


ORIGINAL ARTICLE

A ten-year follow-up of the prevalence of pressure injuries in the Czech Republic: Analysis of the National Registry

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Abstract

The study aims to follow up on the analysis of Pressure injuries (PIs) prevalence conducted between 2007 and 2014 and after the new methodological requirements for PIs surveillance establishment at the national level. A retrospective, nationwide cross-sectional analysis of data regarding the STROBE checklist was collected by the National Health Information System (NHIS). The International Classification of Diseases (ICD-10) diagnoses L89.0-L89.9 for PIs were used in the period 2010–2019. A total of 264 442 records of patients with diagnoses of L89.0-L89.9 were identified from 2010 to 2019 (26 444 patients per year on average). The numbers are increasing every year, and there is a 40% increase between 2010 and 2019. When comparing recorded PIs, the percentage of PIs occurrence in category I decreased, and the number of PIs in category IV increased in the second analysed period. Still, in absolute numbers, there is an increase across all categories. The age of patients with recorded PIs also rose slightly in the second analysed period. We have proven the PIs prevalence increase in an ageing population.

KEYWORDS

epidemiology, national registry, pressure injuries, pressure ulcers, prevalence

Key Messages

- pressure injuries (PIs) are a significant public health issue both for individuals and the health care system because of their epidemiological, economic, and socio-familial impact
- the prevalence of PIs differ due to different methodology in data reporting and collection; presented data are based on national health registries
- the prevalence of PIs has increased between the two evaluated periods (2007–2014 and 2010–2019); PIs prevalence increases in an ageing population

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- the mean age of men with PIs has increased from 70 to 73 years in the last decade, and the mean age of women has increased from 79 to 81 years (there is a statistically significant difference between the age structure of men and with L89* (0.001, Mann Whitney test) at the national level.
- the percentage of PIs occurrence in category I decreased, and the number of PIs in category IV increased in the second analysed period. Still, in absolute numbers, there is an increase across all age categories.

1 | INTRODUCTION

Pressure injuries (PIs) are a significant public health issue both for individuals and the health care system because of their epidemiological, economic, and socio-familial impact.¹ Pressure injuries are often described as chronic wounds with varying depths of full-thickness skin and tissue damage and a slow tendency to heal.²⁻⁴ They often reflect comorbidity or multimorbidity and represent the so-called silent epidemic affecting a large proportion of the world's population.⁵ The incidence of pressure injuries worldwide and the prevalence of pressure injuries in health care settings ranging from 0% to 72.5%.⁶⁻⁹ It has been found that 10% of hospital patients and 5% of community care patients suffer from pressure injuries and that 72% of all pressure injuries occur in persons older than 65 years.^{10,11} The differences in incidence and prevalence are influenced by differences in data collection and analysis methodology.

Neither direct comparison of economic models of cost-effectiveness is possible because of differences in cost input analyses and outcomes. However, a high economic burden of pressure injuries worldwide is obvious, and it may increase with the ageing population.¹²⁻¹⁴ Most pressure injuries surveillance practices depend on the local expertise of particular health care providers. However, information on the PIs occurrence is considered one of the indicators of health care quality.¹³ Greater emphasis on prevention reduces the burden of pressure injuries, affecting populations of all ages and all health care providers. We chose to conduct a retrospective analysis of national health statistics to determine the number of patients with pressure injuries in the Czech Republic. We recognise the need for valid data on prevalence for both health care providers, health and social care payers, and for patient groups. We follow up on the analysis conducted for data collected in 2007–2014 after the methodological requirements for pressure injuries surveillance were established at the national level - evaluation of reported diagnoses by PI.¹⁵ According to the analyses mentioned above, new practices of PIs surveillance were implemented in our country. Therefore, we expect that new information will be available. We have also implemented a new methodology and processes for recording pressure

injuries in healthcare facilities in the Czech Republic to enhance the standardisation of reporting.¹⁶

