udina, Maria-Eulàlia; Catalan Institute of Health González-Samartino, Maribel; Hospital Universitari de Bellvitge, Nursing Management Team; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Epidemiology
Keywords:	Prevalence, Wounds and Injuries, Hospitalization

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

ORIGINAL ARTICLE

Prevalence of chronic wounds in hospitalized patients in Catalonia, Spain: a multicentre cross-sectional descriptive observational study

María-Magdalena López-Jiménez, RN, MSN, PhD candidate[1,2,3], Marta Romero-García RN, MSN, PhD[2,3*], Jordi Adamuz, RN, MSN, PhD[1,2,3], Marta Tapia-Pérez, RN[1,3], Esperanza Zuriguel-Pérez, RN, MSN, PhD[4]; Carmen Berbis-Morelló, RN, MSN, PhD[5], Mònica Pons-Prats RN[6], Trinidad Castro-Navarro RN[7], Maria-Eulàlia Juvé-Udina, RN, MSN, PhD[3,8]. Maribel González-Samartino, RN, MSN, PhD[1,2,3,9].

[1]Nursing Knowledge Management and Information Systems Department, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

[2]Fundamental and Clinical Nursing Department, Faculty of Nursing, University of Barcelona, Barcelona, Spain.

[3]IDIBELL, Bellvitge Institute of Biomedical Research, Barcelona, Spain.

[4]Nurse Research Coordinator, VHIR, Vall d'Hebron Institute of Biomedical Research, Barcelona, Spain.

[5]Nursing Management Team, Joan XXIII University Hospital, Tarragona, Spain.

[6]Nursing Knowledge Management and Information Systems Department, Verge de la Cinta Hospital, Tortosa, Tarragona, Spain

[7]Nursing Knowledge Management and Information Systems Department, Germans Trias i Pujol University Hospital, Badalona, Spain.

[8]Catalan Institute of Health, Barcelona, Spain.

[9]Nursing Management Team, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

Word Count: 3217 words.

Corresponding Author: Marta Romero-García. Faculty of Nursing. Fundamental and Clinical Nursing Department, Feixa Llarga s/n, 08907, L'Hospitalet de Llobregat. Barcelona (SPAIN). E-mail: martaromero@ub.edu

ABSTRACT

Background: A few studies have described their overall prevalence and the characteristics of hospitalized patients. Knowing the profile of patients with chronic wounds in our environment can help improve follow-up and establish future improvement strategies in the management of care for these patients, improving the quality and safety of care and reducing associated costs. We aimed to determine the prevalence and sociodemographic profile of adult hospitalized patients with chronic wounds admitted to the 8 hospitals of the Catalan Institute of Health during the years 2016-2020.

Methods: A descriptive observational cross-sectional multicenter study was conducted from January 1, 2016 to December 31, 2020 in wards, step-down units, and home hospitalization services at eight health public hospitals to the Catalan Institute of Health, the main public healthcare provider in Catalonia, Spain. All patients over 18 years old, admitted with chronic wounds during the study period, in hospitalization units, intermediate care, and home hospitalization services. The main variables of the study were nursing diagnoses for the types of chronic wounds: pressure injuries, arterial ulcers, venous ulcers, mixed ulcers, and diabetic foot ulcers, recorded at the nurse's electronic health records. Secondary variables collected included: age, sex, reason for admission, admission unit, type of hospital, source of admission, and discharge destination (continuity of care). A descriptive and comparative analysis was performed.

Results: This study identified a prevalence of chronic wounds in hospitalized patients of 2.1% (16,935). The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of chronic wounds was observed during the period 2016-2020. The main reasons for admission of patients with chronic wounds were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more

venous ulcers. Additionally, patients with pressure injuries had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay, whereas patients with vascular ulcers required more continuous care after discharge than the rest of the chronic wounds. (pvalue=0.000).

Conclusions: Chronic wounds remain an important health problem, so it is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care. Therefore, it would be interesting to study the relationship between patient care complexity and the chronic wounds they present.

Keywords: Prevalence, Chronic wounds, Ulcers, Hospitalized patients.

DATA AVAILABILITY STATEMENT

All relevant data are available in the article or the Supplementary Materials.

STRENGTHS AND LIMITATIONS

- It was a multicenter study and a large number of patients were included.
- Electronic nursing data are recorded voluntarily and the nursing registry of CW may be associated with under-registration.
- The high volume of patients included impeded a detailed review of their healthcare history.

BACKGROUND

Chronic wounds (CW) are a heterogeneous group of lesions that include vascular Ulcers (venous and arterial ulcers), diabetic ulcers, and pressure ulcers, among others [1-4]. Sibbald et al. suggest that any wound persisting for more than six weeks is considered chronic in nature [1].

Numerous factors, both general and local, are associated with the slow healing of chronic wounds, such as age, certain medications, malnutrition, associated diseases, socio-familial situation, and inadequate wound treatment [5]. Currently, the progressive increase in life expectancy is associated with an increase in the prevalence of chronic diseases, as well as chronic wounds. It is estimated that between 1% and 1.5% of the population in developed countries have some type of wound, and in Europe, between 2% and 4% of total healthcare expenditure is used for their treatment [3,6,7].

According to the National Consensus Conference on Lower Extremity Ulcer [8], 75-80% of lower extremity ulcers are of venous aetiology, representing a population prevalence of 0.5 to 0.8%. As for arterial ulcers or those of ischemic aetiology, the prevalence ranges between 0.2% and 2%. It is common that ulcers of neuropathic aetiology, in the context of diabetes mellitus, are referenced in the clinical concept of diabetic foot. Epidemiological data indicates a prevalence of diabetes mellitus of between

7% and 7.5%, and it is estimated that 15-25% of diabetic patients will develop a foot ulcer during their lifetime [8].

Pressure injuries (PI) are defined as skin and underlying tissue lesions caused when sustained pressure between a bony protrusion and a support surface results in blockage of the microcirculation at that level. As a result of tissue hypoxia in the area, rapid tissue degeneration occurs [9]. PI prevalence rates have followed a steady trend in recent years, according to studies in Spain [10,11], standing at 0.043% in the latest study from 2022. Far from a short-term solution, it is estimated that in the next 10 years, due to demographic changes and the upward trend of certain diseases such as diabetes or obesity, the incidence of chronic wounds will increase [3,4,12,13]. During the last decade in Catalonia, nurses in public hospitals of the Catalan Institute of Health and other healthcare providers have been recording the nursing care process and its outcomes in the electronic health record system, using the ATIC standardized interface terminology data model [14]. More than 200,000 care episode records are generated annually. The patient assessment, care plan - including nursing diagnoses and interventions - as well as the continuous evaluation of their progress, are routinely recorded in all centers. Nurses record the type of wound and the care interventions for each patient, based on the wound assessment, as well as the care products used [15].

Although there are studies that have evaluated the prevalence of some of the described types of chronic wounds, few have described their overall prevalence and the characteristics of hospitalized patients. Knowing the profile of patients with chronic wounds in our environment can help improve follow-up and establish future improvement strategies in the management of care for these patients, improving the quality and safety of care and reducing associated costs. Therefore, the objective of this study was to determine the prevalence and sociodemographic profile of adult hospitalized patients with

chronic wounds admitted to the 8 hospitals of the Catalan Institute of Health during the years 2016-2020.

METHODS

Setting and study design

A descriptive observational cross-sectional multicenter study was conducted from January 1, 2016 to December 31, 2020 in the hospitalization units, intermediate care, and home hospitalization services at eight health public hospitals to the Catalan Institute of Health, the main public healthcare provider in Catalonia, Spain. These centers were classified into hospitals of high and low complexity (A1, A2, and A3 for high complexity; B1, B2, B3, B4, and B5 for low complexity). All episodes of patients over 18 years old, admitted with chronic wounds during the study period, in wards, step-down units, and home hospitalization services at eight health public hospitals were included. Excluded from the study were adult patients hospitalized in critical care units, short-stay units, or emergency observation units. Patients identified as close to the end of life were also excluded. The sampling technique used was non-probabilistic consecutive sampling.

Patient and Public Involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Data collection

The data source used was Business Objects and the Minimum Basic Data Set (MBDS), the data warehouse of electronic health record systems in centers under study. For nursing record data, the extraction was performed annually from 2016 to 2020, by unit, center, and in aggregate. The data were pseudo-anonymized. These data were coded and reviewed to detect potential inconsistencies in a data collection sheet created with Microsoft Excel 2010. In the database, no identifying data of all included patients was

present, as a consecutive numerical code was used to identify each patient. Study approval was granted by the institutional research ethics committee (PR185/21). Informed consent was waived due to the study's retrospective design.

Variables

The main variables of the study were nursing diagnoses for the types of chronic wounds: pressure injuries (PI), arterial ulcers (AU), venous ulcers (VU), mixed ulcers (MU) and diabetic foot ulcers (DFU), recorded at the nurse's electronic health care records. Pressure injuries were considered both hospital-acquired and community-acquired. In our study, community-acquired pressure ulcers were those recorded at the nursing station within the first 24 hours of admission. Hospital-acquired pressure ulcers were considered as those recorded after the first 24 hours of the patient's hospitalization. Secondary variables collected included: age, sex, reason for admission (AP-GRD), admission unit, type of hospital, source of admission, and discharge destination (continuity of care).

Statistical analysis

The analysis strategy primarily included descriptive statistics, using the mean, standard deviation, and minimum and maximum values for variables that follow a normal distribution, while for variables that do not follow a normal distribution, the median, 25th and 75th percentiles, and minimum and maximum values were used for analyzing the sociodemographic characteristics of the study population and the prevalence of chronic wounds. For the comparative analysis of sociodemographic differences according to the types of chronic wounds, to detect significant differences between types of chronic wounds, the chi-square test or Fisher's exact test was used for categorical variables, and the t-test or Mann-Whitney U test for continuous variables. Statistical significance was

established at a bilateral p<0.05. This analysis was conducted using SPSS statistical software version 23 (Chicago, Illinois).

