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Received: 13 December 2019 | Revised: 17 March 2020 | Accepted: 20 March 2020

DOI: 10.1111/iwj.13364

ORIGINAL ARTICLE

IWJ WILEY

Prevalence of acute and chronic wounds – with emphasis on pressure ulcers – in integrated continuing care units in Alentejo, Portugal

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Abstract

The aim of the study was to describe the prevalence and general characteristics of acute and chronic wounds in 2018 in Alentejo (Portugal) continuing care units. In order to look at associations, wound characteristics studied were location, type, place of acquisition, number, and duration, and patient characteristics were sex, age, and presence of risk factors. During the first 2 weeks of February 2018, a total of 770 patients were assessed at continuing care units of Alentejo. Of these, 135 exhibited wounds, a prevalence of 17.5%. Almost two out of three patients (63%) had arterial hypertension, slightly more than one in three (37%) had a stroke and/or immobility and 30% had diabetes. Of the total wounds identified, 18% were acute wounds and 82% were chronic wounds. Of the 24 acute wounds, traumatic wounds (76%), and surgical wounds (22%) were the most prevalent. The four types of pressure ulcers represented 80% of the chronic wounds. The median duration of the pressure ulcers was 5.5 months and 25% had duration over 10 months.

KEYWORDS

chronic wounds, continuing care units, pressure ulcer, prevalence

1 | INTRODUCTION

Portugal presents a negative effective growth rate (natural balance negative since 2009 and migratory balance negative since 2011) and more recent data indicate that the number of healthy life years in both sexes has suffered a significant reduction since 2014.[1] The most relevant risk factors for the healthy life years lost in the Portuguese population are inadequate eating habits (16%), hypertension (13%), smoking habits (12%), and high body mass index (12%).[1] The main causes of mortality in Portugal are diseases of the circulatory system (33%), followed by malignant tumours (27%), diseases of the respiratory system (13%), and endocrine and nutritional diseases (6%). In the 2014 report of the Organisation for Economic Cooperation and Development (OECD), Portugal was the European country with the highest diabetes incidence rate.[1]

Even though the Portuguese are living longer, the number of years lived in full health (healthy life expectancy, HALE) did not increase at the same rate.[2] As the Portuguese population ages, the number of patients with multimorbidity is increasing. A study characterising the state of health of the Portuguese population aged 25 to 74 years showed a high prevalence of chronic diseases such as hypertension (36%), obesity (28.7%), and diabetes (9.8%).[3] As a consequence, more people need help with activities of daily living because of decreased mobility.[4] Although long-term care disorders are the present challenge for the provision of

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care in advanced ages, care is largely designed for individual diseases rather than multimorbidity.[5]To address this problem and improve the rehabilitation process, in 2004, the National Health Service established the National Network of Integrated and Continuing Care (NNICC) for "the provision of continued and integrated care to people who, regardless of age, are in a situation of dependency" through "rehabilitation, adaptation and social reintegration" and "provision and maintenance of comfort and quality of life, even in situations that cannot be recovered".[6] The integrated care is at two levels: institutional access and local access, which includes home care. At the institutional level, there are convalescence units for short term recovery, medium-term and rehabilitation units as well as long-term and maintenance care units. At the local level, home care and autonomy promotion are delivered by integrated continuing care teams.

A major morbidity that is observed in these patients is the presence or development of complex wounds, such as pressure ulcers. Pressure injuries or pressure ulcers are a frequent health problem throughout the world.[7] They are a painful, costly, difficult to heal and are often preventable.

