ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

ΣΥΣΧΕΤΙΣΗ ΤΗΣ ΠΑΡΟΥΣΙΑΣ ΕΝΔΟΓΕΝΩΝ ΑΙΤΙΟΛΟΓΙΚΩΝ ΄Η ΕΠΙΒΑΡΥΝΤΙΚΩΝ ΠΑΡΑΓΟΝΤΩΝ ΠΟΥ ΣΧΕΤΙΖΟΝΤΑΙ ΜΕ ΤΗΝ ΕΜΦΑΝΙΣΗ ΕΛΚΩΝ ΠΙΕΣΗΣ ΣΕ ΑΣΘΕΝΕΙΣ ΜΟΝΑΔΩΝ ΕΝΤΑΤΙΚΗΣ ΘΕΡΑΠΕΙΑΣ

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Περίληψη

Εισαγωγή: Τα έλκη κατακλίσεων αποτελούν ένα από τα ποιο σημαντικά κλινικά προβλήματα για τους ασθενείς που νοσηλεύονται στις Μονάδες Εντατικής Θεραπείας.

Σκοπός: Η διερεύνηση των παραγόντων κινδύνου και ο συσχετισμός τους με τη συχνότητα των ελκών κατάκλισης σε ασθενείς που νοσηλεύονται σε Μονάδες Εντατικής Θεραπείας.

Υλικό και μέθοδος: Τα δεδομένα συλλέχθηκαν ύστερα από μελέτη 264 ιατρικών φακέλων ασθενών που νοσηλεύθηκαν στην Μονάδα Εντατικής Θεραπείας του Νοσοκομείου «Παπαγεωργίου» της Θεσσαλονίκης την χρονική περίοδο 2010-1012. Καταγράφηκε η ύπαρξη ενδογενών αιτιολογικών και επιβαρυντικών παραγόντων και συσχετίσθηκε με την παρουσία ελκών κατάκλισης. Οι παράγοντες αυτοί ήταν: στεφανιαία νόσος, κακοήθειες, καρδιακή ανεπάρκεια, αγγειακό εγκεφαλικό επεισόδιο, ανοσοκαταστολή, υποκατάσταση νεφρικής λειτουργίας, Σακχαρώδης Διαβήτης, ηλικία, ημέρες νοσηλείας. Τέλος, κατεγράφησαν εργαστηριακές και κλινικές παράμετροι (αιματοκρίτης, αλβουμίνη, κλίμακα Γλασκώβης). Η στατιστική ανάλυση έγινε με τη χρήση του στατιστικού πακέτου SPSS.

Αποτελέσματα: 56 από τους 264 ασθενείς (21,2%) εμφάνισαν έλκη κατακλίσεως. Η ηλικία ((B = -0,74, PR = 0,47, OR = 0, 32-0,69, p <0,001), οι ημέρες νοσηλείας στην Μονάδα Εντατικής Θεραπείας (B = 0,04, OR = 1,01-1,07, p <0,001) και η τιμή του αιματοκρίτη (B = 0,93, OR = 0,85-0,96, p <0,003) αποτελούν στατιστικά σημαντικές παραμέτρους για την εμφάνιση ελκών κατάκλισης.

Συμπεράσματα: Η προχωρημένη ηλικία, η χαμηλή τιμή του αιματοκρίτη και οι αυξημένες ημέρες νοσηλείας αποτελούν σημαντικούς παράγοντες για την εμφάνιση ελκών κατάκλισης.

Λέξεις κλειδιά: έλκη πίεσης, παράγοντες κινδύνου, Μονάδα Εντατικής Θεραπείας.

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RESEARCH ARTICLE

CORRELATION OF PRESENCE OF ENDOGENOUS CAUSATIVE OR AGGRAVATING FACTORS AS TO THE OCCURRENCE OF PRESSURE ULCERS IN PATIENTS OF INTENSIVE CARE UNITS

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Abstract

Introduction: Pressure ulcers consists one of the most important clinical problems for patients hospitalized in Intensive Care Units.

Purpose: To investigate the risk factors and their correlation with the incidence of pressure ulcers in patients hospitalized in the intensive care unit.