RESULTS

Prevalence

During the years 2016-2020, 796,698 patients were admitted to the participating centers. Of these, 16,935 had some type of chronic wound, meaning a global incidence of chronic wounds of 2.1%: 9,667 (1.21%) pressure ulcers episodes, 5,080 (0.64%) arterial ulcers episodes, 1,167 (0.15%) generic ulcers episodes, 1,139 (0.14%) venous ulcers episodes, 1,105 (0.14%) diabetic foot ulcers episodes, and 190 (0.02%) mixed ulcers episodes. When analyzing pressure ulcers according to the stage, the results were as follows: 34.6% in stage I, 64.1% in stage II, 17.7% in stage III, and 7.2% in stage IV, with stage II pressure ulcers being the most prevalent.

Regarding the global incidence by center, we can observe that high-complexity hospitals have a prevalence of 2.39%, compared to a 1.81% in low-complexity hospitals. The centers with the highest prevalence are center A1 (3.57%), B5 (3.25%), A2 (2.69%), and B2 (2.40%), while those with the lowest incidence are centers B3 (2.03%), B4 (1.94%), A3 (1.58%), and B1 (0.82%).

The prevalence during the study years of the different types of chronic wounds showed a downward trend in pressure injuries, venous ulcers, and diabetic foot ulcers. However, mixed and arterial ulcers remained stable over the 5 years' study period. **(Figure 1).**

Clinical and Sociodemographic Characteristics

The clinical and sociodemographic characteristics of the study populations were analyses are presented in **Supplementary Table 1**. The mean age was 75.5 years and 61.8% (10,472) were male. Regarding clinical characteristics, the mean of length of stay

was 13 days (interquartile range [IQR]: 7-16). Regarding the type of admission, 78.2% (13,243) were episodes admitted via emergency, while 21.8% (3,692) were scheduled patients. Of the patients' episodes treated with chronic wounds, 76.2% (12,900) came from their homes or social residences, 10.8% (1,833) were referred from acute hospitals, and 9.4% (1,591) were referred from primary care centers. The main reasons for admission of the studied patients were cardiocirculatory disease (34.5%), musculoskeletal/connective tissue (15.2%), and respiratory disease (12.5%). Only 12.1% (2,050) required admission to the ICU, and 53.6% (9,083) were discharged home, 27.3% (4,626) to another hospital, 11.3% died (1,906), and 7.5% (1,272) were admitted to home hospitalization.

Analyzing the relationship between the types of wounds and the sociodemographic characteristics of studied patients, we can observe that the mean age was significantly higher in patients with pressure injuries and venous ulcers (pvalue=0.000). Additionally, differences in gender were observed, with a higher frequency of men among patients with arterial ulcers (74.2% vs. 25.8%) and diabetic foot ulcers (70% vs. 30%) compared to the total study population (pvalue=0.000). In contrast, venous ulcers were more prevalent in women, significantly increasing compared to the prevalence in the studied population (pvalue=0.000).

Regarding the length of stay, a longer hospital stay was observed in patients with pressure ulcers compared to the global study population (median: 16 vs. 13 days), while it was slightly lower in patients with venous ulcers (median: 10 vs. 13 days). It was also observed that among patients with arterial ulcers, the frequency of scheduled admissions was higher than in the overall population (30.5% vs. 21.8%) (pvalue=0.000). Regarding the source of studied episodes, no differences were observed among the different types of wounds.

However, it was identified that patients with pressure injuries had a higher frequency of ICU admissions (17.9% vs. 12%) (pvalue=0.000). In terms of discharge destination, the mortality rate was higher in patients with pressure injuries than in the overall study population (15.2% vs. 11.3%), whereas the mortality rate was lower in patients with arterial ulcers (5.2% vs. 11.3%) (pvalue=0.000). Additionally, patients with venous, arterial, and diabetic foot ulcers required greater care continuity from primary care (pvalue=0.000).

Finally, it is worth noting that although the main reason for admission among the studied patients was cardiovascular problems, this reason was more prevalent among patients with arterial ulcers than in the overall study population (65.7% vs. 34.5%) (pvalue=0.000). Additionally, a higher frequency of admission due to respiratory problems was observed in patients with pressure injuries (18.2% vs. 12.5%) (pvalue=0.000).

DISCUSSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of chronic wounds was observed during the period 2016-2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more venous ulcers. Additionally, patients with PI had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay, whereas patients with vascular ulcers required more continuous care after discharge than the rest of the CW. These results help highlight that CW remain an important health problem, so it is important to consider the

characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care.

It is estimated that 1-2% of the population in developed countries will have a chronic wounds during their lifetime [16], slightly below the global prevalence results of this study. It should be noted that there are few similar studies in hospitalized patients with which to compare the global prevalence data obtained. Ahmajärvi et al, in their 2016 study, observed a prevalence of 0.08% of CW in hospitalized patients [17]. Three studies in Spain show a prevalence of chronic CW ranging between 0.11% and 7.8% [18-20] but do not include hospitalized population. Regarding the downward trend observed in the prevalence of chronic wounds over the years studied (2016-2020), there are national prevalence studies that inform us of a sustained trend, although only in PI and dependency-related injuries (DRL) [10,21]. This data concourse with our results. Conversely, a previous study by Yao et al., analysing the trend over 5 years (2014-2018), as in the present study, shows an upward trend of CW in China [22]. It is possible that these results are related to the improvement in the quality of care in the different centers in our study and strategies introduced at the Catalan Institute of Health, such as the dissemination of the clinical practice guideline for lower extremity wounds in 2018 [23]. In addition, several studies were published regarding the progressive improvement in staffing levels during the studied years [24]. Furthermore, in 2020, the trend was more pronounced due to the fact that it coincided with the COVID-19 pandemic. This had a significant impact on the hospitals included in the study, as the patients' profile admitted throughout most of the year was different from the usual. The care intensity required at the time may have caused a chronic wound under-recording.

According to the aetiology of CW in this study, pressure injuries are the most prevalent (1.21%). Previous studies conducted in hospitalized patients show similar results [25,26].

Reviews conducted in Europe show a 10.8% prevalence of PI, with a wide variability depending on the countries, between 1.1% and 27.2% [27,28]. Another systematic review conducted demonstrated a 0.2%-29.6% prevalence of PI [29]. The last national prevalence study conducted in Spain in 2022 [21] established a 7.7% prevalence of PI in hospitalized patients. In the field of primary care, previous studies show a prevalence approximately 0.1% [18-21], quite below the results obtained in studies of hospitalized patients, which may be due to the fact that hospitalized patients are more at risk of developing PI due to compromised mobility [27]. As for the stage of PI, the most prevalent in our study were stage II PI, which is consistent with the fifth national prevalence study in hospitalized patients [10]. Amir et al., in 2016 observed a 8% prevalence of PI, of which 42.3% were stage III-IV [30]. The prevalence of venous ulcers was estimated at approximately 0.09%. Internationally, other studies establish a 0.05% prevalence of VU in hospitalized patients [21]. In primary care, the result was 0.04% [18,19]. Both studies are consistent with the results obtained in our study. According to diabetic foot ulcers, our study shows a prevalence of 0.09% in hospitalized patients. Internationally, we find that the range of prevalence is wide, between 1.2% and 20.4% [28]. A systematic review conducted in Australia established a 2.6%prevalence of DFU. Other studies in primary care show prevalence of 0.01% [18,19]. As for arterial ulcers, which in our study accounted for 0.42%, in a previous systematic review, the prevalence of AU was estimated between 0.7% and 10.9% [31]. Graves et al, in their narrative review found that data on AU prevalence are scarce, and those that they found concluded prevalence of 0.01% in primary care services [27]. This is consistent with the prevalence of other studies (0.012-0.005%) [18,19], probably because they are studies in the field of primary care.

Focusing on sociodemographic characteristics and in line with other studies, the prevalence of CW increases with age, consistent with results obtained in previous research [10,19,20]. Older people with chronic diseases and multiple comorbidities are at greater risk of developing CW. Age increases not only the risk of developing a wound, but also the delay in its healing [17]. Males predominate with 56% of cases, consistent with other studies in the hospital setting [10,20], unlike the results found in primary care, where females prevail [18-20,32]. In terms of patient profiles, there are studies that coincide with ours [25] in which the most common pathologies were cardiorespiratory. Finally, our study shows that ICU stays increase the prevalence of PI compared to the rest of the CW. These data are consistent with previous studies showing that prolonged ICU admission is associated with poorer health outcomes [33]. Finally, regarding discharge destinations, it is observed that patients with vascular ulcers required more care from primary care. This may be due to the fact that many of these patients have a type of chronic injury that requires a multidisciplinary approach led by advanced practice nurses or expert nurses who are precise in the diagnosis and recording of the specificity of CW [14], improving their approach, management, and follow-up. Standards and structured data allow better management of treatment, involve patients in their own care, and reduce the possibility of omitting necessary parameters to describe and understand wound progression. Increasing comorbidities are variables that impact the complexity of patients treated in hospitals. Responding to this complexity requires significantly more dedication time and often causes a lack of time to address care [31] so that the figure of the advanced practice nurse in CW in hospitalized patients could help reduce this omission. The incorporation of an advanced practice nurse could help improve the diagnostic accuracy of chronic wound care. Professionals are trained to treat wounds such as pressure ulcers, vascular ulcers, and diabetic ulcers, and have good diagnostic accuracy, but there are rare

wounds that may resemble these and lead to misdiagnosis. A misdiagnosis prolongs the patient's suffering, delays healing, increases costs, and can worsen the condition with inappropriate treatments [34]. Studies focused on chronic wound care recommend that professionals maintain a high level of awareness on potentially malignant lesions. This can help make a timely and accurate diagnosis, and avoid the application of inappropriate treatments due to a misdiagnosis. It is crucial to emphasize the importance of a thorough evaluation before classifying a wound as chronic [35]. For all the above reasons, it is important to research the standardization of treatment and the outcome of chronic wounds once diagnosed, as well as factors related to nursing care that predict a proper wound outcome [36]. Research on tools that assist us in making both diagnostic and treatment decisions is needed, and AI could be of great help in this regard.

CONCLUSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of CW was observed during the period from 2016-2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. It is worth noting that the prevalence of arterial and diabetic foot ulcers was higher in men, while women presented more venous ulcers. Additionally, patients with pressure injuries had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay; whereas patients with vascular ulcers required more continuous care after discharge than the rest of the CW. These results help highlight that chronic wounds remain an important health problem. It is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care, based on nursing diagnoses that allow us a high level of specificity.

LIST OF ABRREVIATIONS

AP-DRG, Diagnosis Related Groups

AU, arterial ulcers

CW, chronic wounds

DFU, diabetic foot ulcers

DRL, dependency-related injuries

ICU, intensive care units

IQR, interquartile range

MBDS, Minimum Basic Data Set

MU, mixed ulcers

PI, pressure injuries

VU, venous ulcers

DECLARATIONS

Ethics approval: This study was approved by the Clinical Research Ethics Committee of the Bellvitge University Hospital (PR185/21). Informed consent was waived due to the study's retrospective design. Ethical and data protection protocols related to anonymity and data confidentiality (access to records, data encryption and archiving of information) were complied with throughout the study.

Patient consent for publication: Not required.

Data availability statement: All data relevant to the study are included in the article or uploaded as supplemental information.

Competing interests: We declare that we have no competing interests.

Funding: This study had been funded by the COIB (PR-553/2022) as part of the Nurse Research Projects Grants

Author contributions: All authors had full access to all study data and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: MMLJ, JAT, MGS. Team coordination: MMLP, MGS. Acquisition of data: MMLJ, MTP, MPP, TCN, EZP, CBM. Analysis and interpretation data: MMLJ, MGS, JAT, MRG. Drafting of the manuscript: MMLJ, JA, MGS. Critical revision of the manuscript for important intellectual content: MRG, MTP, MPP, TCN, EZP, CBM. Statistical analysis: MMLJ, JAT. Obtained funding: MMLJ. Administrative, technical and material support: MTP, MPP, TCN, EZP, CBM. Study supervision: MGS, MRG. MMLJ is responsable for the overall content as guarantor and accepts full responsibility for the finished work and/or the conduct of the study, had access to the data and controlled the decision to publish.

Acknowledgements: We thank the CERCA Programme/Generalitat de Catalunya for institutional support.

REFERENCES

1. Gary Sibbald R, Goodman L, Reneeka P. Wound bed preparation 2012. J Cutan Med Surg. 2013;17 (SUPPL.1).
2. Li D. Design and implementation for wound measurement application. Prim Intent Aust J Wound Manag. 2006;14(2):56–8.
3. Batas R. Community nursing care for chronic wounds: A case study of optimal home treatment of a venous leg ulcer. Gastrointest Nurs. 2019;17(June):S32–9.
4. Heyer K, Herberger K, Protz K, Glaeske G, Augustin M. Epidemiology of chronic wounds in Germany: Analysis of statutory health insurance data. Wound Repair Regen. 2016;24(2):434–42.
5. Cacicedo González R, Castañeda Robles C, Cossío Gómez F, Delgado Uría A, Fernández Saíz B, Gómez España MV, et al. Manual de Prevención y Cuidados Locales de Heridas Crónicas. Servicio Cántabro de Salud. 2011. 51–94 p.
6. Samaniego-Ruiz M-J, Llatas FP, Jiménez OS. Valoración de las heridas crónicas en el adulto: una revisión integrativa. Rev da Esc Enferm da USP. 2018;52(0):1–10.
7. Lindholm C, Searle R. Wound management for the 21st century: combining effectiveness and efficiency. Int Wound J. 2016;13:5–15.
8. Marinel Roura J, Verdú Soriano J. C.O.N.U.E.I 2018 [Internet]. Conferencia Nacional de consenso sobre las Úlceras de la Extermidad Inferior (C.O.N.U.E.I). 2018. 37–50 p. Available from: https://www.aeev.net/guias/CONUEI2018AEEVH.pdf
9. Mata M, Cos FX, Morros R, Diego L, Barrot J, Carrera T, et al. Direcció clínica Guies de pràctica clínica.

10. Pancorbo Hidalgo P, García Fernández F, Pérez López C, Soldevilla Agreda J. Prevalencia de lesiones porpresión y otras lesiones cutáneasrelacionadas con la dependenciaen población adulta en hospitalesespañoles: resultados del5o Estudio Nacional de 2017. Gerokomos. 2019;30(2):76–86.
11. Dolores López-Franco M, Soldevilla-Agreda JJ, Enric Torra-Bou J, Pancorbo-Hidalgo PL, Martínez Vázquez S, García-Fernández FP. Prevalencia de las lesiones cutáneas relacionadas con la dependencia en centros de atención primaria de salud de España: resultados del 6.o Estudio Nacional del GNEAUPP 2022. Gerokomos. 2023;34(4):260–8.
12. Pedro García Fernández F, Javier Soldevilla Ágreda J, Luis Pancorbo Hidalgo P, Verdú Soriano J, Rodríguez Palma M, Gómez TS. Manejo Local de las Úlceras y Heridas [Internet]. 2018. 1–53 p. Available from: https://gneaupp-1fb3.kxcdn.com/wp-content/uploads/2018/11/GNEAUPP.DT03.Tratamiento.pdf
13. Goudy-Egger L, Dunn KS. Use of continuing education to increase nurses' knowledge of chronic wound care management. J Contin Educ Nurs. 2018;49(10):454–459.
14. Juvé-Udina M. ATIC Eje diagnostico. Ed. Naaxpot SLU, editor. Barcelona; 2016.
15. Juvé-Udina M, Adamuz-Tomás J. Nursing Knowledge Tools and Strategies to Improve Patient Outcomes and the Work Environment. In: Rollins N, Hafsteinsdóttir TB, editors. Mentoring in Nursing through Narrative Stories Across the World. Springer; 2023. p. 211–22.
16. Gupta S, Sagar S, Kisaka T, Tripathi S, Gupta S, Care I, et al. Chronic wounds: magnitude, socioeconomic burden and consequences. Wounds Asia. 2021;4(1):8–14.

17. Ahmajärvi KM, Isoherranen KM, Mäkelä A, Venermo M. A change in the prevalence and the etiological factors of chronic wounds in Helsinki metropolitan area during 2008-2016. Int Wound J. 2019;16(2):522–6.
18. Díaz-Herrera MÁ, Martínez-Riera JR, Verdú-Soriano J, Capillas-Pérez RM, Pont-García C, Tenllado-Pérez S, et al. Multicentre study of chronic wounds point prevalence in primary health care in the southern metropolitan area of Barcelona. J Clin Med. 2021;10(4):1–11.
19. Alayeto CL, Lozano SA. Prevalencia de heridas crónicas y lesiones cutáneas relacionadas con la dependencia en atención. 2023;34(2):134–7.
20. Ferrer-Solà M, Chirveches-Pérez E, Molist-Señé G, Molas-Puigvila M, Besolí-Codina A, Jaumira-Areñas E, et al. Prevalencia de la heridas crónicas en una comarca de la provincia de Barcelona. Enferm Clin. 2009;19(1):4–10.
21. García-Fernández FP, Soldevilla-Agreda JJ, Pancorbo-Hidalgo PL, Enric Torra-Bou J, Dolores López-Franco M. Prevalencia de las lesionescutáneas relacionadas conla dependencia en adultos hospitalizados en España:resultados del 6.o Estudio Nacional del GNEAUPP 2022. Gerokomos. 2023;34(4):250–9.
22. Yao Z, Niu J, Cheng B. Prevalence of Chronic Skin Wounds and Their Risk Factors in an Inpatient Hospital Setting in Northern China. Adv Ski Wound Care. 2020;33(9):1–10.
23. Institut Català de la Salut (ICS). Guia de pràctica clínica: Grup de Ferides Còniques. Available from: http://ics.gencat.cat/web/.content/documents/assistencia/gpc/gpc_ulceres_extremitats_inferiors.pdf
24. Juvé-Udina ME, González-Samartino M, López-Jiménez MM, Planas-Canals M, Rodríguez-Fernández H, Batuecas Duelt IJ, et al. Acuity, nurse staffing and

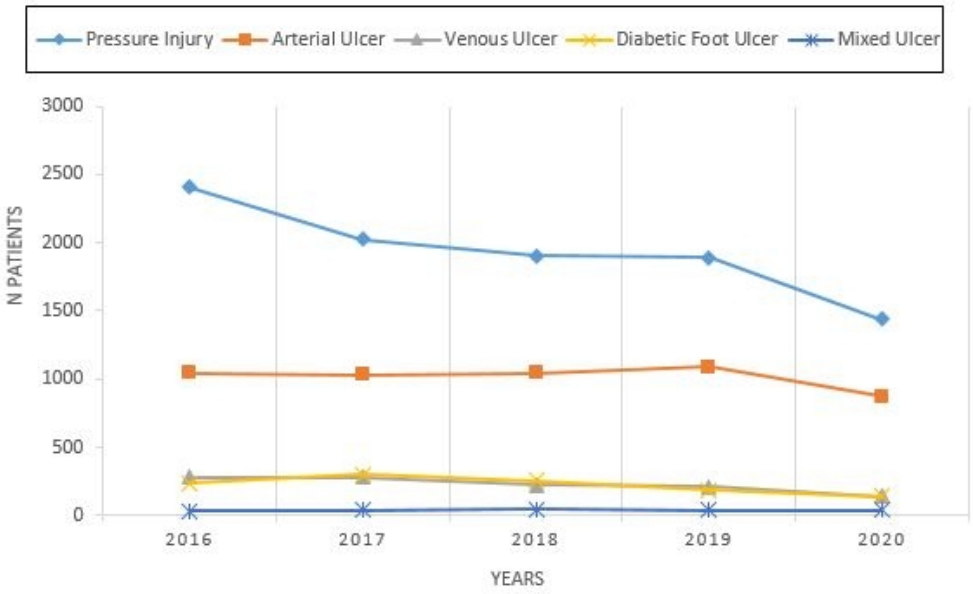
workforce, missed care and patient outcomes: A cluster-unit-level descriptive comparison. J Nurs Manag. 2020;28(8):2216–29.