Pressure ulcers are defined as localised damage to the skin and/or underlying tissue, as a result of pressure or pressure in combination with shear.[7] A systematic review carried out by Coleman about risk factors emerging most frequently as independent predictors of pressure ulcer development included three primary domains of mobility/activity, perfusion (including diabetes) and skin/pressure ulcer status.[8] Another systematic review about risk factors for pressure ulcers among critical care patients, found that age, mobility/activity, perfusion, and vasopressor infusion emerged as important risk factors for pressure ulcer development.[9]A number of contributing or confounding factors are also associated with pressure ulcers, the primary of which is impaired mobility.[7]

Because of their association with other disorders, pressure ulcers impact has been undervalued and they are often seen as the inevitable complication of the underlying diseases. Nevertheless, chronic wounds, and pressure ulcers in particularly, are an important public health problem because of the considerable consumption of human, material and financial resources.[10]

Around the world, pressure ulcers prevalence in health care settings presents large variations. A recent systematic review reported global point prevalence of pressure injuries in acute hospitals at 14.8% and period prevalence at 11.6%, with a mean incidence of 6.3%.[11] Several efforts to assess the real dimension of the problem have been insufficient and the treatment and prevention of complex wounds is still neglected. Across OECD countries the observed prevalence rate of pressure ulcers in long-term facilities was 5.35 and the highest rates of pressure ulcer prevalence were observed in Spain, Italy, and Portugal, at nearly twice the OECD average.[12]

Key Message

- a major morbidity that is observed in these patients is the presence of complex wounds, particularly pressure ulcers

In spite of the existing data on prevalence included in the HALT (Health care-Associated Infection and Antimicrobial Use in Long-Term Care Facilities) studies conducted by the European Centre for Disease Control and Prevention, more specific information related to healing rates, type and quality of care, and costs is not available in Portugal.[1314]

The Region of Alentejo, situated in the south of Portugal, is characterised by its wide geographical area and a population with a low average socioeconomic level, increasing aging, a high percentage of people with disabilities and a high prevalence of chronic disabilities. The total number of beds available in the National Integrated and Continuing Care is 770 of which 116 (15.1%) are convalescence, 231 (30.0%) medium duration, and 423 (54.9%) long duration. In 2015, a working group was set up and a trained facilitator was appointed to carry out a needs assessment, and design and implement a programme of improvement strategies at the regional level with the goal to reduce the time to healing and prevention of new wounds. An initial prevalence study was carried out to assess the baseline dimension of the problem. Multiple interventions were designed based on the results obtained, including visits to individual units and wound assessment via telemedicine.

1.1 | Objectives of the study

The present study aims to: (a) estimate the prevalence of wounds in Alentejo continuing care units; (b) classify wounds with respect to location, type, place of acquisition, number, and duration; (c) assess the association of gender, age, type of risk factors present, place of acquisition, number, type, and duration of the most severe wound in patients with multiple wounds.

2 | MATERIAL AND METHODS

2.1 | Participants

The population under study included all in-patients present in the institution during the period of the study who

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presented at least one wound, regardless of the type or aetiology. In February, a total of 770 patients were admitted in Alentejo's NNICC units. Of these, 135 exhibited wounds. So, the prevalence is equal to 135/770 (17.5%). The same reasoning was carried out for the remaining units.

2.2 | Ethical considerations

The study received Institutional (Administração Regional de Saúde do Alentejo) Ethics Committee approval.

2.3 | Data collection procedures

The data collection tool devised by Sociedade Portuguesa de Feridas was used with due permission. The questionnaire is segmented into four sections, each targeting a specific area. The first section obtains demographic (sex and age) and administrative information; the second section is focused on patient history and risk factors; the third section examines the location of all the wounds; and the fourth focuses on wound characteristics, such identification of each wound until the maximum of six wounds, type (venous leg ulcer, arterial leg ulcer, other leg ulcers, diabetic foot, pressure ulcers according to EPUAP classification, moisture lesion, surgical wounds, traumatic wounds, burns, fistulas, and abscess), place of acquisition (home, hospital, long-term care facility, continuing care unit, primary health centre, and others), duration of wounds (ages, months, weeks, and days), time to treat the most severe wound (hours or/and minutes), and the frequency of wound dressing change, respectively.

The tool was applied to all inpatients with wounds. The questionnaire was made available to all NNICC health professionals following appropriate training through a computer platform.

2.4 | Study design

This is a cross-sectional study carried out in the NNICC covering areas in the coastal region of Alentejo and the districts of Portalegre, Évora, and Beja, in the first 2 weeks of February 2018.

