# Decubitus as a Cause of Death even in the 21st Century

## Dekubitus jako příčina úmrtí i ve 21. století


### Abstract

*Aim:* The aim of the study was to analyze the incidence of decubitus in patients hospitalized and undergoing a surgery at the 1st Surgical Clinic (St. Anna's Hospital in Brno) in 2015. *Methods:* A retrospective analysis of data from the hospital data system and a specific electronic tool (I-hojeni.cz). The statistical software R was used to obtain results of Pearson's Chi-squared test with Yates' continuity correction and statistical significance level of 0.05. *Results:* The majority of the 3,937 hospitalized patients underwent a surgery (n = 3,431; 86.4%). A newly developed decubitus was detected in 31 patients. The mean age of patients was 82.61 years, the majority were women (18 : 13). Mean body mass index (BMI) was 25.37, mean duration of hospitalization reached 26.67 days. Mean decubitus grade within our group was 1.64. Five patients had more than one decubitus. Decubitus were most frequently located in the area of heel, followed by buttocks area and sacrum. Development of a pressure ulcer was independent of BMI ($p > 0.05$). There was an association between patient age and development of decubitus ($p = 0.02493$). Three patients died of decubitus. *Conclusion:* In spite of implementation of all available preventive measures, decubitus ulcers still occur in surgically treated patients in the 21st century and their treatment is associated with significant financial and time cost.

### Souhrn

*Cíl:* Cílem studie bylo analyzovat výskyt dekubitů u pacientů hospitalizovaných a podstupujících operaci na 1. chirurgické klinice u sv. Anny v roce 2015. *Metodika:* Retrospektivní analýza administrativních dat z nemocničního informačního systému a z dat speciálního elektronického nástroje (I-hojeni.cz). Použit byl statistický software R, statistická analýza byla provedena pomocí Pearsonova chí-kvadrátu na hladině významnosti 0,05. *Výsledky:* Z celkového počtu 3 937 hospitalizovaných podstoupila většina operační výkon (n = 3 431; 86,4 %). Nově se vytvořil dekubitus u 31 pacientů. Průměrný věk pacientů byl 82,6 let, jednalo se většinou o ženy (18 : 13). Body Mass Index (BMI) byl průměrně 25,37; délka hospitalizace 26,67 dní. Průměrný stupeň dekubitu byl 1,64. Pět pacientů mělo více než jeden dekubitus. Nejčastěji se vyskytovaly dekubity na patě, následně na hýždích a sakru. Nezjistili jsme statisticky významný vztah mezi BMI a vznikem dekubitů ($p > 0,05$). Věk pacientů a délka hospitalizace statisticky významně souvisely s výskytem dekubitů ($p = 0,02493$). *Závěr:* Přes všechna preventivní opatření vznikají dekubity u chirurgicky léčených pacientů i ve 21. století a jejich léčba je nákladná a dlouhá.


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### Klíčová slova

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## Introduction

Pressure ulcers (decubitus) develop rapidly, within hours in some cases. Statistics show that decubitus ulcers develop within the first fourteen days of a patient's immobility in two thirds of bedridden patients. Fifty percent of all pressure sores affect patients aged 70+. The risk of death rises four times with occurrence of a pressure ulcer [1,2].

Development of a decubitus ulcer is affected both by local and general factors. The local factors include mainly pressure, friction, scissor effect as well as wetness in the given area. Apart from ischemia, mechanical damage to the tissue also contributes to the development of a decubitus ulcer. The general factors involve innervation disorders, disorder of blood circulation in the given area, incorrect nutrition, immobility, inactivity, incontinence, altered psychological status, immunity disorders. Furthermore, various diseases may be associated with a decubitus ulcer. Any surgical inter-

vention immobilizes patients to some extent and thus predisposes to decubitus, especially in patients with numerous comorbidities. Annually, 187–281 million people undergo a surgery, i.e. each twenty-fifth inhabitant of this planet faces some kind of surgical intervention within a year. The number of interventions per capita increases with the level of development of a country [3].