25. Samaniego MJPF. Prevalencia e incidencia de heridas crónicas en atención primaria. Revista SEHER. Rev Soc Española Heridas SEHER. 2020;10(2171–8644):18–26.
26. Raeder K, Jachan DE, Müller-Werdan U, Lahmann NA. Prevalence and risk factors of chronic wounds in nursing homes in Germany. Int Wound J. 2020;17(5):1128–34.
27. Graves N, Phillips CJ, Harding K. A narrative review of the epidemiology and economics of chronic wounds. Br J Dermatol. 2022;187(2):141–8.
28. Graves N, Zheng H. The prevalence and incidence of chronic wounds: a literature review. Wound Practice & Research: Journal of the Australian Wound Management Association. J Aust Wound Manag Assoc [Internet]. 2014;22(1):14–9. Available from: https://search.informit.org/doi/abs/10.3316/INFORMIT.272162994803134
29. Mccosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T. Chronic wounds in Australia : A systematic review of key epidemiological and clinical parameters. 2019;(August 2018):84–95.
30. Amir Y, Lohrmann C, Halfens RJG, Schols JMGA. Pressure ulcers in four Indonesian hospitals: prevalence, patient characteristics, ulcer characteristics, prevention and treatment. Int Wound J. 2017;14(1):184–93.
31. McCosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T, Graves N, et al. Chronic wounds in Australia: A systematic review of key epidemiological and clinical parameters. Int Wound J. 2019;16(1):84–95.

32. Vieira CPDB, de Araújo TME. Prevalence and factors associated with chronic wounds in older adults in primary care*. Rev da Esc Enferm. 2018;52:1–8.
33. Adamuz J, Juve-Udina ME, Gonzalez-Samartino M, Jimenez-Martinez E, Tapia-Perez M, Lopez-Jimenez MM, et al. Care complexity individual factors associated with adverse events and in-hospital mortality. PLoS One. 2020;15(7 July):1–16.
34. Hess CT. Misdiagnosis of Wounds. Adv Ski Wound Care. 2019;32(3):144.
35. Lyundup A V., Balyasin M V., Maksimova N V., Kovina M V., Krasheninnikov ME, Dyuzheva TG, et al. Misdiagnosis of diabetic foot ulcer in patients with undiagnosed skin malignancies. Int Wound J. 2022;19(4):871–87.
36. Evan Darwin MT-C. Healing Chronic Wounds: Current Challenges and Potential Solutions. Curr Dermatol Rep. 2018;7(4):296–302.

Figure 1. Distribution of chronic wounds by year

Figure 1. Distribution of chronic wounds by year



Distribution of chronic wounds by year

152x103mm (96 x 96 DPI)

Table 1. Sociodemographic and Clinical Characteristics

	Total patients n=16.935		*Pressure Injury n=9.967*		*Arterial Ulcer n=5.080*		*Venous Ulcer n=1.139*		*Diabetic Foot Ulcer n=1.105*		*Mixted Ulcer n=190*		*Ulcer (generic) n=1.167*	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Sociodemographic Characteristics														
Median Age (IQR)	75	(65-84)	77	(67-85)[a]	72	(63-81)[a]	77	(69-85)[a]	71	(62-80)[a]	77	(69-85)[b]	76	(65-84)
Gender														
Male	10.472	(61.8)	5.495	(56.8)[a]	3.769	(74.2)[a]	554	(48.6)[a]	774	(70.0)[a]	106	(55.8)	667	(57.2)[b]
Female	6463	(38.2)	4.172	(43.2)[a]	1.311	(25.8)[a]	585	(51.4)[a]	331	(30.0)[a]	84	(44.2)	500	(42.8)[b]
Clinical Characteristics														
Median Length of Hospital Stay (IQR)	13	(7-26)	16	(8-32)[a]	11	(6-20)[a]	10	(6-16)[a]	13	(7-25)	12	(7-25)	13	(7-24)
Admission Type														
Emergency	13.243	(78.2)	7.969	(82.4)[a]	3.532	(69.5)[a]	959	(84.2)[a]	881	(79.6)	146	(76.8)	903	(77.4)
Planned	3.692	(21.8)	1.698	(17.6)[a]	1.548	(30.5)[a]	180	(15.8)[a]	224	(20.4)	44	(23.2)	264	(22.6)
Source														
Home/Social Residence	12.900	(76.2)	7.276	(75.3)[b]	3.948	(77.7)[b]	866	(76.0)	860	(77.7)	133	(70.0)[b]	902	(77.3)
Acute Hospital	1.833	(10.8)	1.100	(11.4)[b]	503	(9.9)[b]	118	(10.4)	128	(11.5)	20	(10.5)	117	(10.0)
Primary Care Center	1.591	(9.4)	934	(9.7)	431	(8.5)[b]	122	(10.7)	86	(7.8)[b]	20	(10.5)	113	(9.7)
Transfer within Same Center	499	(2.9)	275	(2.8)	178	(3.5)[b]	26	(2.3)	27	(2.4)	14	(7.4)[a]	28	(2.4)
Socio-Health Center	108	(0.6)	80	(0.8)[a]	19	(0.4)[b]	6	(0.5)	6	(0.5)	3	(1.6)	7	(0.6)
Outpatient Consultations	4	(0.1)	2	(0.0)	1	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)
ICU stay														
YES	2.050	(12.1)	1.734	(17.9)[a]	164	(3.2)[a]	71	(6.2)[a]	96	(8.7)[a]	13	(6.8)[b]	112	(9.6)[b]
NO	14.885	(87.9)	7.933	(82.1)[a]	4.916	(96.8)[a]	1.068	(93.8)	1.009	(91.3)[a]	177	(93.2)[b]	1.055	(90.4)[b]
Discharge Destination														
Home (Continuity of Care with PC)	9.083	(53.6)	4.488	(46.4)[a]	3.086	(60.7)[a]	687	(60.3)[a]	689	(62.4)[a]	110	(57.9)	644	(55.2)
Other Health Center	4.626	(27.3)	3.295	(34.1)[a]	960	(18.9)[a]	241	(21.2)[a]	250	(22.6)[a]	48	(25.3)	294	(25.2)
Voluntary Discharge	48	(0.3)	15	(0.2)[a]	26	(0.5)[b]	4	(0.4)	5	(0.5)	0	(0.0)	4	(0.3)
Death	1.906	(11.3)	1.472	(15.2)[a]	266	(5.2)[a]	134	(11.8)	79	(7.1)[a]	21	(11.1)	129	(11.1)
Home Hospitalization	1.272	(7.5)	396	(4.1)[a]	741	(14.6)[a]	73	(6.4)	82	(7.4)	11	(5.8)	96	(8.2)
Patient Profile														
Cardiovascular	5.843	(34.5)	1.832	(19)[a]	3.339	(65.7)[a]	397	(34.9)	429	(38.8)[b]	63	(33.2)	333	(28.5)[a]
Musculoskeletal/Connective Tissue	2.577	(15.2)	1.229	(12.7)[a]	1.120	(22.0)[a]	99	(8.7)[a]	208	(18.8)[b]	22	(11.6)	198	(17.0)
Respiratory	2.113	(12.5)	1.759	(18.2)[a]	70	(1.4)[a]	157	(13.8)	90	(8.1)[a]	35	(18.4)[b]	125	(10.7)
Neurological	1.212	(7.2)	994	(10.3)[a]	53	(1.0)[a]	67	(5.9)	55	(5.0)[b]	14	(7.4)	70	(6.0)
Renal and Urinary Tracts	1.093	(6.5)	864	(8.9)[a]	53	(1.0)[a]	85	(7.5)	70	(6.3)	13	(6.8)	83	(7.1)
Digestive	982	(5.8)	782	(8.1)[a]	43	(0.8)[a]	87	(7.6)[b]	52	(4.7)	8	(4.2)	86	(7.4)[b]

[a] **p-value<0.001**
[b] **p-value between 0.05 and 0.001**

BMJ Open

Prevalence of chronic wounds in hospitalized patients in Catalonia, Spain: a multicentre cross-sectional descriptive observational study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2024-095542.R2
Article Type:	Original research
Date Submitted by the Author:	03-May-2025
Complete List of Authors:	López Jiménez, María Magdalena; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Romero-García, Marta ; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Adamuz, Jordi; Bellvitge University Hospital, Nursing Knowledge Management and Information Systems Department; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL Berbis-Morelló, Carmen; Joan XXIII University Hospital Tarragona, Nursing Management Team Pons-Prats, Mònica; Tortosa Verge de la Cinta Hospital, Nursing Knowledge Management and Information Systems Department Tapia-Pérez, Marta; Bellvitge University Hospital, Nursing knowledge Management and Information Systems Department; IDIBELL Zuriguel Pérez, Esperanza; Hospital Vall d'Hebron, Nursing Research Unit Castro-Navarro, Trinidad; University Hospital Germans Trias i Pujol, Nursing knowledge Management and Information Systems Department Juvé-Udina, Maria-Eulàlia; Catalan Institute of Health González-Samartino, Maribel; Hospital Universitari de Bellvitge, Nursing Management Team; University of Barcelona, Fundamental and Clinical Nursing Department; IDIBELL
Primary Subject Heading:	Nursing
Secondary Subject Heading:	Epidemiology, Dermatology
Keywords:	Prevalence, Wounds and Injuries, Hospitalization

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

ORIGINAL ARTICLE

Prevalence of chronic wounds in hospitalized patients in Catalonia, Spain: a multicentre cross-sectional descriptive observational study

María-Magdalena López-Jiménez, RN, MSN, PhD candidate[1,2,3], Marta Romero-García RN, MSN, PhD[2,3*], Jordi Adamuz, RN, MSN, PhD[1,2,3], Marta Tapia-Pérez, RN[1,3], Esperanza Zuriguel-Pérez, RN, MSN, PhD[4]; Carmen Berbis-Morelló, RN, MSN, PhD[5], Mònica Pons-Prats RN[6], Trinidad Castro-Navarro RN[7], Maria-Eulàlia Juvé-Udina, RN, MSN, PhD[3,8]. Maribel González-Samartino, RN, MSN, PhD[1,2,3,9].