2.5 | Statistical analysis

To analyse the associations between two nominal or one ordinal and other nominal variables, Pearson's chi-square test of independence was used. If the assumptions were not fulfilled (ie, all expected values greater than 1 and no more than 20% of the expected values less than 5), adjacent categories were summed. To study the relationship between the duration of the most severe wounds and the age of patient, the Spearman correlation coefficient was used, because the two variables did not follow a normal distribution.

To identify the factors that influenced the duration of the most severe wound a logistic regression model was fitted.[9] In order to fit the model, we follow the strategy as recommended by Hosmer et al (2013), but with adaptations given the small number of events: (a) for the initial model, all the variables that were found to be significant in the univariate phase ($P < .10$) were selected; (b) from this model were eliminated successively, and in descending order of P-values, all non-significant variables ($P > .05$); (c) it was verified if any of the variables that were not included in the initial model are shown to be significant in the presence of those in the model, in which case they were added to the model; (d) the functional form of the continuous variable was validated through the lowess method and GAM adjustment, and the fractional polynomials method was applied in case of nonlinearity with the logit and the parsimonious of the model was evaluated trying to joint categories that not only were not statistically different but also that make sense in the context; (e) the interactions that made sense in the context of the study were tested ($P < .05$); (f) a residual analysis was carried out by covariate patterns to search for influential observations or outliers. The significance of variables and interactions was tested using the likelihood ratio test. When each variable was excluded, it was observed the impact it had on the estimates of the remaining coefficients. The goodness of fit was carried out using Hosmer's and Lemeshow's goodness-of-fit test and Cessie van Houwelingen goodness-of-fit test, and the discriminative ability of the model was evaluated by the area under the radio operating curve (AUC).

Statistical analysis was performed using software R, v. 3.4.2, free trial licence, and IBM® SPSS Statistics, v.24, campus licence/University of Évora.

3 | RESULTS

3.1 | Characterisation of the patients

The response rate was 97.4% (one convalescence unit did not send data (19 beds). A total of 770 patients were assessed. Of these, 135 exhibited wounds – a prevalence of 17.5%.

Of the patients with wounds, average age was 79 years (SD of 12 years), with a range from 40 to 97 years and a median of 83 years. Over half of the patients were male (54.4%).

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More than 60% had arterial hypertension, 37% had a history of stroke and/or immobility, and 30% had diabetes (Table 1). These factors combined with dyslipidemia accounted for almost 50% of all antecedents and possible risk factors (Table 1).

Almost two out of three patients had between two and four risk factors, only two patients had no risk factors, and 19% had six or more risk factors (Table 2).

The majority of patients with wounds were admitted to the medium duration and rehabilitation units (48.2%) and to the long duration and maintenance units (34.8%). The convalescent units accounted for 17.0% of the patients with wounds. Figure 1 presents the estimated prevalence of patients with wounds for each type of unit.

TABLE 1 Distribution of antecedents/risk factors with a frequency greater than 10%, in patients with wounds (n = 138), and cumulative distribution of risk factors among the 529 risk factors present

Antecedent/risk factor	Patients (%)	Cumulative risk factors (%)
Arterial hypertension	63.0	16.2
Immobility	37.0	25.7
Stroke	37.0	35.2
Diabetes	29.6	42.9
Dyslipidemia	23.4	49.1
Heart failure	21.5	54.7
Previous history of ulcer	17.0	59.0
Obesity	12.6	62.3
Neoplasia	11.9	65.3
Rheumatological diseases	11.9	68.4
Sedentary lifestyle	10.4	71.0
Anaemia	10.4	73.7

TABLE 2 Distribution of patients according to the number of risk factors

Number of risk factors	Patients (%)
0	1.5 (n = 2)
1	5.2 (n = 7)
2	18.5 (n = 25)
3	23.0 (n = 31)
4	20.7 (n = 28)
5	11.9 (n = 16)
6	10.4 (n = 14)
7	5.2 (n = 7)
8+	3.7 (n = 5)

3.2 | Characterisation of the wounds

More than half of patients had a single wound (53.3%), 24.4% of the patients had two wounds, 13.3% had three wounds, and the remaining 9% had four or more wounds.