2 | MATERIALS AND METHODS

We conducted a retrospective, nationwide cross-sectional analysis of data according to the STROBE reporting guideline provided/collected by the National Health Information System (NHIS). Data from the NHIS for the period 2010–2019 were analysed. The analysis followed the analysis from 2007–2014 when only information from inpatient care was available. Data for this study come from all health care providers in the Czech Republic (both inpatient and outpatient). We analysed epidemiologic data to determine the regional and specific prevalence of PIs in the Czech Republic. The International Classification of Diseases (ICD-10) diagnoses L89.0-L89.9 for pressure ulcers/pressure injuries were used. All individuals diagnosed with L89.0-L89.9 in their documentation from any type of healthcare facility in a given year, either as a primary or secondary diagnosis, were considered patients with PIs. The analysis was computed using aVertica database for data pre-processing and SPSS 26.0.0.0 for the statistical analysis of data. Descriptive statistics were presented as absolute and relative frequencies for categorical variables and as mean \pm SD or median ranging from 25th to 75th percentile. Differences between group characteristics were analysed using the χ^2 test for categorical variables, and continuous characteristics were compared using the Mann-Whitney *U* test or the Kruskal-Wallis test. Differences were considered statistically significant when $P \leq .05$.

2.1 | Electronic databases

The National Registry of Reimbursed Health Services (NRRHS) serves as a database where patients are reported to health care providers. The database contains data from health insurance companies, including complete data on reported diagnoses, procedures, and treatments. Specific types of documents were analysed for

patients with reported diagnoses L89.0-L89.9. Patients with PIs are all individuals diagnosed with L89* in the primary or secondary diagnosis position on any medical document in a given year.

2.2 | Patient and public involvement

No patients were personally involved in our study. According to the Czech law, no special ethical approval is required for analyses for research purposes if the data are analysed by the Institute for Health Information and Statistics (IHIS) and not by a third party. Anonymous data are subsequently published in an aggregated form, so identification of individual patients is not possible. The study procedures were reviewed and approved by the Board of Directors of the IHIS in accordance with the requirements of the Ministry of Health of the Czech Republic (no unique IRD number was assigned).

3 | RESULTS

The analysis is based on data managed under the National Health Information System (NHIS) and national health registries that collect data at the national level in the Czech Republic, for example, the National Register of Reimbursed Health Services (NRRHS). A total of 264 442 records of patients with diagnoses of L89.0-L89.9 pressure injuries were identified from 2010 to 2019 (26 444 patients per year on average, Figure 1). The numbers are increasing every year, and there is a 40% increase between 2010 and 2019.

In 2019, nearly 30 590 people were diagnosed with L89-L89.9, and the prevalence rate was 287 cases per 100 000 population. Overall, 50.5% of patients with PIs were treated as inpatients, and 40.8% of patients with PIs were treated as outpatients without hospitalisation. For

the remaining 7.1% of patients, there is no evidence of outpatient or inpatient care related to PIs in 2019; most of them have only a medical device voucher (see Table 1).

The conducted analysis identified individual categories/stages of PIs. We analysed the data in more detail in relation to the category of PIs. The detailed description of the recorded PIs categories/stages during the period 2010–2019 is shown in Figure 2. As we can see, the number of PIs category/stages I and the number of unclassified has decreased.

The number of men and women with reported PIs increases each year; with women being more affected. The mean age of men with pressure injuries has increased from 70 to 73 years in the last decade, and the mean age of women has increased from 79 to 81 years (see Table 2). Thus, there is a statistically significant difference between

TABLE 1 The type of healthcare services contact recorded within the diagnosis of L89* in 2019

Year: 2019	Number of patients (% of total)
Total patients with recorded L89*	30 590 (100%)
Reported care	
Outpatient care	16 580 (54.2%)
Inpatient (Hospitalisation) care	15 438 (50.5%)
Medical and treatment aids	5605 (18.3%)
Patient transport	2704 (8.8%)
Emergency ambulance transport	367 (1.2%)
Typology of patients	
Hospitalisation care (with or without outpatient care)	15 923 (52.1%)
Outpatient care without hospitalisation	12 495 (40.8%)
Other (medical device only / transport / emergency ambulance transport)	2172 (7.1%)