Statistics show that approximately 2–5% of surgical interventions lead to an infection. Further sources also show that, in the European Union, healthcare-associated infections (HAI) resulting from medical treatment and examinations as well as from hospitalization affect up to a tenth of patients (i.e. approx. 3 million annually). Roughly 50,000 cases result in death. For example, in Great Britain alone the losses relating to post-operative infections raised to up to 1 billion pounds per year. These infections have far-reaching consequences not only for patients' health and their return to active life but also for smooth functioning of the hospital and financial health of the entire healthcare system. The available statistics reveal that almost 10% of hospitalizations longer than two days are associated with infections. This consumes 41% of all hospitalization costs; hospitalization of an average of 23 days, daily costs per one patient suffering from a HAI of up to 443 Eur – i.e. the costs double up compared to a standard hospitalization. Almost 95% of HAIs result in death of the patient. This also includes patients with decubitus developed during hospitalization [1].

In spite of extensive prevention measures, occurrence of decubitus ulcer is still a "nightmare" for both patients and medical staff. Despite of all preventive measures, decubitus ulcer still occurs in the 21st century. Its treatment is associated with significant financial and time cost. Impaired wound healing can be caused by the patient characteristics such as age or comorbidity of the patient, including malnutrition, obesity, uncontrolled diabetes, cardiovascular diseases, immunity disorders or infection. Infection can be classified as minor (superficial with minimal local reddening), moderate (deeper or larger) or severe (associated with systemic sepsis effects). The intensity of infection can be determined with appropriate and rigorous infection diagnostics. Infectious complications of an acute wound show a number of symptoms (calor, tumor, dolor, rubor, functio laesae), while with chronic wounds, the infection can be hidden and the stagnating ulcer, ongoing secretion and prolonged healing may sometimes be the only symptoms. A large number of studies have been published that focused on a variety of microbiological populations in a chronically infected wound. The majority of results were obtained using the blood agar only as a cultivation medium. The results of these studies show that various types of *Staphylococcus, Streptococcus, Enterococcus* and facultative anaerobic gram-negative bacteria are the microorganisms most frequently found in wounds. Such studies only rarely mention cultivation-requiring and slowly growing bacteria, let alone bacteria that cannot be cultivated under common conditions – e.g. anaerobic bacteria. The majority of studies on chronic wounds do not describe the incidence and prevalence of anaerobic bacteria even though it has been known for some time that anaerobic bacteria are a contributing factor in wound infections and impaired healing. Current studies show that the share of anaerobic bacteria on the critical colonization of a wound is much higher than expected [2,4].

Today, microbiological diagnostics of a chronic wound may use not only cultivation on blood agar and anaerobic substrate but also some relatively new methods such as PCR (polymeric chain reaction), FISH (fluorescent *in situ* hybridization), DGGE (electrophoresis in gradient deuterated gel) and BTEFAP test (bacterial tag-encoded FLX titanium amplicon pyrosequencing) [5].

As we do not have a national electronic tool to monitor the incidence of pressure ulcers used in some other countries [6], we decided to use our local database (hospital information system).

## Material and methods

We carried out a retrospective study with the aim to investigate the cause of decubitus at the 1st Surgical Clinic during 2015. We used the electronic databases of the Hospital Information System and an originally developed electronic tool (I-hojeni.cz) used locally at our clinic.

We recorded the age, comorbidity, BMI, length of hospitalization, presence of other infections, and the number of other factors as well as the type of a surgical intervention. Statistical associations were evaluated using the Pearson's chi-squared test (statistical significant value 0.05).

## Results

The 1st Surgical Clinic hospitalized 3,937 patients in 2015. Of these, 3,431 (86.4%) patients underwent a surgery. Newly developed decubitus ulcer was detected in 31, i.e. 0.90% of the surgically treated patients suffered from pressure sores. The risk of decubitus was assessed using the Norton Scale for Assessing Risk of Pressure Ulcers. The majority of patients (n = 24; 77.4%) had moderate risk, six patients (19.3%) high risk and one patient was diagnosed with decubitus ulcer though at an early stage of its development.

Mean age of patients suffering from decubitus was 82.61 years with a range of 59–93 years. Mean body mass index (BMI) was 25.37 (min. 17.1, max. 40.4). Mean duration of hospitalization was 26.67 days with the range of 3–107 days. Mean grade of decubitus within our group was 1.64 (1–3). Five patients had more than one pressure sore.