Of the 251 identified wounds, 45 (17.9%) were acute wounds and 206 (82.1%) were chronic wounds. Thirty-four (76%) of the acute wounds were from trauma and 10 (22%) were surgical wounds. The four categories of pressure ulcers dominated the chronic wounds, representing 80% of this typology.

Regarding the most serious wound, 24 patients (17.8%) had acute wounds and 111 (82.2%) had chronic wounds. Pressure ulcers represented 65.1% of all wounds: 36.5% were of category 4, 16.7% category 3, 6.3% category 2, and 5.6% category 1. Since pressure ulcers were the most frequent type of wounds, we further analysed the sub-sample composed of patients with pressure ulcers. In the cases where patients had more than one pressure ulcer wound, we considered the category of the most severe pressure ulcer (or the category of the most serious wound if pressure ulcers were not the most serious wound exhibited by the patient). This sub-sample included 88 patients: 6 with category 1 (6.8%), 7 with category 2 (8.0%), 28 with category 3 (31.8%), and 47 with category 4 (53.4%). There were 16 patients with two category 4 pressure ulcers, four patients with three category 4 pressure ulcers, three patients with four category 4 pressure ulcers, and two patients with six category 4 pressure ulcers.

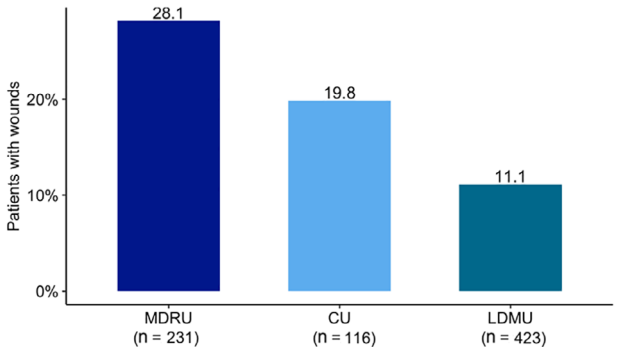

FIGURE 1 Prevalence of wounds in each treatment unit. n is the number of patients in each treatment unit. CU, convalescent units; LDMU, long duration and maintenance units; MDRU, medium duration and rehabilitation units

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The more frequent areas of injury included sacrococcygeal (22.2%), trochanter (22.2%), and calcaneus (21.6%). These regions corresponded to 66% of the pressure ulcer observed.

There was no difference in categories of pressure ulcers between the genders ($P = .988$). Patients with immobility were more likely to have more severe ulcers ($P = .051$). Only 5% of the patients with category 1-2 ulcers had immobility, while this was 64% in patients with category 4 ulcers. We did not observe associations between the category of pressure ulcers and the other most frequent risk factors (indicated in the questionnaire) such as arterial hypertension ($P = .405$), stroke ($P = .345$), diabetes (0.653), or dyslipidaemia ($P = .384$).

The places of acquisition of almost all pressure ulcers were the hospital (43.4%), the patient's home (25.2%), and NNICC (23.9%), as shown in Figure 2. The proportion of wounds that came from the Hospital was significantly different ($P < .001$) from the proportion of pressure ulcers that came from NNICC.

There was no significant difference between the number of most serious pressure ulcers and the second most serious pressure ulcers that came from the hospital as compared with those from the NNICC ($P = .379$ and $P = .166$, respectively). However, considering the 45 patients whose pressure ulcers had originated in the hospital, about 9 out of 10 of the other wounds (89%) had also originated in the hospital.

3.3 | Duration of the most severe pressure ulcer wound

The most serious wounds had a median duration of 5.5 months, and ranged from 5 days to 3312 days.

The duration of the most severe pressure ulcer was not related to the patient's age (Spearman $r = .067$, $P = .552$).