Material and Methods: Data collected studying 264 patients from the Intensive Care Unit of "Papageorgiou" Hospital of Thessaloniki in the period 2010-2012. The presence of endogenous causative and aggravating factors associated with the occurrence of pressure ulcers was recorded. These factors were: Coronary Heart Disease, malignancies, heart failure, stroke, immunosuppression, renal replacement, Diabetes Mellitus, age, hospital days. Finally, laboratory and clinical parameters (hematocrit, albumin, Glasgow Coma Scale) were recorded. Statistical analysis was processed using the SPSS software program.

Results: 56 out of the 264 patients (21.2%) experienced pressure ulcers. Age (B = -0,74, PR = 0,47, OR = 0, 32-0,69, p <0,001), days of hospitalization in the Intensive Care Unit (B = 0,04, OR = 1,01-1,07, p <0,001) and hematocrit value (B = 0,93, OR = 0,85-0,96, p <0,003) are statistically significant parameters for the occurrence of pressure ulcers.

Conclusions: Old age, low hematocrit value, increased number of hospital days, are important for the appearance of pressure ulcers.

Keywords: : pressure ulcers, risk factors, Intensive Care Unit

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introduction

The appearance of pressure ulcers constitutes an important clinical problem, which strongly concerns the health care professionals and reflects the quality of provided nursing care.[1-5]

The risk factors for the appearance of pressure ulcers (PU) can be distinguished either as factors that concern the patients or as general organizational factors. Factors that are related with patients can be intrinsic (e.g. age or illness) or extrinsic risk factors (e.g. pressure, shear forces, forces of friction). The organizational factors include the type of institution (e.g. facilities for short-term care or long-term care), the experience and the specialization of the health care personnel of each clinic.[6-14]

The European and United States National Pressure Ulcer Advisory Panels (EPUAP and NPUAP) determined the pressure ulcer as "localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear". In the special environment of the Intensive Care Unit (ICU) some other factors have been associated with the occurrence of pressure ulcers. Examples of such factors are the reduced mobility, continuous administration of vasoactive agents, malnutrition, and other unspecified factors, such as the proportion of the nursing staff, the quality and quantity of medical and nursing interventions.[15]

The purpose of this research was to investigate the relationship between the presence of endogenous causative or aggravating factors with the appearance of pressure ulcers in patients in Intensive Care Units.

Material and method

The study was carried out in ICU of "Papageorgiou" Hospital of Thessaloniki. Authorization was asked of by the management of the hospital, in order to have free access to medical files.

Nursing folders of 264 patients of ICU "Papageorgiou" Hospital were retrospectively studied during the period of December 2010-December 2012. The existence of endogenous causative and aggravating factors was recorded. These factors were: Coronary Heart Disease, Malignancies, Heart Failure, Stroke, Immunosuppression, Renal Replacement, Diabetes Mellitus, age and hospital days. Laboratory and clinical parameters such as hematocrit, albumin, Glasgow Coma Scale (GCS) were, also, recorded. Endogenous causative and aggravating factors, laboratory and clinical parameters were associated with the presence of pressure ulcers. Regarding the age , values were given according to Cubbin-Jackson Scale[16] (1:>70 years old , 2: 56-70 years old, 3: 40-55 years old , 4: <40 years old).The data has been encoded properly and entered into the software SPSS 17.0, by which the statistical analysis was conducted. Parametric t-tests were applied to study the correlation scales of prolonged hospitalization, ROC curves of pressure ulcers were exported and the factor Cox Hazard for parametric similarities was calculated.

Results

In this study, 264 medical folders of patients, who had been hospitalized in the intensive care unit (ICU), were studied retrospectively. Of these patients, 166 were men (62.9%) and 98 were women (37.1%). 56 patients appeared Pressure Ulcers (32 men, 24 women).