[1]Nursing Knowledge Management and Information Systems Department, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

[2]Fundamental and Clinical Nursing Department, Faculty of Nursing, University of Barcelona, Barcelona, Spain.

[3]IDIBELL, Bellvitge Institute of Biomedical Research, Barcelona, Spain.

[4]Nurse Research Coordinator, VHIR, Vall d'Hebron Institute of Biomedical Research, Barcelona, Spain.

[5]Nursing Management Team, Joan XXIII University Hospital, Tarragona, Spain.

[6]Nursing Knowledge Management and Information Systems Department, Verge de la Cinta Hospital, Tortosa, Tarragona, Spain

[7]Nursing Knowledge Management and Information Systems Department, Germans Trias i Pujol University Hospital, Badalona, Spain.

[8]Catalan Institute of Health, Barcelona, Spain.

[9]Nursing Management Team, Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain.

Word Count: 3217 words.

Corresponding Author: Marta Romero-García. Faculty of Nursing. Fundamental and Clinical Nursing Department, Feixa Llarga s/n, 08907, L'Hospitalet de Llobregat. Barcelona (SPAIN). E-mail: martaromero@ub.edu

ABSTRACT

Background: Few studies have investigated the prevalence of chronic wounds and the clinical and sociodemographic characteristics of hospitalized patients affected by them. Understanding these characteristics within the inpatient setting can support improved follow-up, inform care strategies, enhance quality and safety, and reduce associated healthcare costs. This study aimed to determine the prevalence and the sociodemographic profile of adult inpatients with chronic wounds admitted to the eight hospitals of the Catalan Institute of Health between 2016 and 2020.

Methods: A descriptive, observational, cross-sectional, and retrospective multicenter study was conducted using routinely collected clinical data from January 1, 2016, to December 31, 2020. The study encompassed hospital wards, step-down units, and home hospitalization services across eight public hospitals managed by the Catalan Institute of Health, the main public healthcare provider in Catalonia, Spain. The study included all patients aged 18 years or older who were hospitalized with chronic wounds during the study period. The main variables were nursing diagnoses of chronic wound types: pressure injuries (PI), arterial ulcers (AU), venous ulcers (VU), mixed ulcers (MU), and diabetic foot ulcers (DFU), as recorded in nursing electronic health records. Secondary variables included age, sex, reason for admission, unit of admission, hospital type, source of admission, and discharge destination. A descriptive and comparative analysis was performed.

Results: Among 796,698 hospitalized patients, 16,935 (2.1%) presented with at least one chronic wound. The most common types of chronic wounds were pressure injuries and arterial ulcers. A slight decline in the prevalence of chronic wounds was observed over the study period. Cardiovascular and respiratory conditions were the leading causes of

admission among these patients. Arterial and diabetic foot ulcers were more prevalent in men, whereas venous ulcers were more frequently observed in women. Patients with pressure injuries had longer hospital stays, higher rates of intensive care units (ICU) admissions, and increased in-hospital mortality. In contrast, patients with vascular ulcers more often required continued care after discharge ($p < 0.001$).

Conclusions: Chronic wounds continue to represent a significant healthcare challenge. It is essential to consider the clinical characteristics and health outcomes of hospitalized patients with chronic wounds in order to improve care quality and safety. Further research is warranted to explore the relationship between patient care complexity and the type of chronic wounds present.

Keywords: Prevalence, Chronic wounds, Ulcers, Hospitalized patients.

DATA AVAILABILITY STATEMENT

All relevant data are available in the article or the Supplementary Materials.

STRENGTHS AND LIMITATIONS

- This multicenter study included a large number of patients.
- Electronic nursing data are recorded voluntarily, and the nursing registry of chronic wounds may be associated with under-registration.
- The results of this study only apply to adult inpatients.

BACKGROUND

Chronic wounds (CW) represent a heterogeneous group of lesions that include vascular ulcers (venous and arterial), diabetic foot ulcers, and pressure injuries, among others [1–4]. Sibbald et al. have proposed that wounds persisting for more than six weeks should be considered chronic in nature [1].

Multiple general and local factors contribute to delayed healing in chronic wounds. These include advanced age, pharmacological treatments, malnutrition, comorbidities, social and familial context, and inadequate wound management [5]. The increasing life expectancy observed in recent decades is closely linked to a rising prevalence of chronic conditions, including chronic wounds. It is estimated that between 1% and 1.5% of the population in high-income countries are affected by some type of wound, and in Europe, wound care accounts for approximately 2% to 4% of total healthcare expenditure [3,6,7].

According to the National Consensus Conference on Lower Extremity Ulcers [8], 75% to 80% of lower extremity ulcers are of venous origin, with a population prevalence of 0.5% to 0.8%. In contrast, arterial ulcers—those of ischaemic aetiology—have a prevalence ranging between 0.2% and 2%. Ulcers of neuropathic origin, typically associated with diabetes mellitus, are clinically categorized under the broader concept of diabetic foot. Epidemiological data suggest that diabetes mellitus affects 7% to 7.5% of the general population, and it is estimated that 15% to 25% of individuals with diabetes will develop a foot ulcer during their lifetime [8].

Pressure injuries (PI) are defined as localized damage to the skin and underlying tissue, usually over a bony prominence, resulting from prolonged pressure and subsequent occlusion of the microcirculation. This process leads to tissue hypoxia and rapid degeneration [9]. In Spain, recent studies have shown that PI prevalence has remained

relatively stable in recent years, with the most recent data from 2022 indicating a prevalence of 0.043% [10,11]. However, due to demographic trends and the rising incidence of chronic diseases such as diabetes and obesity, the incidence of chronic wounds is expected to increase over the next decade [3,4,12,13]. Over the past ten years in Catalonia, nurses working in public hospitals under the Catalan Institute of Health, as well as other healthcare providers, have systematically documented the nursing care process and outcomes using the ATIC standardised interface terminology within electronic health record (EHR) systems [14]. More than 200,000 care episodes are recorded annually. These records include patient assessments, care plans (nursing diagnoses and interventions), and continuous monitoring of patient progress. Nurses routinely document wound types, care interventions based on wound assessment, and the use of specific wound care products [15].

While several studies have assessed the prevalence of specific types of chronic wounds, few have examined their overall prevalence or described the characteristics of hospitalised patients with chronic wounds. A clearer understanding of the patient profile in our healthcare setting may contribute to improved clinical follow-up and the development of targeted strategies for managing these patients. This, in turn, can enhance the quality and safety of care while helping to reduce healthcare costs.

Therefore, the objective of this study was to determine the prevalence and sociodemographic characteristics of adult patients hospitalised with chronic wounds at the eight hospitals of the Catalan Institute of Health between 2016 and 2020.

METHODS

Setting and study design

A descriptive, observational, cross-sectional, and retrospective multicenter study was conducted using routinely collected clinical data from January 1, 2016, to December 31, 2020. The study encompassed hospital wards, step-down units, and home hospitalization services across eight public hospitals managed by the Catalan Institute of Health, the main public healthcare provider in Catalonia, Spain. These centers were classified into hospitals of high and low complexity (A1, A2, and A3 for high complexity; B1, B2, B3, B4, and B5 for low complexity). The study included all patients aged 18 years or older who were hospitalized with chronic wounds during the study period, in wards, step-down units, and home hospitalization services at eight health public hospitals. Excluded from the study were adult patients hospitalized in critical care units, short-stay units, or emergency observation units. Patients identified as close to the end of life were also excluded. The sampling technique used was non-probabilistic consecutive sampling.

Patient and Public Involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Data collection

The data source used was Business Objects and the Minimum Basic Data Set (MBDS), the data warehouse of electronic health record systems in centers under study. For nursing record data, the extraction was performed annually from 2016 to 2020, by unit, center, and in aggregate. The data were pseudo-anonymized. These data were coded and reviewed to detect potential inconsistencies in a data collection sheet created with Microsoft Excel 2010. In the database, no identifying data of all included patients was present, as a consecutive numerical code was used to identify each patient. Study approval

was granted by the institutional research ethics committee (PR185/21). Informed consent was waived due to the study's retrospective design.

Variables

The main variables of the study were nursing diagnoses for the types of chronic wounds: pressure injuries (PI), arterial ulcers (AU), venous ulcers (VU), mixed ulcers (MU) and diabetic foot ulcers (DFU), recorded at the nurse's electronic health care records. Pressure injuries were considered both hospital-acquired and community-acquired. In our study, community-acquired pressure ulcers were those recorded at the nursing station within the first 24 hours of admission. Hospital-acquired pressure ulcers were considered as those recorded after the first 24 hours of the patient's hospitalization. Secondary variables collected included: age, sex, reason for admission (diagnosis related groups), admission unit, type of hospital, source of admission, and discharge destination (continuity of care).