The duration of the most severe pressure ulcer was significantly different between the two sexes ($P = .007$): the median duration in females was 8.5 months with an interquartile range of 8.3 months and the median duration in males was 3.0 months with an interquartile range of 7.3 months. Figure 3 presents the difference in duration of pressure ulcers between gender, using three categories.

The duration of pressure wounds between gender was compared by adjusting for the pressure wound category ($P < .001$), but there was no interaction between the two factors ($P = .767$), so the difference between the genders does not depend on the pressure wound category. It is also concluded that the difference between genders does not depend on whether or not the patients have arterial hypertension ($P = .982$). Regarding the difference between gender, it depends on whether the patient has dyslipidemia ($P = .027$): for patients with dyslipidemia there are no differences between the sexes ($P = .507$) and for patients without dyslipidemia the duration is greater in female ($P < .001$).

The duration of the most serious ulcer pressure did not depend on where the wound was acquired ($P = .284$).

Regarding influence on the duration of the most severe wound and given the five most frequent risk factors, we observed that only arterial hypertension ($P = .034$) and dyslipidaemia ($P = .054$) had an association with the duration of the wound. The duration of pressure ulcers in patients without arterial hypertension (median = 8.5 months, interquartile range = 9.2 months) is greater than the duration of the pressure ulcers in patients with arterial hypertension (median = 4 months, interquartile range = 8 months). The duration of pressure ulcers in patients with dyslipidaemia (median = 9 months, interquartile range = 7.8 months) seemed to be greater than the duration of the pressure ulcers in patients without dyslipidaemia (median = 4.5 months, interquartile range = 8.5 months). There is no significant differences in the duration of pressure ulcers between patients with and without stroke ($P = .141$), immobility ($P = .815$), and diabetes ($P = .695$).

The duration of the most severe pressure ulcer depended on its category severity ($P < .001$). The duration of wounds in patients with a pressure ulcer of category