In addition, the relative frequency of the coexistence of the causative factors and pathologies, which were related to the clinical condition and health status of patients in the

ICU, was calculated (Table 1). Most patients suffered from heart failure (31.4%), stroke (23.1%), Coronary Disease (22, 3%) and Diabetes Mellitus (21, 2%)

Wanting to give a more representative picture of the health status of the patients in question, an attempt was made to record some important facts on hematological, biochemical parameters and the general health status of patients. Patients had anemia with a mean hematocrit at around 33%, and it appears they had a markedly limited capacity of consciousness, as the assessment of the Glasgow scale was on average reduced by 5 units (mean 9.56). Albumin levels were significantly low (Mean=2,79mg/dL). Concerning the days of hospitalization of patients in the ICU, the average residence time was about 27 days, while the sores appeared in patients from the 11th day of treatment and on. (Supplementary Table 2)

From 166 male patients, 32 (19, 3%) appeared PU. Males were identified and analyzed based on their underlying pathological situations and their underlying diseases. Of the male patients who had pressure ulcers, and compared with predisposing factors, we can see that Diabetes Mellitus (37.5%), immobility (31.3%), and immunosuppression (30,8%) are related, to a greater extent, with the emergence of the phenomenon of pressure ulcers (Table 2). Also, factors such as coronary heart disease (25.4%), malignancy (23.5%) and stroke (23%) seem to, also, contribute significantly to the development of the phenomenon of PU.

Comparing the parameters of hospitalization with the occurrence of pressure ulcers, it is obvious that age and low hematocrit value, are statistically significant factors of development and occurrence of the phenomenon of pressure ulcers (P value of age, P value of hematocrit are <0.001) (Table 3).

In addition, by analyzing the multiple logistic regression, focus was on independent parameters of hospitalization days, hematocrit, age and Diabetes Mellitus. From this data, it was concluded that the old age (OR 0,29-0,62 and p-Value <0,001) and the increased number of hospitalization days in the ICU (OR 1,01-1,07 and p-Value <0,001) are more important factors in the evolution and emergence of the phenomenon of pressure ulcers compared with hematocrit (OR 0,85-0,96 and p-Value <0,003) and glucose levels(Table 4) .

Then in Graph 1, the display of sensitivity and specificity using the ROC curve for predicting occurrence of pressure ulcers, risk factors can be seen, with the main studied features being the amount of albumin, days of hospitalization, the Glasgow Coma Scale and the hematocrit. The ROC curve of the test of the Glasgow Scale and days of hospitalization is higher, at all points, from the corresponding curve of the test for hematocrit and albumin. Therefore, the test of the Glasgow Coma Scale and days of hospitalization has greater discretionary power, because it has greater sensitivity for any level of specificity.

Discussion

The purpose of this study was the correlation of the presence of endogenous causative or aggravating factors for the occurrence of pressure ulcers in patients of ICU. The results showed that the occurrence of pressure ulcers is significantly correlated with the presence of diabetes (p-value = 0,001) immobilization (p-value = 0,006), old age (p-value <0,001), lower hematocrit value (p-value <0,001) albumin (p-value = 0,022) and days of hospitalization. In the case of diabetes mellitus, 37.5% of male patients suffering from the disease experienced pressure ulcers. Patients with pressure ulcers are older than patients without them and have lower scores on the parameters of neurological status (b coefficients of the independent variables p-

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value <0,05). Patients who experienced PU were hospitalized for more days than those who did not develop them (p-value <0,016). Patients with PU had a higher mean score on the Glasgow Coma Scale. Albumin rates (0.41) and hematocrit (0.38) have less impact on the appearance of pressure ulcers in relation with the days of hospitalization and the Glasgow Coma Scale. Furthermore, the likelihood of pressure ulcers in men is greater compared to women.

Other factors such as coronary heart disease, the presence of malignancy, stroke, the disease of immunosuppression and the replacement of renal function exhibit p-value greater than $\alpha = 5\% \approx 0.05$ and consequently, do not constitute factors of the occurrence of pressure ulcers.