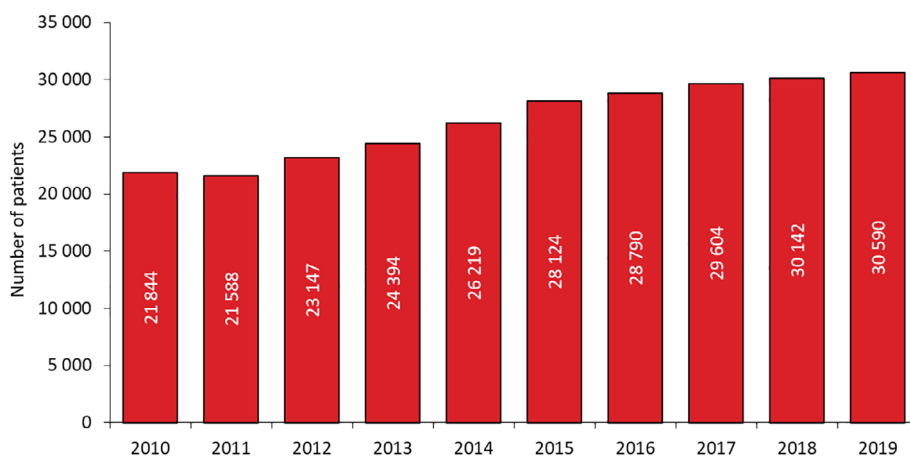


FIGURE 1 Number of cases associated with the development of PIs for each year (nationwide data, both inpatient and outpatient care)

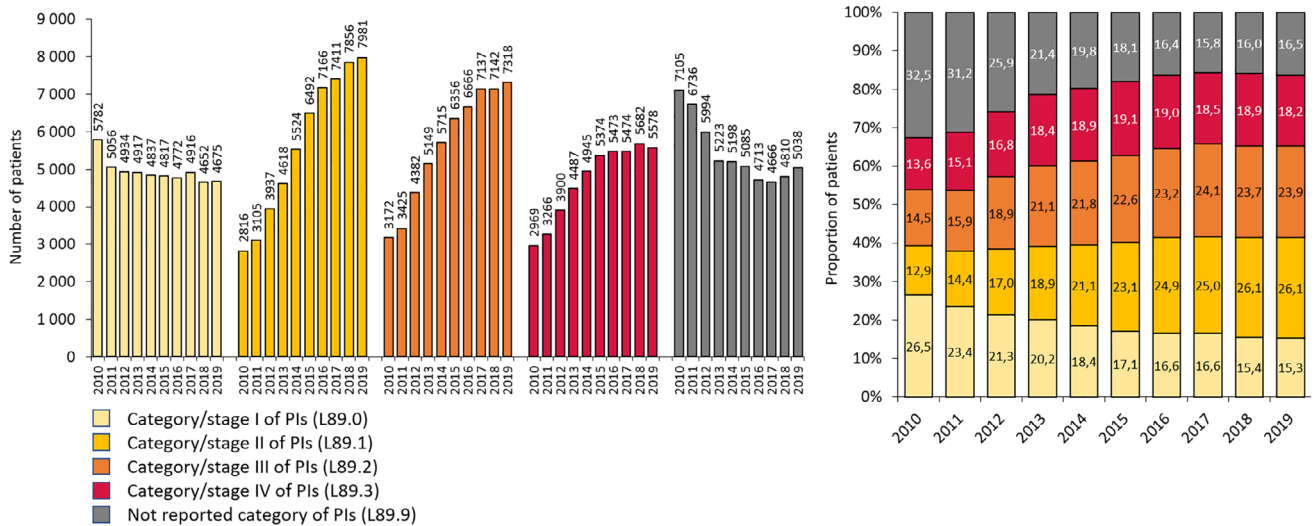


FIGURE 2 Detailed analyses of the categories/stages of PIs in recorded patients (period 2010–2019)

TABLE 2 Gender and age in patients with recorded diagnosis L89* (evaluated on data from 2019)

Gender	N (2019)	Age (years)		Mann-Whitney test P
		Mean (± SD)	Median (IQR)	
Men	12,772	72.8 ± 14.8	75 (66; 83)	<.001*
Women	17,818	80.8 ± 12.6	84 (76; 89)	
Total	30,590	77.4 ± 14.1	80 (71; 87)	

Note: *significant P-value ≤ .05.