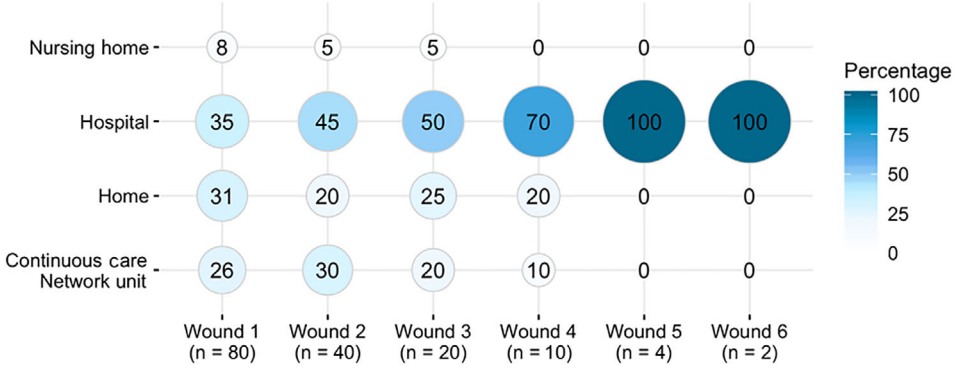

FIGURE 2 Distribution of pressure ulcers according to origin

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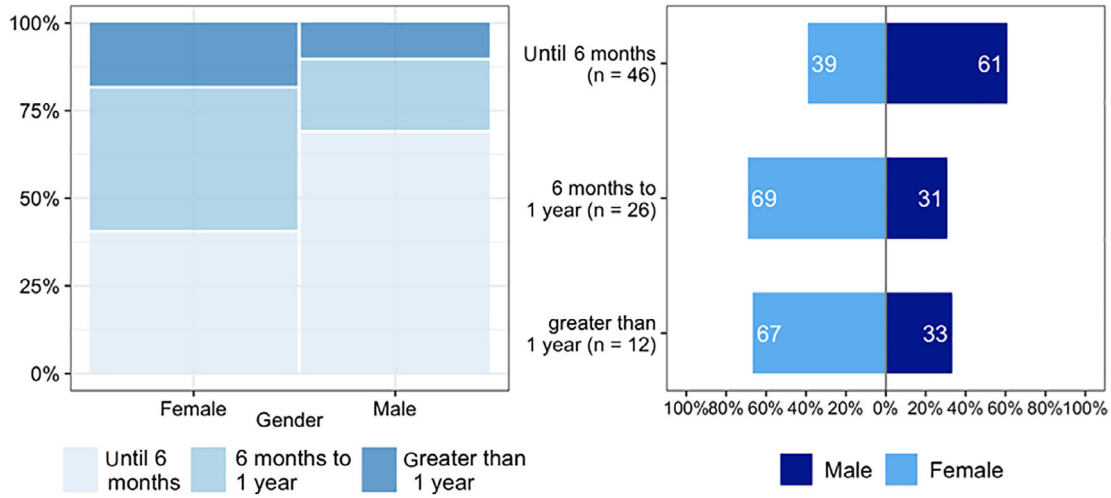
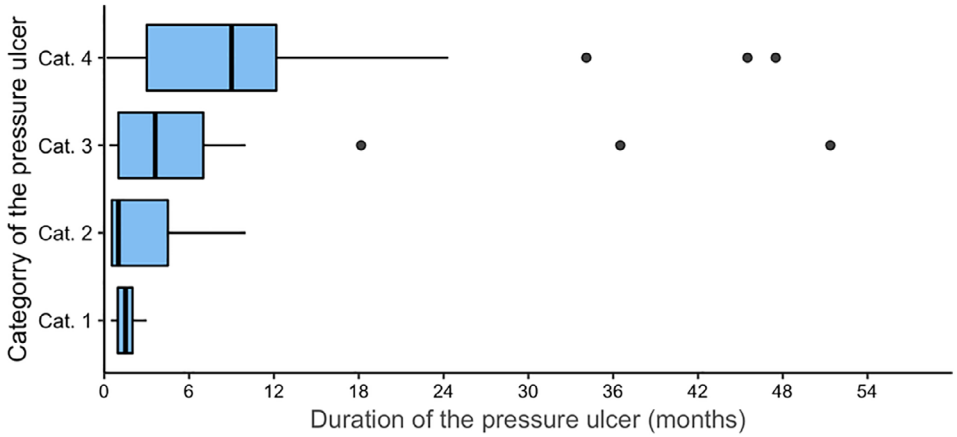


FIGURE 3 Distribution of patients according to gender and the duration of the most severe pressure ulcer

FIGURE 4 Distribution of the duration of the most severe pressure ulcer wound according to its category



4 (median = 9 months, IR = 8.9 months) was significantly different from the patients with a pressure ulcer category 3 (P = .031; median = 3.6 months, IR = 6 months), the patients with a pressure ulcer category 2 (P = .018; median = 1 month, IR = 4 months), and the patients with a pressure ulcer category 1 (P = .005; median = 1.5 month, IR = 1 month). There was no significant difference between the duration of pressure ulcers categories 3 and 2 (P = .255), categories 3 and 1 (P = .148), and categories 2 and 1 (P = .318) (Figure 4).

Since the distribution of the duration of the most severe wound have a great skewness and several outliers, to find the more important variables that explain a longer duration of the wound, we categorise the response variable into a binary variable response: duration no more than 6 months and duration more than 6 months. We have used 6 months as a cut-off value because there were only 15 patients whose most severe wounds were longer than 1 year.

There are some variables not statistically significant neither in the univariate logistic models nor when controlling for other variables. Therefore, these variables do not seem to have a great influence on the duration of the most severe wound: patient age (P = .650), number of wounds per patient (P = .916), immobility as a risk factor (P = .722), stroke as a risk factor (P = .172), diabetes as a risk factor (P = .741), source of the wound (P = .151), and number of risk factors (0.557).