Statistical analysis

The analysis strategy primarily included descriptive statistics, using the mean, standard deviation, and minimum and maximum values for variables that follow a normal distribution, while for variables that do not follow a normal distribution, the median, 25th and 75th percentiles, and minimum and maximum values were used for analyzing the sociodemographic characteristics of the study population and the prevalence of chronic wounds. For the comparative analysis of sociodemographic differences according to the types of chronic wounds, to detect significant differences between types of chronic wounds, the chi-square test or Fisher's exact test was used for categorical variables, and the t-test or Mann-Whitney U test for continuous variables. Statistical significance was

established at a bilateral p<0.05. This analysis was conducted using SPSS statistical software version 23 (Chicago, Illinois).

RESULTS

Prevalence

Between 2016 and 2020, 796,698 patients were admitted to the participating centers. Of these, 16,935 had some type of chronic wound, meaning a global incidence of chronic wounds of 2.1%: 9,667 (1.21%) pressure ulcers episodes, 5,080 (0.64%) arterial ulcers episodes, 1,167 (0.15%) generic ulcers episodes, 1,139 (0.14%) venous ulcers episodes, 1,105 (0.14%) diabetic foot ulcers episodes, and 190 (0.02%) mixed ulcers episodes. When analyzing pressure ulcers according to the stage, the results were as follows: 34.6% in stage I, 64.1% in stage II, 17.7% in stage III, and 7.2% in stage IV, with stage II pressure ulcers being the most prevalent.

Regarding the global incidence by center, we can observe that high-complexity hospitals have a prevalence of 2.39%, compared to a 1.81% in low-complexity hospitals. The centers with the highest prevalence are center A1 (3.57%), B5 (3.25%), A2 (2.69%), and B2 (2.40%), while those with the lowest incidence are centers B3 (2.03%), B4 (1.94%), A3 (1.58%), and B1 (0.82%).

The prevalence during the study years of the different types of chronic wounds showed a downward trend in pressure injuries, venous ulcers, and diabetic foot ulcers. However, mixed and arterial ulcers remained stable over the 5 years' study period. **(Figure 1).**

Clinical and Sociodemographic Characteristics

The clinical and sociodemographic characteristics of the study populations were analyses are presented in **Supplementary Table 1**. The mean age was 75.5 years and 61.8% (10,472) were male. Regarding clinical characteristics, the mean of length of stay

was 13 days (interquartile range [IQR]: 7-16). Regarding the type of admission, 78.2% (13,243) were episodes admitted via emergency, while 21.8% (3,692) were scheduled patients. Of the patients' episodes treated with chronic wounds, 76.2% (12,900) came from their homes or social residences, 10.8% (1,833) were referred from acute hospitals, and 9.4% (1,591) were referred from primary care centers. The main reasons for admission of the studied patients were cardiocirculatory disease (34.5%), musculoskeletal/connective tissue (15.2%), and respiratory disease (12.5%). Only 12.1% (2,050) required admission to the ICU, and 53.6% (9,083) were discharged home, 27.3% (4,626) to another hospital, 11.3% died (1,906), and 7.5% (1,272) were admitted to home hospitalization.

Analyzing the relationship between the types of wounds and the sociodemographic characteristics of studied patients, we can observe that the mean age was significantly higher in patients with pressure injuries and venous ulcers ($p < 0.001$). Additionally, differences in gender were observed, with a higher frequency of men among patients with arterial ulcers (74.2% vs. 25.8%) and diabetic foot ulcers (70% vs. 30%) compared to the total study population ($p < 0.001$). In contrast, venous ulcers were more prevalent in women, significantly increasing compared to the prevalence in the studied population ($p < 0.001$).

Regarding the length of stay, a longer hospital stay was observed in patients with pressure ulcers compared to the global study population (median: 16 vs. 13 days), while it was slightly lower in patients with venous ulcers (median: 10 vs. 13 days). It was also observed that among patients with arterial ulcers, the frequency of scheduled admissions was higher than in the overall population (30.5% vs. 21.8%) ($p < 0.001$). Regarding the source of studied episodes, no differences were observed among the different types of wounds.

However, it was identified that patients with pressure injuries had a higher frequency of ICU admissions (17.9% vs. 12%) ($p < 0.001$). In terms of discharge destination, the mortality rate was higher in patients with pressure injuries than in the overall study population (15.2% vs. 11.3%), whereas the mortality rate was lower in patients with arterial ulcers (5.2% vs. 11.3%) ($p < 0.001$). Additionally, patients with venous, arterial, and diabetic foot ulcers required greater care continuity from primary care ($p < 0.001$).

Finally, it is worth noting that although the main reason for admission among the studied patients was cardiovascular problems, this reason was more prevalent among patients with arterial ulcers than in the overall study population (65.7% vs. 34.5%) ($p < 0.001$). Additionally, a higher frequency of admission due to respiratory problems was observed in patients with pressure injuries (18.2% vs. 12.5%) ($p < 0.001$).

DISCUSSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of chronic wounds was observed during the period 2016-2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. Arterial and diabetic foot ulcers were more prevalent in men, whereas venous ulcers were more frequently observed in women. Additionally, patients with PI had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay, whereas patients with vascular ulcers required more continuous care after discharge than the rest of the CW. These results help highlight that CW remain an important health problem, so it is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care.

It is estimated that 1-2% of the population in developed countries will have a chronic wounds during their lifetime [16], slightly below the global prevalence results of this study. It should be noted that there are few similar studies in hospitalized patients with which to compare the global prevalence data obtained. Ahmajärvi et al, in their 2016 study, observed a prevalence of 0.08% of CW in hospitalized patients [17]. Three studies in Spain show a prevalence of chronic CW ranging between 0.11% and 7.8% [18-20] but do not include hospitalized population. Regarding the downward trend observed in the prevalence of chronic wounds over the years studied (2016-2020), there are national prevalence studies that inform us of a sustained trend, although only in PI and dependency-related injuries (DRL) [10,21]. This data concourse with our results. Conversely, a previous study by Yao et al., analysing the trend over 5 years (2014-2018), as in the present study, shows an upward trend of CW in China [22]. It is possible that these results are related to the improvement in the quality of care in the different centers in our study and strategies introduced at the Catalan Institute of Health, such as the dissemination of the clinical practice guideline for lower extremity wounds in 2018 [23]. In addition, several studies were published regarding the progressive improvement in staffing levels during the studied years [24]. Furthermore, in 2020, the trend was more pronounced due to the fact that it coincided with the COVID-19 pandemic. This had a significant impact on the hospitals included in the study, as the patients' profile admitted throughout most of the year was different from the usual. The care intensity required at the time may have caused a chronic wound under-recording.

According to the aetiology of CW in this study, pressure injuries are the most prevalent (1.21%). Previous studies conducted in hospitalized patients show similar results [25,26]. Reviews conducted in Europe show a 10.8% prevalence of PI, with a wide variability depending on the countries, between 1.1% and 27.2% [27,28]. Another systematic review

conducted demonstrated a 0.2%-29.6% prevalence of PI [29]. The last national prevalence study conducted in Spain in 2022 [21] established a 7.7% prevalence of PI in hospitalized patients. In the field of primary care, previous studies show a prevalence approximately 0.1% [18-21], quite below the results obtained in studies of hospitalized patients, which may be due to the fact that hospitalized patients are more at risk of developing PI due to compromised mobility [27]. As for the stage of PI, the most prevalent in our study were stage II PI, which is consistent with the fifth national prevalence study in hospitalized patients [10]. Amir et al., in 2016 observed a 8% prevalence of PI, of which 42.3% were stage III-IV [30]. The prevalence of venous ulcers was estimated at approximately 0.09%. Internationally, other studies establish a 0.05% prevalence of VU in hospitalized patients [21]. In primary care, the result was 0.04% [18,19]. Both studies are consistent with the results obtained in our study. According to diabetic foot ulcers, our study shows a prevalence of 0.09% in hospitalized patients. Internationally, we find that the range of prevalence is wide, between 1.2% and 20.4% [28]. A systematic review conducted in Australia established a 2.6%prevalence of DFU. Other studies in primary care show prevalence of 0.01% [18,19]. As for arterial ulcers, which in our study accounted for 0.42%, in a previous systematic review, the prevalence of AU was estimated between 0.7% and 10.9% [31]. Graves et al, in their narrative review found that data on AU prevalence are scarce, and those that they found concluded prevalence of 0.01% in primary care services [27]. This is consistent with the prevalence of other studies (0.012-0.005%) [18,19], probably because they are studies in the field of primary care.

Focusing on sociodemographic characteristics and in line with other studies, the prevalence of CW increases with age, consistent with results obtained in previous research [10,19,20]. Older people with chronic diseases and multiple comorbidities are at

greater risk of developing CW. Age increases not only the risk of developing a wound, but also the delay in its healing [17]. Males predominate with 56% of cases, consistent with other studies in the hospital setting [10,20], unlike the results found in primary care, where females prevail [18-20,32]. In terms of patient profiles, there are studies that coincide with ours [25] in which the most common pathologies were cardiorespiratory. Finally, our study shows that ICU stays increase the prevalence of PI compared to the rest of the CW. These data are consistent with previous studies showing that prolonged ICU admission is associated with poorer health outcomes [33]. Finally, regarding discharge destinations, it is observed that patients with vascular ulcers required more care from primary care. This may be due to the fact that many of these patients have a type of chronic injury that requires a multidisciplinary approach led by advanced practice nurses or expert nurses who are precise in the diagnosis and recording of the specificity of CW [14], improving their approach, management, and follow-up. Standards and structured data allow better management of treatment, involve patients in their own care, and reduce the possibility of omitting necessary parameters to describe and understand wound progression. Increasing comorbidities are variables that impact the complexity of patients treated in hospitals. Responding to this complexity requires significantly more dedication time and often causes a lack of time to address care [31] so that the figure of the advanced practice nurse in CW in hospitalized patients could help reduce this omission. The incorporation of an advanced practice nurse could help improve the diagnostic accuracy of chronic wound care. Professionals are trained to treat wounds such as pressure ulcers, vascular ulcers, and diabetic ulcers, and have good diagnostic accuracy, but there are rare wounds that may resemble these and lead to misdiagnosis. A misdiagnosis prolongs the patient's suffering, delays healing, increases costs, and can worsen the condition with inappropriate treatments [34]. Studies focused on chronic wound care recommend that

professionals maintain a high level of awareness on potentially malignant lesions. This can help make a timely and accurate diagnosis, and avoid the application of inappropriate treatments due to a misdiagnosis. It is crucial to emphasize the importance of a thorough evaluation before classifying a wound as chronic [35]. For all the above reasons, it is important to research the standardization of treatment and the outcome of chronic wounds once diagnosed, as well as factors related to nursing care that predict a proper wound outcome [36]. Research on tools that assist us in making both diagnostic and treatment decisions is needed, and AI could be of great help in this regard.