Depicting the sensitivity and specificity through the ROC curve for predicting pressure ulcers occurrence and considering the area under the ROC curve (AUC), we observe that the two variables which play the most important role are the scores on the Glasgow scale with negative influence (AUC =-0.62) and the number of days of hospitalization (AUC = 0.61) (Figure 1)

The above results are consistent with the results of the literature. A prospective study[17] held in New York showed that the incidence of pressure ulcers in the four year period between 1993 and 1997, was about half the rate of incidence during the period January 1998 - August 1998. This difference was associated with different durations in days of hospitalization of these patients in ICUs. 97% of the ulcers appear to develop in patients who had remained in the ICU for more than 7 days, while most cases also appear to have occurred in patients with sepsis. Moreover, the variable analysis of the data showed that age, hospitalization days, regardless of the presence of a prognostic factor for the development of pressure ulcers, enhance the severity of the disease and eventual multiorgan failure.[17]

In a large (n = 1192) multicenter study designed to compare the process of ulcer prevention in hospitalized patients, the most important factors associated with an increased risk for developing ulcers were old age, low hemoglobin level and diabetes mellitus[18]

Another study by Berlowitz et al.,[19] among nursing home residents showed that lower body mass index is associated with greater risk of developing pressure ulcers, while the incidence of hypoalbuminemia is a major factor leading to the increased incidence of ulcers pressure . In the study of Terekeci et al., it was shown that the incidence of pressure sores on patients with albumin of less than 35 g / L was increased (21, 4%), whereas the group with normal levels of albumin was 7.7 %.[8]

Pressure ulcers is a complication that causes intense pain, increases morbidity and leads to serious long-term complications. On the other hand, immobility, poor nutritional status and factors that contribute to the development of ischemia of the tissues (hypotension, dehydration, vasomotor deficiency, shock, heart failure), also seem to be crucial for the occurrence of pressure ulcers. They can occur within a few hours or days and can take weeks or even months to heal depending on their seriousness and the prevailing conditions of hospitalization. These are the main reasons why it is important to follow protective treatment measures.[20,21]

Conclusions

Proper care of ulcers requires the application of appropriate preventive and curative measures, as well as the documentation of the medical and nursing treatment measures. Functional methods, the required personnel and equipment required for the successful implementation of these preventive measures should be clearly specified. Training and continuous updating of

the staff, as well as the practical application of methods of treatment should be monitored regularly, so the necessary improvements in methods of treatment, when necessary, are made.

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ANNEX

Table 1. Descriptive characteristics

		%
Men	166	62,9
Women	98	37,1
Pressure Ulcer presence	56	21,2
Coronary Disease	59	22,3
Malignancy	34	12,9
Heart failure	83	31,4
Stroke	61	23,1
Immunosuppression	39	14,8
Renal replacement	12	4,5
Diabetes mellitus	56	21,2

Supplementary Table 2. Clinical and laboratory parameters

	N	Minimum	Maximum	Mean	SD
Age *	264	1	4	2,44	1,04
Albumin (mg/dl)	264	0,7	4,5	2,79	0,64
Days of hospitalization	264	15	76	26,76	12
Glasgow Scale	264	3	15	9,56	4,4
Hematocrit (%)	264	19,6	51,0	32,94	6,18
Day of PU presence	**56**	**4**	**20**	**10,5**	**4,7**

*Age (1 :> 70, 2: 56-70, 3: 40-55, 4: <40 according to Cubbin-Jackson Scale)
SD= Standard Deviation

PU: Pressure Ulcer

Table 3. Comparison of various risk factors in relation to the appearance of pressure ulcers

Risk factors	Without PU	With PU	OR 95% CI	P-Value
Diabetes Mellitus	62,5%	37,5%	1,57- 5,69	0,001
Coronary Heart Disease	74,6%	25,4%	0,69-2,68	0,369
Malignancy	76,5%	23,5%	0,49-2,74	0,723
Stroke	77%	23%	0,57-2,26	0,705
Immunosuppression	69,2%	30,8%	0,85-3,89	0,114
Renal Replacement Therapy	75%	3 25%	0,32-4,78	0,743
Immobility	**68,7%**	**31,3%**	**1,25-4,21**	**0,006**

PU=Pressure Ulcer

OR = Odds Ratio

CI = Confidence Interval

Table 3. Comparison of hospitalization parameters with the occurrence of pressure ulcers

Hospitalization parameters	Without PU (N=208)		With PU (N=56)		
	Mean	SD	Mean	SD	P-Value
Age(1-4)*	2,61	1,05	1,82	0,76	<0,001
Hospitalization days	25,6	11,04	30,08	14,5	0,016
Hematocrit (%)	33,5	6,4	30,8	4,2	<0,001
Albumin(mg/dl)	2,84	0,65	2,62	0,56	0,022
Glasgow Scale	**9,22**	**4,41**	**10,9**	**4,3**	**0,011**

*Age (1 :> 70, 2: 56-70, 3: 40-55, 4: <40 according to Cubbin-Jackson Scale)

PU=Pressure Ulcer

SD=Standard Deviation

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Table 4 Multiple logistic regression analysis of various risk factors with dichotomous variable the appearance or not of pressure ulcers.