The adjusted multivariate logistic model (Table 3) fits the data well (Hosmer and Lemeshow goodness-of-fit test: P = .981; Cessie van Howellingen goodness-of-fit test: P = .912) and has a very good discriminative capacity (AUC of the ROC curve = 0.873). Based on the odds ratio, we can conclude that:

1 A patient having a pressure ulcer of category 4 is almost 69 times more likely (in odds sense) to have a pressure wound with a duration greater than 6 months

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Covariate	$\hat{\beta}$	$\hat{\sigma}_{\hat{\beta}}$	*P*-value	OR	$CI_{95\%}$ (OR)
Gender					
Male (reference)					
Female	−1.319	0.461	.004		
Dyslipidaemia					
Yes (reference)					
No	−3.405	1.069	.001		
Gender × Dyslipidaemia	4.361	1.420	.002		
Arterial hypertension					
Yes (Reference)					
No	1.601	0.716	.025	4.96	(1.35; 24.29)
Pressure ulcer category					
1 or 2 (reference)					
Pressure ulcer category 3	2.629	1.278	.040	13.86	(1.55; 334.42)
Pressure ulcer category 4	4.229	1.272	<.001	68.64	(8.10; 1657.15)
Intercept	−2.764	1.395	.048		

TABLE 3 Estimated coefficients $(\hat{\beta})$ of the logistic regression model for most severe pressure wound duration (≤6 months vs >6 months), SDs $\left(\hat{\sigma}_{\hat{\beta}}\right)$, *P*-values (Wald), odds ratio (OR), and 95% confidence intervals based on profile likelihood

than a patient having a pressure wound of category 1 or 2.

2 A patient having a pressure ulcer of category 3 is almost 14 times more likely (in odds sense) to have a pressure wound with a duration greater than 6 months than a patient having a pressure wound of category 1 or 2.

3 A patient not having arterial hypertension is five times more likely to have a wound with a duration greater than 6 months than a patient having arterial hypertension as a risk factor.

4 A female patient with no dyslipidaemia as risk factor is 22 ($CI_{95\%}$ (OR = 4.34, 112.09) times more likely to have a wound with a duration greater than 6 months than a male patient with no dyslipidaemia as risk factor.

5 A male patient with dyslipidaemia as risk factor is 30 times ($CI_{95\%}$ (OR = 4.35, 307.52) more likely to have a wound with a duration greater than 6 months than a male patient with no dyslipidaemia as risk factor.

4 | DISCUSSION

This is the first largest prevalence study undertaken in NNICC in Portugal. Results are consistent with pressure ulcer aetiology conceptual frameworks confirming that overall there is no single factor which can explain pressure ulcer risk, but rather a complex interplay of factors which increase the probability of pressure ulcer development. When evaluating intrinsic risk factors within the conceptual framework of Coleman pressure ulcers aetiology, three major intrinsic risk factors should always be considered: mobility, tissue perfusion, and patient age all of them present in the population of our study.[8] Immobility is a significant pressure ulcer risk factor.[8151617] This is logical, people who are unable to reposition themselves are more likely to be exposed to prolonged external mechanical forces.[8] There was a significant association between the category of pressure ulcers and immobility in this study. Among the patients with immobility as a risk factor, 64.1% had category 4 pressure ulcers.

Tissue perfusion-related patient characteristics include oedema, diabetes, vascular disease, circulation, and blood pressure. Even within the construct of tissue tolerance, interaction effects are considered, such as in the case of a patient who develops perfusion issues (eg, hemodynamic instability) which can subsequently influence oxygenation levels. The importance of these characteristics suggests that factors that impair circulation will increase the probability of pressure ulcer development.[818] In this study, we did not observe an association between the category of pressure ulcers and the other most frequent risk factors such as arterial hypertension ($P = .405$), stroke ($P = .345$), diabetes (0.653), and dyslipidaemia ($P = .384$). However, we did not adjust our analyses for possible confounders.

Advanced age contributes to the risk of pressure ulcer development.[8919] Elderly individuals have less subcutaneous fat, decreased dermal thickness and decreased sensory perception. Besides this, older patients are more likely to have comorbidities that themselves are risk factors for the development of pressure ulcers. The combination of these factors make elderly patients prone to rapid tissue injury.[18]

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A mean of 79 years and a median of 83 years of age signals the aging of our population, predisposing them to the development of chronic wounds.