CONCLUSION

This study identified a 2.1% prevalence of chronic wounds in hospitalized patients. The main chronic lesions were pressure injuries and arterial ulcers. A slight downward trend in the prevalence of CW was observed between 2016 and 2020. The main reasons for admission of patients with CW were related to cardiovascular and respiratory diseases. Arterial and diabetic foot ulcers were more prevalent in men, whereas venous ulcers were more frequently observed in women. Additionally, patients with pressure injuries had longer hospital stays, a higher frequency of ICU admission, and mortality during their hospital stay; whereas patients with vascular ulcers required more continuous care after discharge. These results help highlight that chronic wounds remain an important health problem. It is important to consider the characteristics and health outcomes of hospitalized patients with chronic wounds, to establish improvements in the quality and safety of care, based on nursing diagnoses that allow us a high level of specificity.

LIST OF ABRREVIATIONS

AU, arterial ulcers

CW, chronic wounds

DFU, diabetic foot ulcers

DRL, dependency-related injuries

ICU, intensive care units

IQR, interquartile range

MBDS, Minimum Basic Data Set

MU, mixed ulcers

PI, pressure injuries

VU, venous ulcers

DECLARATIONS

Ethics approval: This study was approved by the Clinical Research Ethics Committee of the Bellvitge University Hospital (PR185/21). Informed consent was waived due to the study's retrospective design. Ethical and data protection protocols related to anonymity and data confidentiality (access to records, data encryption and archiving of information) were complied with throughout the study.

Patient consent for publication: Not required.

Data availability statement: All data relevant to the study are included in the article or uploaded as supplemental information.

Competing interests: We declare that we have no competing interests.

Funding: This study had been funded by the COIB (PR-553/2022) as part of the Nurse Research Projects Grants

Author contributions: All authors had full access to all study data and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: MMLJ, JAT, MGS. Team coordination: MMLP, MGS. Acquisition of data: MMLJ, MTP, MPP, TCN, EZP, CBM. Analysis and interpretation data: MMLJ, MGS, JAT, MRG. Drafting of the manuscript: MMLJ, JA, MGS. Critical revision of the manuscript for important intellectual content: MRG, MTP, MPP, TCN, EZP, CBM. Statistical analysis: MMLJ, JAT. Obtained funding: MMLJ. Administrative, technical and material support: MTP, MPP, TCN, EZP, CBM. Study supervision: MGS, MRG. MMLJ is responsable for the overall content as guarantor and accepts full responsibility for the finished work and/or the conduct of the study, had access to the data and controlled the decision to publish.

Acknowledgements: We thank the CERCA Programme/Generalitat de Catalunya for institutional support.

REFERENCES

1. Gary Sibbald R, Goodman L, Reneeka P. Wound bed preparation 2012. J Cutan Med Surg. 2013;17 (SUPPL.1).
2. Li D. Design and implementation for wound measurement application. Prim Intent Aust J Wound Manag. 2006;14(2):56–8.
3. Batas R. Community nursing care for chronic wounds: A case study of optimal home treatment of a venous leg ulcer. Gastrointest Nurs. 2019;17(June):S32–9.
4. Heyer K, Herberger K, Protz K, Glaeske G, Augustin M. Epidemiology of chronic wounds in Germany: Analysis of statutory health insurance data. Wound Repair Regen. 2016;24(2):434–42.
5. Cacicedo González R, Castañeda Robles C, Cossío Gómez F, Delgado Uría A, Fernández Saíz B, Gómez España MV, et al. Manual de Prevención y Cuidados Locales de Heridas Crónicas. Servicio Cántabro de Salud. 2011. 51–94 p.
6. Samaniego-Ruiz M-J, Llatas FP, Jiménez OS. Valoración de las heridas crónicas en el adulto: una revisión integrativa. Rev da Esc Enferm da USP. 2018;52(0):1–10.
7. Lindholm C, Searle R. Wound management for the 21st century: combining effectiveness and efficiency. Int Wound J. 2016;13:5–15.
8. Marinel Roura J, Verdú Soriano J. C.O.N.U.E.I 2018 [Internet]. Conferencia Nacional de consenso sobre las Úlceras de la Extermidad Inferior (C.O.N.U.E.I). 2018. 37–50 p. Available from: https://www.aeev.net/guias/CONUEI2018AEEVH.pdf
9. Mata M, Cos FX, Morros R, Diego L, Barrot J, Carrera T, et al. Direcció clínica Guies de pràctica clínica.

10. Pancorbo Hidalgo P, García Fernández F, Pérez López C, Soldevilla Agreda J. Prevalencia de lesiones porpresión y otras lesiones cutáneasrelacionadas con la dependenciaen población adulta en hospitalesespañoles: resultados del5o Estudio Nacional de 2017. Gerokomos. 2019;30(2):76–86.
11. Dolores López-Franco M, Soldevilla-Agreda JJ, Enric Torra-Bou J, Pancorbo-Hidalgo PL, Martínez Vázquez S, García-Fernández FP. Prevalencia de las lesiones cutáneas relacionadas con la dependencia en centros de atención primaria de salud de España: resultados del 6.o Estudio Nacional del GNEAUPP 2022. Gerokomos. 2023;34(4):260–8.
12. Pedro García Fernández F, Javier Soldevilla Ágreda J, Luis Pancorbo Hidalgo P, Verdú Soriano J, Rodríguez Palma M, Gómez TS. Manejo Local de las Úlceras y Heridas [Internet]. 2018. 1–53 p. Available from: https://gneaupp-1fb3.kxcdn.com/wp-content/uploads/2018/11/GNEAUPP.DT03.Tratamiento.pdf
13. Goudy-Egger L, Dunn KS. Use of continuing education to increase nurses' knowledge of chronic wound care management. J Contin Educ Nurs. 2018;49(10):454–459.
14. Juvé-Udina M. ATIC Eje diagnostico. Ed. Naaxpot SLU, editor. Barcelona; 2016.
15. Juvé-Udina M, Adamuz-Tomás J. Nursing Knowledge Tools and Strategies to Improve Patient Outcomes and the Work Environment. In: Rollins N, Hafsteinsdóttir TB, editors. Mentoring in Nursing through Narrative Stories Across the World. Springer; 2023. p. 211–22.
16. Gupta S, Sagar S, Kisaka T, Tripathi S, Gupta S, Care I, et al. Chronic wounds: magnitude, socioeconomic burden and consequences. Wounds Asia. 2021;4(1):8–14.

17. Ahmajärvi KM, Isoherranen KM, Mäkelä A, Venermo M. A change in the prevalence and the etiological factors of chronic wounds in Helsinki metropolitan area during 2008-2016. Int Wound J. 2019;16(2):522–6.
18. Díaz-Herrera MÁ, Martínez-Riera JR, Verdú-Soriano J, Capillas-Pérez RM, Pont-García C, Tenllado-Pérez S, et al. Multicentre study of chronic wounds point prevalence in primary health care in the southern metropolitan area of Barcelona. J Clin Med. 2021;10(4):1–11.
19. Alayeto CL, Lozano SA. Prevalencia de heridas crónicas y lesiones cutáneas relacionadas con la dependencia en atención. 2023;34(2):134–7.
20. Ferrer-Solà M, Chirveches-Pérez E, Molist-Señé G, Molas-Puigvila M, Besolí-Codina A, Jaumira-Areñas E, et al. Prevalencia de la heridas crónicas en una comarca de la provincia de Barcelona. Enferm Clin. 2009;19(1):4–10.
21. García-Fernández FP, Soldevilla-Agreda JJ, Pancorbo-Hidalgo PL, Enric Torra-Bou J, Dolores López-Franco M. Prevalencia de las lesionescutáneas relacionadas conla dependencia en adultos hospitalizados en España:resultados del 6.o Estudio Nacional del GNEAUPP 2022. Gerokomos. 2023;34(4):250–9.
22. Yao Z, Niu J, Cheng B. Prevalence of Chronic Skin Wounds and Their Risk Factors in an Inpatient Hospital Setting in Northern China. Adv Ski Wound Care. 2020;33(9):1–10.
23. Institut Català de la Salut (ICS). Guia de pràctica clínica: Grup de Ferides Cròniques. Available from: http://ics.gencat.cat/web/.content/documents/assistencia/gpc/gpc_ulceres_extremitats_inferiors.pdf
24. Juvé-Udina ME, González-Samartino M, López-Jiménez MM, Planas-Canals M, Rodríguez-Fernández H, Batuecas Duelt IJ, et al. Acuity, nurse staffing and

