Original Article

Measuring interrater reliability in application of the Braden Scale*

Avaliação da concordância na aplicação da Escala de Braden interobservadores

Evaluación de la concordancia en la aplicación de la Escala de Braden interobservadores

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ABSTRACT

Objectives: To verify pressure ulcer prevalence in hospital units of adult patients in the University Hospital of the University of São Paulo (HU-USP), and to verify interrater reliability in risk assessment, using the Braden Scale. **Methods:** A quantitative, exploratory study. Data were collected by six trained collaborators who conducted physical exams and risk assessment in 87 patients, an evaluation that is considered the "gold standard". Data from the assessments performed by the nurses, of those same patients, were collected from the patient records. **Results:** We verified the pressure ulcer prevalence within the hospital was 19.5%, with 63.6% prevalence in the intensive care unit, 15.6% in the surgical clinic, 13.9% in the medical clinic, and 0% in the semi-intensive [step-down] unit. Regarding interrater reliability in the clinical evaluation of the patients, there was strong agreement in the subscores of: sensory perception, activity, mobility, friction/shear. Moisture and nutrition showed lower agreement, suggesting that these subscores require discussion to verify the causes of the discrepancies. **Conclusion:** Pressure ulcer prevalence studies provide the possibility to verify the extent of the problem and provide input for the construction of strategies and prevention programs.
Keywords: Pressure ulcer/epidemiology; Prevalence, Risk assessment; Quality indicators, health care

RESUMO

Objetivos: Verificar a prevalência de úlcera por pressão nas unidades de internação de pacientes adultos do Hospital Universitário da Universidade de São Paulo (HU-USP) e verificar a concordância entre observadores na avaliação de risco, por meio da Escala de Braden. **Métodos:** Estudo exploratório, quantitativo. Os dados foram coletados por seis colaboradoras treinadas que realizaram exame físico e avaliação de risco em 87 pacientes, avaliação esta considerada "padrão ouro". Os dados das avaliações feitas pelas enfermeiras, nos mesmos pacientes, foram coletados dos prontuários. **Resultados**: verificou-se prevalência de 19,5% no hospital e 63,6% na Unidade de Terapia Intensiva, 15,6% na Clínica Cirúrgica, 13,9% na Clínica Médica e 0% na Semi-Intensiva. Quanto à concordância entre os observadores na avaliação clínica dos pacientes, a percepção sensorial, atividade, mobilidade e fricção/cisalhamento apresentaram fortíssima concordância. Umidade e nutrição, baixa concordância, sugerindo que esses subescores deverão ser discutidos para verificar as causas da controvérsia. **Conclusão:** Estudos de prevalência de úlcera por pressão possibilitam verificar a extensão do problema e fornecem subsídios para construção de estratégias e programas de prevenção.
Descritores: Úlcera por pressão/epidemiologia; Prevalência, Medição de risco; Indicadores de qualidade em assistência à saúde

RESUMEN

Objetivos: Verificar la prevalencia de úlcera por presión en las unidades de internamiento de pacientes adultos del Hospital Universitario de la Universidad de Sao Paulo (HU-USP) y verificar la concordancia entre observadores en la evaluación de riesgo, por medio de la Escala de Braden. **Métodos:** Estudio exploratorio, cuantitativo. Los datos fueron recolectados por seis colaboradoras entrenadas que realizaron examen físico y evaluación de riesgo a 87 pacientes, evaluación considerada "patrón oro". Los datos de las evaluaciones realizadas por las enfermeras, en los mismos pacientes, fueron recolectados de las historias clínicas. **Resultados:** se verificó prevalencia del 19,5% en el hospital y el 63,6% en la Unidad de Cuidados Intensivos, el 15,6% en la Clínica Quirúrgica, el 13,9% en la Clínica Médica y el 0% en la Semi-Intensiva. Respecto a la concordancia entre los observadores en la evaluación clínica de los pacientes, la percepción sensorial, actividad, movilidad y fricción/corte presentaron fortísima concordancia. Humedad y nutrición, baja concordancia, sugiriendo que esos sub escores deben ser discutidos para verificar las causas de la controversia. **Conclusión:** Los estudios de prevalencia de úlcera por presión posibilitan verificar la extensión del problema y ofrecen subsidios para la construcción de estrategias y programas de prevención.
Descriptores: Úlcera por presión/epidemiología; Prevalencia; Medición de riesgo; Indicadores de calidad de la atención de salud.

** Study conducted at the University Hospital of São Paulo, USP, São Paulo (SP), Brazil.*

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INTRODUCTION

The quality of health care has been widely discussed nationally and internationally since the 1980s, because of high costs for maintaining services, scarce availability of resources, and the aging of the population globally. Allied to this, there has been an important epidemiological transition, recorded in all parts of the world where infectious and parasitic diseases have given way to chronic disease, demanding more and specific nursing care.