TABLE 3 Relation between gender and category/stage of PI (nationwide data from 2019)

Category/stage of PIs	Gender		χ ² test P
	Men (%)	Women (%)	
Category/stage I of PIs (L89.0)	18.1	18.6	<.001*
Category/stage II of PIs (L89.1)	22.0	21.7	
Category/stage III of PIs (L89.2)	22.5	20.8	
Category/stage IV of PIs (L89.3)	18.5	17.4	
Not reported category of PIs (L89.9)	18.9	21.5	
Total	100	100	

Note: *significant P-value ≤ .05.

the age structure of men and women diagnosed with L89* (0.001, Mann Whitney test). Women are 8 years older on average (2019 data).

We also analysed the differences between the age and gender of the patients with L89* related to the category/stage of PIs. As Tables 3 and 4 show, there are differences between males and females and different age groups.

There is a statistical difference between men and women in the category/stage of PIs (0.001, χ² test). A higher proportion of unspecified PIs was reported in women. Nevertheless, it is impossible to deduce the fundamental differences in the representation of particular PI categories/stages between the two genders because we have a rather large number of records (more than 30 000 per year). Since in 18.9% of men (respectively 21.5% of women), there was no reported category of PI; thus, it is not possible to compare in any detail the representation of PIs categories in men and women and to draw conclusions about how they differ. As mentioned above, a too large proportion of them has an undetermined category/stage of PIs. In reality, it could be any category/stage, which would fundamentally bias the results.

The age distribution of patients is not the same in all categories/stages, and there are statistical differences (0.001, Kruskal-Wallis test).

The age structure of patients diagnosed with L89* in the analysed period of 2010–2019 is shown in Figure 3.

4 | DISCUSSION

Epidemiological data analysis was performed as a follow-up study after the introduction of the new reporting methodology. A total of 264 442 records of patients with PIs between the years 2010 and 2019 were identified (patients could be reported more than once based on the number of hospitalizations). The annual number of patients with pressure injuries continues to increase; 30 590 individuals were reported to have a diagnosis of L89-L89.9 in 2019. PIs are considered adverse events that are reported to the Adverse Event Reporting System.¹⁶ Methodological

Category/stage of PIs	Age (years)			Kruskal-Wallis test P
	N (2019)	Mean (\pm SD)	Median (IQR)	
Category/stage I of PIs (L89.0)	4675	76.6 \pm 15.4	80 (70; 87)	<.001*
Category/stage II of PIs (L89.1)	7981	77.8 \pm 13.4	80 (71; 87)	
Category/stage III of PIs (L89.2)	7318	77.3 \pm 13.8	80 (71; 87)	
Category/stage IV of PIs (L89.3)	5578	77.1 \pm 13.8	80 (71; 87)	
Not reported category of PIs (L89.9)	5038	78.0 \pm 14.9	81 (72; 88)	
Total	30,590	77.4 \pm 14.1	80 (71; 87)	

TABLE 4 Relation between age and category/stage of PI (nationwide data from 2019)

Note: *significant P-value \leq .05.