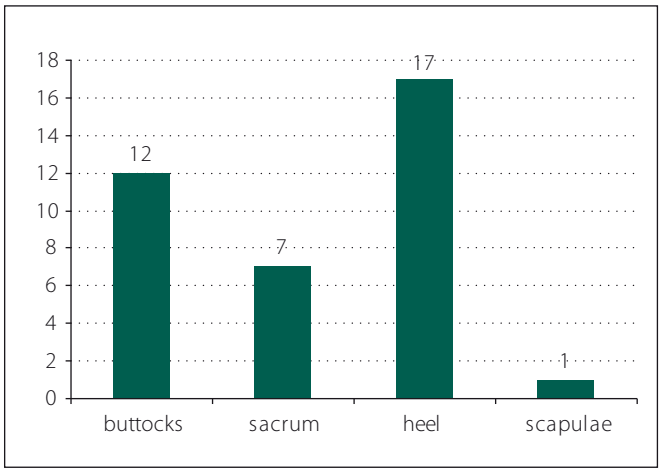
Decubitus most frequently occurred in the area of the heel, followed by buttocks area and sacrum (graph 1). Trauma patients had the highest incidence (graph 2). Three patients died. Two died of sepsis, one of respiratory insufficiency. The monitored values were compared with the number of terminated hospitalizations – 3,940 in 2015 in our clinic, mean age was 58.15 years, BMI 26.5 and mean duration of hospitalization was 5.92 days for the entire groups of patients.

Statistical software R was used to obtain the results of Pearson's Chi-squared test with Yates' continuity correction and the calculated results were X-squared = 5.0288, df = 1, p value = 0.02493. In case of BMI, we confirmed that development of decubitus is independent of BMI. We found an association between the age of patients and development of decubitus and development of decubitus and duration of hospitalization, respectively.

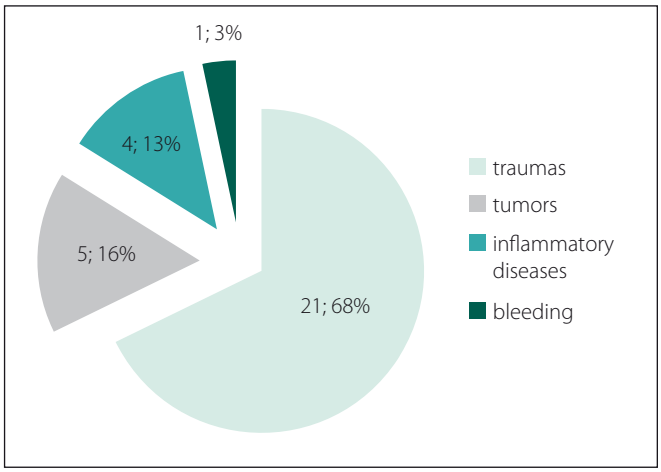
## Discussion

Each decubitus ulcer brings complication both for the patient and the caring staff (pain, infection aggravating both local and general health status, including development of sepsis). Infected decubitus ulcer represents a source of HAIs [1–4].

It is necessary to point out, though, that the defect wound may be a significant source of loss of proteins. The loss of proteins may be up to 50 g per day in stage IV, depending on the size of the defect. This




Graph 1. Localization of decubitus in monitored patients.




Graph 2. Diagnoses of patients with decubitus.

leads to malnutrition or reduced tissue regeneration, impaired self-protection of organism, anemia etc. Decubitus and its treatment lead to extended stay of a patient in a healthcare facility [1,2,6].

Treatment of decubitus ulcer is local, nevertheless complications related to an infection also need to be managed. This therapy should always be targeted. Treatment with antibiotics is mostly empiric at the start and is based on clinical severity of the infection. In case of moderate and severe infections, it should always be timely and sufficiently aggressive. This way we treat just the infected wounds preventing possible side effects, additional financial costs and risk of induction of microbiological resistance [7].

Local wound treatment utilizes various methods including negative pressure wound therapy (NPWT), mostly used at surgical departments. Negative pressure wound therapy has been used to aid healing since it was first developed in the late 1990s [7–9]. The treatment is recommended for many types of lesions, including open abdominal wounds, open fractures, skin graft donor sites, acute burns, pressure ulcers, post-traumatic wounds, diabetic foot ulcers, split thickness skin grafts, sternal wounds and, more recently, for clean surgery in obese patients [10–12].

Apart from a local therapy, the majority of cases of higher grade decubitus ulcers also require adequate general therapy. Unless the patient treatment is comprehensive, local and overall status can on contrary be aggravated.