According to the *United States Census Bureau*, the number of people aged 65 years or older accounted for 7% of the world population in 2000. One projection suggests that this number will be twice as large in 2030, and that 70% of this population will be living in developing countries such as Brazil, which will be the sixth country in the world in terms of the number of elderly [1]. Thus, a growth in the aging population requires an adequate policy of care and prevention, without which, the costs of treatments will increase abusively and frighteningly [2]. In this context, for health institution administrators and nurse managers, pressure ulcers (PU), as one of the issues faced by the elderly, represent a serious problem in terms of personal and financial suffering, and a challenge to the interdisciplinary team, consuming exorbitant health system resources and hours of nursing care.

Thus, the use of an instrument or scale for PU risk assessment facilitates the identification of predisposing factors or the risk of PU development, and facilitates the planning of preventive measures to avoid the appearance of these lesions. Risk assessment should be adopted and applied in a systematic manner, both at patient admission and daily during the physical examination, and whenever there are changes in the clinical condition

As a strategy for verifying at-risk patients in the University Hospital of São Paulo (HU-USP), among the various scales of risk, we opted for the *Braden Scale* [3]. The authors established a model, involving the two critical determinants for the formation of PU: the intensity and duration of pressure, and tolerance of the skin and underlying structures to support these. The intensity and duration of pressure are related to mobility, activity and sensory perception, while the tolerance of the skin and underlying structures refers to intrinsic factors, such as nutrition and aging, and extrinsic factors, such as moisture, friction and shear [3-4].

The Braden Scale consists of six subscales: sensory perception, activity, mobility, moisture, nutrition, and, friction or shear, which are designed to evaluate the various risk factors for the development of PU. These subscales are scored from one to four points, except friction and shearing, whose measurement ranges from one to three. The total scores range from 6 to 23, and high levels correspond to low risk for the formation of PU, whereas low scores correspond to higher risks. Scores equal to or less than 16 are, generally, identifed as critical and are indicative of risk for PU development [3,5].

In studies conducted in Brazil about PU, low scores on the Braden Scale are associated with the presence of PU[6-10], suggesting good predictive validity. International guidelines recommend the use of the scale to assist the professional in identification of patients at risk, beginning on admission, to guide the adoption of preventive measures of care [11]. However, for the effectiveness of the scale, it is essential that there is maximum concordance between different professionals in relation to the scores of the subscales and the total score, when evaluating the same patient. Otherwise, the scale becomes subjective and will lose its validity.

Studies with different clients advocate 16 as the cutoff score for PU risk, which was also adopted at HU-USP. With this reality, this study had the following objectives: to verify the prevalence of pressure ulcers in inpatient adult units at HU-USP, and to verify concordance between observers regarding risk assessment for the development of PU using the Braden Scale [12-13].

METHODS

This was a prospective, exploratory, quantitative research study, implemented in the HU-USP units of Clinical Surgery (ClCir), Internal Medicine (ClMed), Adult Intensive Care Unit (UTIA), and the Semi-Intensive Care Unit (UCSI). The HU-USP is a general hospital of medium complexity, which has 247 beds distributed into four specialties: surgical, medical, obstetric and pediatric care.

After approval by the institutional Committee of Ethics in Research (Case n° 881/09), we began data collection, which was conducted by six collaborators, properly trained, who did the physical examination and risk assessment for the development of PU, on all admitted patients, by means of the clinical application of the *Braden Scale*, the assessment considered to be the "gold standard". Data from the assessments made by nurses were collected from nursing clinical documentation contained in the records of the patients.

For data collection, we used an instrument consisting of four parts: (1) sociodemographic data (age, gender, race/ethnicity, origin); (2) clinical data (underlying disease, associated diseases, length of hospitalization, medications used continuously, and body mass index); (3) evaluation of patients at risk, based on the Braden Scale; and, (4) characteristics of the PU, when present (number, location and staging). The staging of PU was based on the international classification proposed by the *National Pressure Ulcer Advisory Panel*[14], which consists of

six stages, according to the level of compromised tissue, and is as follows:

- Stage I – intact skin with non-blanchable erythema
- Stage II – Partial thickness skin loss;
- Stage III – Full thickness skin loss;
- Stage IV – Full thickness tissue loss with exposed bone, muscle or tendon;
- Ulcers that cannot be staged – total tissular lesion, in which the base of the ulcer is covered with slough and/or eschar in the wound bed; and
- Suspected deep tissue injury – localized area of intact skin, color purple, brown or a bloodly blister due to soft tissue damage from pressure and/or shear.

The data were subjected to statistical procedures, and in all analyses we used the significance level of 5%. To check the interrater reliability of the clinical application of the Braden scale, the Kappa test was used for the total score and each of the subscores [15-16].