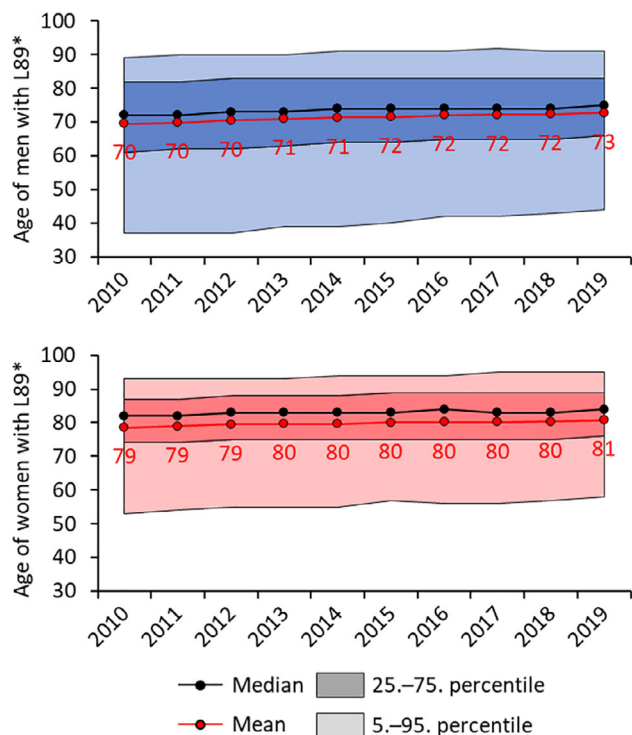


FIGURE 3 Age and gender of patients with PIs (period 2010–2019)

documents on the prevention of adverse events and the implementation of safety measures are provided to healthcare providers to strengthen the educational processes of the target groups of healthcare professionals, but also to support consistent monitoring and reporting. The gradually increasing trend of reported PIs, both in inpatient and outpatient care, may be due to an improvement in care reporting at the national level. Some studies find that risk assessment tools are ineffective in preventing PIs, as PIs in the hospital context are still global problems related to patient safety. Intervention programs are more effective in reducing the PIs occurrence. The evidence-based methodological documents, including appropriate

interventions, should be available to all healthcare professionals.¹⁷ Based on the previous analysis results, the new methodological documents were provided at the national level in the Czech Republic, including proactive and retrospective interventions.¹⁶

The data analysis confirmed that the number of people with a reported PI in the categories/stages II to IV had increased significantly over the last decade. We can assume it is related to the reimbursement as categories identified by L89.1 and L89.9 are not reimbursed in our healthcare system. It could also be influenced by the inability to identify the category I of PIs in clinical practice. In 2019, most patients with PIs in the category/stage II (26.1% of cases), category/stage III (23.9% of cases), and category/stage IV (18.2% of cases) were recorded. PIs, for which the category was not specified, were identified in 16% of records (on average) over the past 5 years. Previous data analysis for the period 2007–2014 showed that, on average, most PIs were reported in category IV.¹⁵ The PIs of the first category were recorded more frequently in 2010–2019, which may be influenced by the implementation of the new methodology for reporting PIs at the national level since 2014. The authors are also aware that the second analysis (2010–2019) included all patients with PIs from inpatient and outpatient facilities. The previous analysis was based only on the nationwide data of hospital patients. Nevertheless, we can note that in the 2010–2019 analysis, the proportion of unreported categories/stages of PIs is lower (about 7% in the last 5 years). The most-reported PIs are the categories/stages II and III; ulcers in the category/stage IV account for about 22%–25% of hospitalised individuals, which is significantly less than the 2007–2014 data showed.

The available studies that identified the costs of pressure injuries prevention and treatment varied considerably. Although the cost of caring for high-risk patients with pressure injuries can significantly impact the health service budget, the cost of treating PIs of higher

categories/stages was found to be significantly higher.¹⁸ A clear causal relationship cannot be confirmed based on data analysis. However, several studies have confirmed that PIs are more common in polymorbid patients.^{19,20} PIs significantly contribute to the excessive length of a hospital stay beyond what would be expected based on the admission diagnosis.²¹⁻²³ A previous analysis of data from 2007–2014 found that the most common comorbid conditions among patients admitted to an inpatient care facility with a principal diagnosis of PIs were cardiovascular disease, metabolic disorders such as diabetes mellitus, and movement disorders, and also confirmed the increase in the mean length of stay among health care providers.¹⁵ Data analysis focusing specifically on patients with neurologic conditions (in the Czech Republic) indicates that patients with brain injury and haemorrhage, neurodegenerative and oncologic conditions, and traumatic spinal cord injury were the most common.²¹