Risk factors	Coefficient B	Odds Ratio	Confidence Interval 95%	P -Value
Age (1-4)*	-0,84	0,43	0,29-0,62	<0,001
Days of Hospitalization	0,04	1,04	1,01-1,07	0,002
Hematocrit (%)	-0,93	0,91	0,85-0,96	0,003
Diabetes Mellitus	0,91	2,47	1,19-5,12	0,014
Standard	2,18			

*Age (1:>70, 2: 56-70, 3: 40-55, 4: <40 according to Cubbin-Jackson Scale)

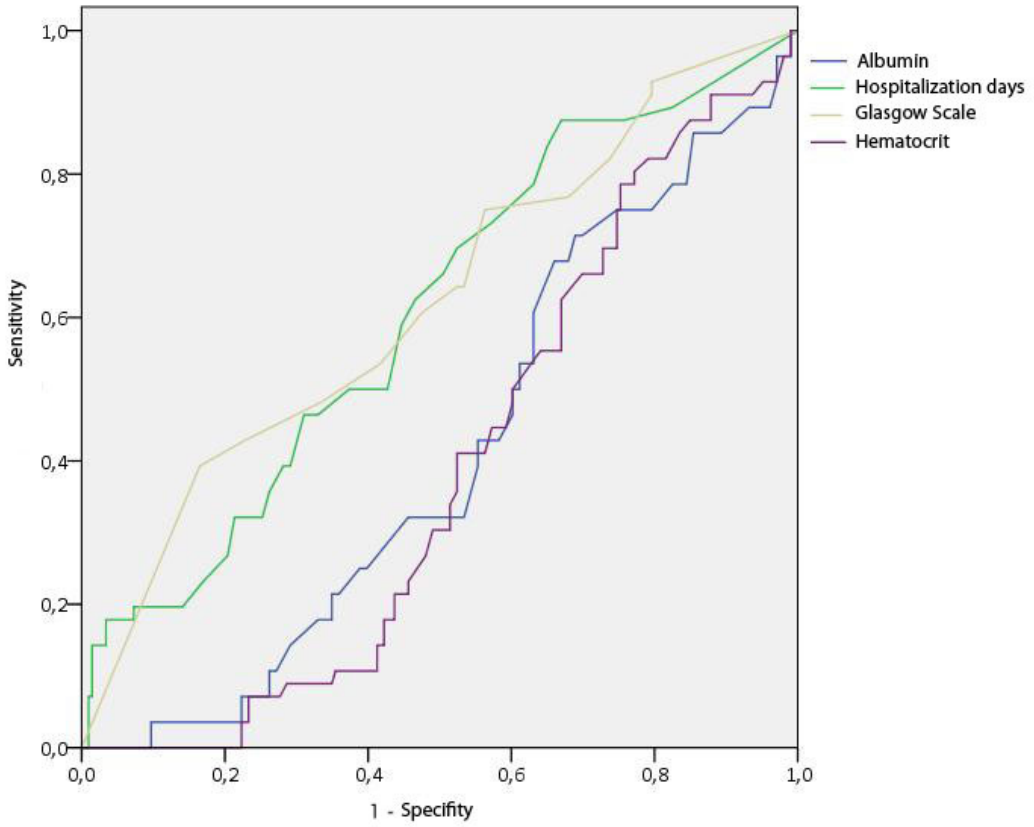

Figure 1. Display of sensitivity and specificity by ROC curve for predicting occurrence of pressure ulcers from various risk factors.(Albumin: AUC:0,41, p= 0,04 , *HD: AUC: 0,61, p=0,014, *GS:AUC:-0,62, p =0,006, Hematocrit: AUC: 0,38, p = 0,01)

***AUC: Area under Curve**

***HD: Hospitalization Days**

***GS: Glasgow Scale**