RESULTS

On April 15, 2009, the HU-USP had 93 patients hospitalized in the units of interest for the study, six of which were not examined because they are in the operating room at the time of data collection. The 87 patients examined had a mean age of 56.6 (SD = 19.2) and a median of 58, ranging from 16 to 92 years. There was a predominance of males (46/52.9%), Caucasians (56/64.4%), and most were from the community of Butantã (59/67.8%). Regarding the clinical characteristics, 69 (70.1%) were nonsmokers, 36 (41.4%) were hospitalized in the ClMed unit, 32 (36, 8%) in the ClCir unit, 11 (12.6%) in the UTIA and 8 (9.2%) were in the UCSI. The mean hospital stay was 10.8 days (SD = 13.5), with a median of six, and a range of one to 102 days.

Of the 87 patients examined, 17 presented with a PU (19.5%). The age of patients with a PU ranged from 45 to 92 years, with a mean of 67.0 years; the age group greater than 61 years had 12 patients with PU (70.6%). There was a slight predominance of males (10 / 58.8%) and non-smokers (10 / 58.8%). With regard to the color/ethnicity, 13 (76.5%) were Caucasian, and regarding location, ten (58.8%) were from the community of Butantã.

In relation to the underlying disease, 9 (52.9%) of 17 patients with PU had underlying disease which compromised the cardiovascular or respiratory system; 3 (17.6%) had comprommised musculoskeletal systems due to a fractured femur; 2 (11.8%) had digestive system disease; and, 3 (17.6%) had diseases that compromised urinary, immune and nervous systems.

The majority of patients with PU (41.2%) were admitted to the UTIA, five (29.4%) were in the ClCir unit and 5 (29.4%) in the ClMed unit. None of the patients admitted to the UCSI presented with PU. The average length of stay of patients with PU was 21.1 days, with the minimum of two and maximum of 102 days.

The vast majority (70.6%) of associated diseases observed in patients with PU had resulting cardiovascular or respiratory system compromise, referring to what happened with the disease base. Regarding medication, there was wide variation, with a predominance of antidepressants (47.1%), antidiabetic agents (35.3%), analgesics, and antiinflammatory steroids and non-steroidals (29.4%).

The 17 patients presented a total of 33 ulcers, ranging from one to five lesions per patient. Of the 33 ulcers observed, 13 (39.3%) were located on the calcaneus; 9 (27.3%) in the sacral region, 3 (9.1%) on the buttocks, 3 (9.1%) on the malleolus, and 5 (15.5%) in other regions of the body, such as the elbow, side of the foot, arm, and others.

With regard to PU staging, we found that, of the 33 PU, 13 (39.3%) were stage II; 10 (30.3%) were stage I; 2 (6.6%) were stage III; 5 (15.5%) were suspected deep tissue injury; and, 3 (9.1%) presented with necrosis. We found no ulcers that were stage IV. With regard to the Braden Scale, there was a mean score of 12, with a range of 8 to 19 points. It was also observed that ten of the patients with PU had Braden Scale scores between 8 and 11, signifying a high risk for PU development.

The age and average length of hospitalization of patients with PU were significantly higher than in the group without PU, showing that patients with PU are, on average, older and have longer hospitalizations ($p < 0.004$ and $p < 0.047$, respectively). It is important to note that the other variables showed no statistical difference.

The study data permitted the assessment of PU prevalence of 19.5% in the overall hospital and partial indexes of 63.6% in the UTIA, followed by 15.6% in the ClCir unit, 13.9% in the ClMed unit, and 0% in the UCSI.

Regarding the interrater reliability in the clinical evaluation of patients using the Braden Scale, there was a relatively low value of kappa in the subscores for moisture (0.473) and nutrition (0.514), only 68.8% and 68 7%, respectively, with similar scores regarded as the gold standard. In the other subscores, sensory perception (0.746), activity (0.807), mobility (0.665), friction and shear (0.829), we observed strong to very strong agreement between observers, as well as for the total scale score. In the correlational analysis to verify if there was a linear correlation between the two evaluations, we noticed that, in addition to a strong linear correlation (Pearson correlation = 0.949), there was strong consistency between the two ratings (ICC = 0.946).

DISCUSSION

Of the 87 patients evaluated in the ClCir, ClMed, UTIA and UCSI units, 17 presented with 33 PU, representing an overall prevalence of 19.5%. These patients were characterized by a mean age of 67 years, and 70.6% of patients were over 60 years, of both genders; with an average BMI of 24.8, within the normal range; most were nonsmokers with a mean stay of more than 20 days, mainly due to underlying diseases associated with cardiovascular or respiratory system compromise. In terms of the PU, there was an average of 1.8 PU, with a minimum of one and a maximum of five PU per patient, located in particular in the calcaneal and the sacral regions, of stages I and II.