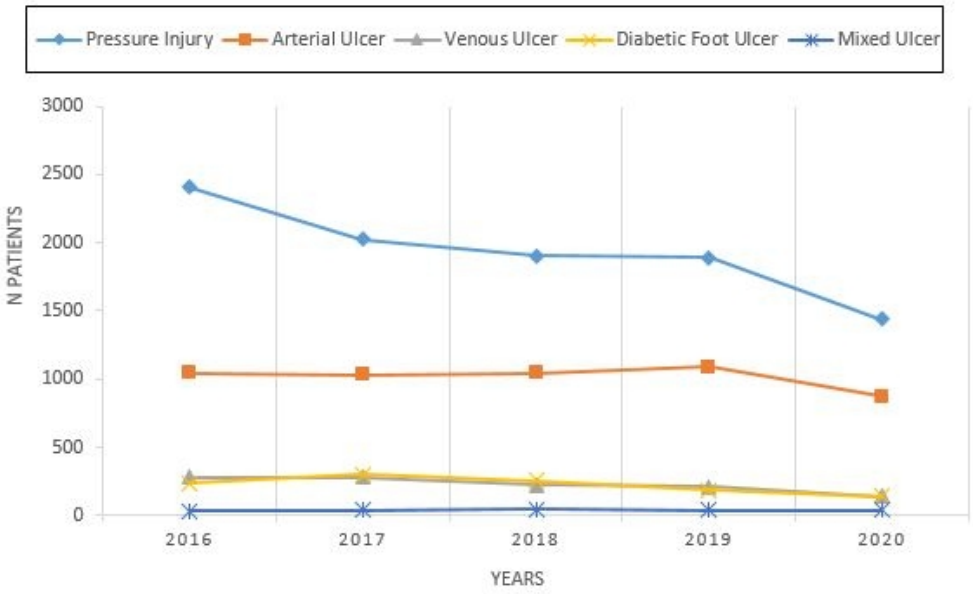
workforce, missed care and patient outcomes: A cluster-unit-level descriptive comparison. J Nurs Manag. 2020;28(8):2216–29.

25. Samaniego MJPF. Prevalencia e incidencia de heridas crónicas en atención primaria. Revista SEHER. Rev Soc Española Heridas SEHER. 2020;10(2171–8644):18–26.
26. Raeder K, Jachan DE, Müller-Werdan U, Lahmann NA. Prevalence and risk factors of chronic wounds in nursing homes in Germany. Int Wound J. 2020;17(5):1128–34.
27. Graves N, Phillips CJ, Harding K. A narrative review of the epidemiology and economics of chronic wounds. Br J Dermatol. 2022;187(2):141–8.
28. Graves N, Zheng H. The prevalence and incidence of chronic wounds: a literature review. Wound Practice & Research: Journal of the Australian Wound Management Association. J Aust Wound Manag Assoc [Internet]. 2014;22(1):14–9. Available from: https://search.informit.org/doi/abs/10.3316/INFORMIT.272162994803134
29. Mccosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T. Chronic wounds in Australia : A systematic review of key epidemiological and clinical parameters. 2019;(August 2018):84–95.
30. Amir Y, Lohrmann C, Halfens RJG, Schols JMGA. Pressure ulcers in four Indonesian hospitals: prevalence, patient characteristics, ulcer characteristics, prevention and treatment. Int Wound J. 2017;14(1):184–93.
31. McCosker L, Tulleners R, Cheng Q, Rohmer S, Pacella T, Graves N, et al. Chronic wounds in Australia: A systematic review of key epidemiological and clinical parameters. Int Wound J. 2019;16(1):84–95.

32. Vieira CPDB, de Araújo TME. Prevalence and factors associated with chronic wounds in older adults in primary care*. Rev da Esc Enferm. 2018;52:1–8.
33. Adamuz J, Juve-Udina ME, Gonzalez-Samartino M, Jimenez-Martinez E, Tapia-Perez M, Lopez-Jimenez MM, et al. Care complexity individual factors associated with adverse events and in-hospital mortality. PLoS One. 2020;15(7 July):1–16.
34. Hess CT. Misdiagnosis of Wounds. Adv Ski Wound Care. 2019;32(3):144.
35. Lyundup A V., Balyasin M V., Maksimova N V., Kovina M V., Krasheninnikov ME, Dyuzheva TG, et al. Misdiagnosis of diabetic foot ulcer in patients with undiagnosed skin malignancies. Int Wound J. 2022;19(4):871–87.
36. Evan Darwin MT-C. Healing Chronic Wounds: Current Challenges and Potential Solutions. Curr Dermatol Rep. 2018;7(4):296–302.

Figure 1. Distribution of chronic wounds by year

Figure 1. Distribution of chronic wounds by year



Distribution of chronic wounds by year

152x103mm (96 x 96 DPI)

Table 1. Sociodemographic and Clinical Characteristics

	Total patients n=16.935		*Pressure Injury n=9.967*		*Arterial Ulcer n=5.080*		*Venous Ulcer n=1.139*		*Diabetic Foot Ulcer n=1.105*		*Mixted Ulcer n=190*		*Ulcer (generic) n=1.167*	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Sociodemographic Characteristics														
Median Age (IQR)	75	(65-84)	77	(67-85)[a]	72	(63-81)[a]	77	(69-85)[a]	71	(62-80)[a]	77	(69-85)[b]	76	(65-84)
Gender														
Male	10.472	(61.8)	5.495	(56.8)[a]	3.769	(74.2)[a]	554	(48.6)[a]	774	(70.0)[a]	106	(55.8)	667	(57.2)[b]
Female	6463	(38.2)	4.172	(43.2)[a]	1.311	(25.8)[a]	585	(51.4)[a]	331	(30.0)[a]	84	(44.2)	500	(42.8)[b]
Clinical Characteristics														
Median Length of Hospital Stay (IQR)	13	(7-26)	16	(8-32)[a]	11	(6-20)[a]	10	(6-16)[a]	13	(7-25)	12	(7-25)	13	(7-24)
Admission Type														
Emergency	13.243	(78.2)	7.969	(82.4)[a]	3.532	(69.5)[a]	959	(84.2)[a]	881	(79.6)	146	(76.8)	903	(77.4)
Planned	3.692	(21.8)	1.698	(17.6)[a]	1.548	(30.5)[a]	180	(15.8)[a]	224	(20.4)	44	(23.2)	264	(22.6)
Source														
Home/Social Residence	12.900	(76.2)	7.276	(75.3)[b]	3.948	(77.7)[b]	866	(76.0)	860	(77.7)	133	(70.0)[b]	902	(77.3)
Acute Hospital	1.833	(10.8)	1.100	(11.4)[b]	503	(9.9)[b]	118	(10.4)	128	(11.5)	20	(10.5)	117	(10.0)
Primary Care Center	1.591	(9.4)	934	(9.7)	431	(8.5)[b]	122	(10.7)	86	(7.8)[b]	20	(10.5)	113	(9.7)
Transfer within Same Center	499	(2.9)	275	(2.8)	178	(3.5)[b]	26	(2.3)	27	(2.4)	14	(7.4)[a]	28	(2.4)
Socio-Health Center	108	(0.6)	80	(0.8)[a]	19	(0.4)[b]	6	(0.5)	6	(0.5)	3	(1.6)	7	(0.6)
Outpatient Consultations	4	(0.1)	2	(0.0)	1	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)
ICU stay														
YES	2.050	(12.1)	1.734	(17.9)[a]	164	(3.2)[a]	71	(6.2)[a]	96	(8.7)[a]	13	(6.8)[b]	112	(9.6)[b]
NO	14.885	(87.9)	7.933	(82.1)[a]	4.916	(96.8)[a]	1.068	(93.8)	1.009	(91.3)[a]	177	(93.2)[b]	1.055	(90.4)[b]
Discharge Destination														
Home (Continuity of Care with PC)	9.083	(53.6)	4.488	(46.4)[a]	3.086	(60.7)[a]	687	(60.3)[a]	689	(62.4)[a]	110	(57.9)	644	(55.2)
Other Health Center	4.626	(27.3)	3.295	(34.1)[a]	960	(18.9)[a]	241	(21.2)[a]	250	(22.6)[a]	48	(25.3)	294	(25.2)
Voluntary Discharge	48	(0.3)	15	(0.2)[a]	26	(0.5)[b]	4	(0.4)	5	(0.5)	0	(0.0)	4	(0.3)
Death	1.906	(11.3)	1.472	(15.2)[a]	266	(5.2)[a]	134	(11.8)	79	(7.1)[a]	21	(11.1)	129	(11.1)
Home Hospitalization	1.272	(7.5)	396	(4.1)[a]	741	(14.6)[a]	73	(6.4)	82	(7.4)	11	(5.8)	96	(8.2)
Patient Profile														
Cardiovascular	5.843	(34.5)	1.832	(19)[a]	3.339	(65.7)[a]	397	(34.9)	429	(38.8)[b]	63	(33.2)	333	(28.5)[a]
Musculoskeletal/Connective Tissue	2.577	(15.2)	1.229	(12.7)[a]	1.120	(22.0)[a]	99	(8.7)[a]	208	(18.8)[b]	22	(11.6)	198	(17.0)
Respiratory	2.113	(12.5)	1.759	(18.2)[a]	70	(1.4)[a]	157	(13.8)	90	(8.1)[a]	35	(18.4)[b]	125	(10.7)
Neurological	1.212	(7.2)	994	(10.3)[a]	53	(1.0)[a]	67	(5.9)	55	(5.0)[b]	14	(7.4)	70	(6.0)
Renal and Urinary Tracts	1.093	(6.5)	864	(8.9)[a]	53	(1.0)[a]	85	(7.5)	70	(6.3)	13	(6.8)	83	(7.1)
Digestive	982	(5.8)	782	(8.1)[a]	43	(0.8)[a]	87	(7.6)[b]	52	(4.7)	8	(4.2)	86	(7.4)[b]

[a] **p-value<0.001**
[b] **p-value between 0.05 and 0.001**