Wounds that fail to heal may cause considerable distress to patients and impact negatively on physical, social, emotional and economic aspects of their life [13]. Generally, older age and duration of hospital stay is associated with higher occurrence of decubitus lesions and ulcers [14,15]. We used administrative data and an originally designed electronic tool (I-hojeni.cz) that focuses on chronic wounds in general rather than decubitus itself. We are aware that these data are insufficient for objective and more detailed evaluation. It is evident that the issue of data and registers in health care is, in general, are insufficiently discussed – not only in relation to pressure ulcers. The lack of studies in this field has also been exposed by Czech researchers [6], who are preparing a new electronic tool for pressure ulcer incidence monitoring [16].

## Conclusion

Our group of patients with post-operative decubitus ulcers was surprisingly small with respect to the number of individuals hospitalized and surgically treated at the 1st Surgical Clinic. We hope that this reflects the quality of care provided by the Clinic's nursing and medical staff. Unlike age, BMI was not found to contribute to the development of decubitus ulcers in our patient group. We also confirmed that the duration of hospitalization is longer in patients suffering from decubitus than in patients without it.

## References

**1.** The National Institute for Health and Clinical Excellence. Appendix H: Methodology checklist: economic evaluations. The Guidelines Manual. London: National Institute for Health and Clinical Excellence, 2009;195:200–7.
**2.** Gottrup F, Apelqvist J, Price P. Outcomes in controlled and comparative studies on non-healing wounds recommendations to improve the quality of evidence in wound management. J Wound Care 2010;19(6):237–68. doi: 10.12968/jowc.2010.19.6.48471.
**3.** World Health Organization. WHO Guidelines for safe surgery: 2009: safe surgery saves lives. Geneva: WHO 2009. [online]. Dostupné z URL: http://whqlibdoc.who.int/publications/2009/9789241598552_eng.pdf 2009.
**4.** Dowd SE, Sun Y, Secor PR, et al. Survey of bacterial diversity in chronic wounds using pyrosequencing, DGGE, and full ribosome shotgun sequencing. BMC Microbiol 2008;8:43. doi: 10.1186/1471-2180-8-43.
**5.** Percival S, Cutting K. Microbiology of Wounds. New York: CRC Press 2010.
**6.** Pokorná A, Saibertová S, Vasmanská S, et al. Registers of pressure ulcers in an international context. Cent Eur J Nurs Midw 2016;7(2):444–52. doi: 10.15452/CEJNM.2016.07.0013.
**7.** Haesler E, ed. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Cambridge Media: Perth, Australia 2014.
**8.** Morykwas MJ, Argenta LC, Shelton-Brown E Iet al. Vacuum-assisted closure: a new method for wound control and treatment: animal studies and basic foundation. Ann Plast Surg 1997;38(6):553–62.
**9.** Fleischmann W, Lang E, Russ M. Treatment of infection by vacuum sealing. Unfallchirurg 1997;100:301–4.
**10.** Stevens P. Vacuum-assisted closure of laparotomy wounds: a critical review of the literature. IntWoundJ2009;6(4):259–66.doi:10.1111/j.1742-481X.2009.00614.x.
**11.** Stannard JP, Volgas DA, Stewart R, et al. Negative pressure wound therapy after severe open fractures: a prospective randomized study. J Orthop Trauma 2009;23(8):552–7. doi: 10.1097/BOT.0b013e3181a2e2b6.
**12.** Mandal A. Role of topical negative pressure in pressure ulcer management. J Wound Care 2007;16(1):33–5. doi: 10.12968/jowc.2007.16.1.26987.
**13.** Andersson AE, Bergh I, Karlsson J, et al. Patients' experiences of acquiring a deep surgical site infection: an interview study. Am J Infect Control 2010;38(9):711–7. doi: 10.1016/j.ajic.2010.03.017.
**14.** Jenkins ML, O'Neal E. Pressure ulcer prevalence and incidence in acute care. Adv Skin Wound Care 2010;23(12):556–9. doi: 10.1097/01.ASW.0000391184.43845.c1.
**15.** Coomer NM, McCall NT. Examination of the accuracy of coding hospital-acquired pressure ulcer stages. Medicare Medicaid Res Rev 2013;3(4). doi: 10.5600/mmrr.003.04.b03.
**16.** Pokorná A, Jarkovský J, Mužík J, et al. A new online software tool for pressure ulcer monitoring as an educational instrument for unified nursing assessment in clinical settings. Mefanet Journal 2016;4(1):26–32.