Studies to determine the prevalence of PU in different institutions and different types of clients, pointed to a prevalence ranging from 1.4% to 30%, showing that the results vary according to the method adopted in the study, the people involved, and the inclusion or exclusion of PU in stage I [8,10,15].

A study conducted in Germany [16] with surgical patients (acute care) had a prevalence of 21.1%, including PU stage I, and 10.2% excluding stage I. Some authors exclude stage I PU from their studies, recognizing that these are pre-injury, i.e., although non-reactive hyperemia is present, the skin remains intact. In the present study, when excluding the stage I PU, we found an overall prevalence of 8% of the hospital, which is a lower prevalence than what was found in the previously mentioned study.

The elevated mean age of patients with PU was shown to be significantly higher than that exhibited by patients without PU, which corroborates studies that claim this group has the major risk for PU development, i.e., patients over the age of 65 years [15,17]. The age factor is considered an indicator of risk for PU in both international and national literature [12,18]. The increased risk is probably a result of changes due to aging of the skin and subcutaneous tissue of the elderly; changes which make the skin more fragile and susceptible to mechanical forces such as pressure, friction and shear.

The presence of PU associated with increased length of hospitalization has also been reported in the literature as another important factor in the pathogenesis of PU. Its development results from the exposure time and intensity of pressure, in combination with intrinsic and extrinsic factors. Thus, the presence of disease that prolongs the hospitalization of the individual and requires prolonged bed rest may serve as a warning flag, so that preventive measures are instituted in order to avoid the formation of PU. The mean length of stay, in the present study, was significantly higher for patients with PU, again corroborating the data in the literature.

Clinically, we found that ten (62.5%) of the patients with PU were nonsmokers, giving them in this respect, less risk for the formation of PU. Nicotine was not found to be significant within this study, although it is considered one of the predisposing factors for the development of PU, by causing vasoconstriction and interfering with blood flow, oxygenation and nutrition of the tissues [12].

The diseases that compromise the cardiovascular and/or respiratory system, whether based on or associated with continuous drug use such as antihypertensives, analgesics/anti-inflammatory steroids and non-steroidals, are also mentioned as factors that influence PU development. The existence of cardiovascular and respiratory diseases in 12 (70.6%) patients with PU in this study, were consistent with citations by several authors as factors that make people more susceptible to the development of PU [10,17,19].

In relation to the location and staging of the PU we encountered, many authors confirm these in similar populations [8,17]. National and international studies also point to the prevalence of PU in the sacral, calcaneal and trochanter regions, locations of support when the patient is supine, lateral or in the sitting position [20-21]. As for staging, there was a predominance of stage II, unlike the study conducted at a general public hospital of Grande São Paulo, where stage I ulcers predominated [8]. As evidenced by this study, stage II ulcers were encountered, mainly, in patients with underlying diseases that are associated with and affect perfusion, such as respiratory diseases and diabetes. The factors that contributed the most to the development of PU were friction/shear, inactivity and lack of mobility in which 94.5%, 82.4%, and 76.5%, respectively, of patients were evaluated with a score of one and two .

Regarding interrater reliability for the clinical application of the Braden Scale for each of the subscores and the total score, a high degree of agreement was observed in the subscores for sensory perception, activity, mobility, and friction/shear. However, the subscores for moisture and nutrition were noted to have relatively low Kappa values, i.e., they were only 68.8% and 68.7%, respectively, of identical responses between observers. This is due to, probably, the lack of specific training of nurses recently hired on the units and also by the fact that minor adjustments were made between the researcher and collaborators regarding these two subscores before data collection, with the result that the descriptors raised doubts among the collaborators regarding their interpretation. Thus, it was determined that patients using a diaper received points for moisture (completely wet) and those receiving a nasoenteral diet, well accepted, received three points on the nutrition subscore. As for the total score, it was noted that there was no statistical difference in average scores between observers. The difference is only one point in total, i.e., the mean score of the nursing evaluation of the units was 16.5, and the evaluation of the researcher was 17.5.

CONCLUSION

The prevalence of pressure ulcers in HU-USP was high (19.5%), especially in the UTIA, where more seriously ill patients are admitted. Regarding interrater reliability we found that for the total score there was no statistically significant difference in mean score between observers. It is believed that systematic training of nurses on the clinical application of the Braden Scale is important, because the evaluation becomes more reliable, thus avoiding unnecessary expense in patients free from risk.

Pressure ulcer prevalence studies allow verification of the extent of the problem in health units and, consequently, provide a basis for building strategies and prevention programs with better resolution, based on the profile of patients and the principle factors predisposed to the development of PU.

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