The incidence of PIs was confirmed to be more common in women in 2019 (52% versus 48% of men); women were 8 years older than men on average. The mean age of women with PIs was 80.8 years, while that of men was 72.8 years. We assume that this is related to the higher life expectancy of women also to the higher number of hospital admissions among women, and the higher consumption of health services by older women in general. The analysis showed an increasing prevalence of PIs in the ageing population; it was more than 2% in people over 80 and more than 5% in people over 90. Other studies have shown that the incidence of hospitalisation with pressure injuries increases in an ageing population. The prevalence is higher in certain patient groups at risk of pressure injuries.²⁴ Geriatric patients are particularly vulnerable to the development of PIs, but truly independent predictive factors are yet to be conclusively determined.²⁵ In geriatrics, health care professionals must strive to provide high-quality care for their patients. Early identification of high-risk patients is crucial for improved survival in geriatric patients and reduced mortality.^{26,27} We reviewed the association between category/stage of PIs and patient age. We cannot even see a logical correlation that, for example, age increases with a higher category/stage of PIs. Patients with the first PI category/stage are slightly younger, but age decreases from the second to the fourth category/stage than expected. When we look at the median and interquartile range, there are no differences. The higher median age in the group with not reported category/stage of pressure injuries is caused by the fact that there are a disproportionate number of women in this group (see the previous table). Women are generally older than men in the Czech population, so they also increase the median age in this group.

4.1 | Strengths and limitations

The greatest strength of this follow-up study is the inclusion of data from all health care facilities in the Czech Republic (inpatient acute care, non-acute care, and ambulatory care facilities) over 10 years concerning the implementation of the new methodology for reporting PIs at the national level. Nevertheless, there are also some weaknesses, mainly related to the limited amount of information on the timing of onset of PI, the effectiveness of prevention programs, and the effectiveness of different treatments. We also lacked risk assessment data, so we were unable to analyse incidents based on PI risk. Data were self-reported by individual facilities, and we were unable to validate the results directly. As the COVID-19 pandemic influenced the healthcare providers and data recording in 2020, we have not included that year in our analyses. As a follow-up, we are planning the prospective study in one Faculty hospital to verify the data reporting and identify the differences (on micro/local and macro/national levels).

5 | CONCLUSION

Using the available epidemiological data from the Czech health registers, we were able to analyse the population data on ICD-10 codes with the coding L89-L89.9 pressure ulcers/pressure injuries for the last 10 years. It was the second nationwide analysis. The first one covered the period from 2007–2014, and the second analysed the period from 2010–2019. Based on the analyses, we found that the number of pressure injuries recorded in healthcare facilities increased. In the period 2007–2014, a total of 0.3% of patients had a PI on admission or developed an ulcer during their care. For the period 2010–2019, it is impossible to define this precisely because we analysed both inpatient and outpatient care facilities based on the number of unique patients and not the number of hospitalizations.

Nevertheless, we performed an additional analysis of the proportion of hospital admissions with PIs from 2010–2019, which is 0.6%. In general, there is a noticeable annual increase in the proportion of hospitalizations with PIs (e.g., in 2010, it was 0.32%, and in 2020 it is 0.88%). When comparing recorded PIs, the number of category I PIs decreased, and category IV PIs increased during the second analysed period. The age of patients with recorded PIs also increased slightly. The increase in the number of reported PIs in acute inpatient care may be related to the overall deterioration of the patients' condition and higher prevalence, but it is also a positive impact of the implementation of the new PIs reporting methodology since

2014 and, in particular, the obligation to report PIs to the central adverse event reporting system imposed by legislation since 2019.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. The survey was carried out as a part of a dissertation thesis at the Masarykova Univerzita.

DATA AVAILABILITY STATEMENT

No patients were involved in the design of the study. For the research purposes analyses, there is not special ethical approval needed according to the Czech law if they are analyzing by the Institute of Health Information and Statistics and not by the third party.

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