The more frequent areas of injury included sacrococcygeal (22.2%), trochanter (22.2%), and calcaneus (21.6%), as observed in other studies.[20,21] Repositioning of the patient to off-load areas of high pressure is an important component of pressure ulcer prevention but difficult in practice mainly because of perception of risk and staff shortages.

The duration of the most severe pressure ulcer was significantly different between the two sexes ($P = .007$), but overall there is minimal evidence to suggest that gender is a risk factor associated with pressure ulcer development.[8]

Most recent studies have taken place in inpatient settings and have focused on risk factors and prevention. In our context, we need to also focus on improvement of time to healing and assess the importance of education. Jenkins et al conducted a scoping review and identified patient and wound factors as potential prognostic factors for healing.[19] Tschannen and Anderson have proposed a framework for prevention of hospital acquired pressure injuries in which they add new constructs of which the one related to environment of care including workload, institutional culture, and teamwork are relevant for all settings.[22] These aspects make it difficult to compare data in long-term care units given the varied definitions of long-term care, and significant differences in number and competency of professionals.

Although the study focused on the outcome of pressure ulcer management in NNICC, the results indicate that a key step in the process of pressure ulcer prevention concerns patients admitted from hospitals. A major challenge will be finding approaches to decrease prevalence among susceptible patients in hospitals, for instance by establishing potential penalties in reimbursement for patients who develop a pressure ulcer.

4.1 | Strength and limitation of study

The main strength of the study is the production of data on prevalence of pressure ulcers in NNICC, and will be useful in future comparisons. The wounds identified can also be followed up to verify time to healing Data were collected with direct observation of patient skin. A limitation of this study is that prevalence data do not show where ulcers were acquired and data on incidence would give crucial information in order to plan intervention to improve wound care. In conclusion, further initiatives are required to promote change in pressure ulcer practice. It is necessary to support NNICC organisations in building the capacity for change to make health care safer. In health organisations, professionals have difficulty in implementing new knowledge and changing their practice. Health professional behaviour change is shaped by beliefs, acceptability of treatments to patients, external policies, and organisational support. There is an important gap between the implications of clinical research evidence and the routine clinical practice of health care professionals. Because individual decisions are often central to adoption of a clinical-related behaviour, more information about the cognitive mechanisms underlying behaviours is needed to improve behavioural change interventions targeting health care professionals.[23]

It is also necessary to change the policies for best practice, evidence of pressure ulcers prevention strategies, equipment for prevention, and treatment of pressure ulcers, documentation of standardised assessments, wound management to achieve best practice and communication to facilitate improvements.[24]The prevention and treatment of pressure ulcers are complex issues and need complex interventions to address them. Perhaps a "care bundle" intervention could be helpful. A care bundle is also referred as a patient care bundle, a prevention bundle, or a nursing cluster bundle. These terms refer to the practice of creating a series of evidence-based treatment and nursing measures to deal with incidental risks.[25] A care bundle usually includes three to six elements, each of which is supported by evidence from randomised controlled trials.[26] In our study, we have identified five key elements that need to be addressed: risk assessment, skin assessment, support surfaces, nutrition, and repositioning. The most important factor for successful implementation of the care bundle is the participation of the whole team. Only if physicians and nurses work together and faithfully perform their duties as described by the protocols of the care bundle can pressure ulcers be effectively prevented.

ACKNOWLEDGEMENTS

This study could not have been undertaken without the support of patients and nurses who collected data at participating units and the authors thank both groups for their contribution to the research.

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How to cite this article: Furtado KAX, Infante P, Sobral A, Gaspar P, Eliseu G, Lopes M. Prevalence of acute and chronic wounds – with emphasis on pressure ulcers – in integrated continuing care units in Alentejo, Portugal. *Int Wound J*. 2020;17:1002–1010. https://doi.org/10.1111/iwj.13364

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