

## Support Surfaces for Pressure Ulcer Prevention in Intensive Care Patients: A Short Review Article

Aikaterini Marvaki<sup>1\*</sup>,  
Olga Kadda<sup>2</sup>, Georgios  
Vasilopoulos<sup>3</sup>, Georgia  
Toylia<sup>3</sup> and Christina  
Marvaki<sup>3</sup>

### Abstract

**Objective:** This short review seeks to present the effectiveness of support surfaces for pressure ulcer prevention in intensive care patients.

**Methods:** A literature search was undertaken of international databases (PubMed, CINAHL, and Cochrane Library). A time limited criteria was applied with respect to articles publication; articles published in the last decade (2010-2020). As key words, the following terms were used: "pressure ulcers", "support surfaces", "intensive care unit", "prevention", "mattresses". Randomized controlled trials (RCTs), which assessed the effectiveness of mattresses for the prevention of pressure ulcers, in intensive care unit (ICU) patients were included in this review.

**Results:** Many researchers have compared support surfaces and revealed the effectiveness between different types of support surfaces. From the present short review of the literature, researchers made an effort to compare the standard hospital mattress with viscoelastic mattress. It was found that the viscoelastic type of mattress reduced the incidence of PUs in critical ill patients. Moreover, some researchers underline the need for systematic and ongoing assessment of the patient's skin as well as implementation of prevention measures.

**Conclusions:** Viscoelastic mattress seems to be more effective compared to standard foam mattresses in prevention of PUs, in ICU patients. Coping strategies can be developed through an organized intensive care team for PUs prevention.

**Keywords:** Pressure ulcers; Supportive surfaces; Intensive care unit; Prevention; Mattresses

- 1 Medical School of Athens, General Hospital of Katerini, Greece
- 2 Cardiac Intensive Care Unit, Onassis Cardiac Surgery Center, Greece
- 3 Department of Nursing, University of West Attica, Athens, Greece

**\*Corresponding author:**

Aikaterini Marvaki

✉ katmarvaki@yahoo.gr

**Tell:** +302351350200

Medical School of Athens, General Hospital of Katerini, Greece

**Citation:** Marvaki A, Kadda O, Vasilopoulos G, Toylia G, Marvaki C (2020) Support Surfaces for Pressure Ulcer Prevention in Intensive Care Patients: A Short Review Article. Health Sci J. 14 No. 3: 718.

**Received with Revision** May 15, 2020, **Accepted:** May 25, 2020, **Published:** May 29, 2020

### Introduction

Pressure Ulcers (PUs) are defined by the United States National Pressure Ulcer Advisory Panel (NPUAP) and the European Pressure Ulcer Advisory Panel (EPUAP) as localized skin injuries to the skin and/or underlying tissue, as a result of pressure, or pressure in combination with shear. Most of the times, PUs are developed in Intensive Care Unit (ICU) patients who are bedridden for long periods of time. According to the international NPUAP/EPUAP Pressure Ulcer Classification System, PUs can be classified into four main categories (I, II, III and IV) according to skin damage. Two more categories are mentioned which are described as Unstageable and Suspected Deep Tissue Injury with unknown damage depth [1,2].

According to literature, the incidence of pressure ulcers ranges from just 0.4% to 38% while the prevalence has been reported to be 3.5% to 69%. In rehabilitation and recovery centers, the reported effect ranges from 2.2% to 23.9%, while in the field

of home care the effect ranges from 0% to 17% [3]. There are countries where PUs incidence in ICU ranges between 19.2% and 44%, while it seems that ICU patients with rhino gastric catheters and mechanical respiratory support are more prone to PUs. Inadequate nutrition combined with patient's comorbidities (vascular disease, heart failure, etc.) are important aggravating factors for the development of PUs [4].

The development of pressure ulcers remain a serious health problem as patient's length of hospital stay, the incidence of complications and the cost of hospitalization increase. Patients with PUs experience significant impairment of physical function and reduced mobility, which often leads them to other health problems (infections, depression, etc.) [5].

Prevention of PUs is very important for patients, family and health professionals. The main goal of ulcer prevention is to minimize or eliminate risk factors. Some of the preventive measures and interventions in brief are the following: frequent reposition,

skin care, use of special support surfaces, adequate nutritional support [6,7].

Pressure ulceration remains a significant cause of morbidity; is associated with poor prognosis and has a real economic impact on the health sector. PUs are an important public health problem, and the treatment and management of complications arising are associated with the increasing costs of health services [1,5-7].

When referring to ICU, patients due to the severity of their clinical condition need an intensive treatment approach, frequent monitoring and supervision of their clinical course; specialized care using new technologies and modern biomedical equipment. This holistic approach of patient care includes assessment of patient's skin integrity along with preventive practices in order to maintain the skin in normal condition [8].

Support surfaces are used in acute, rehabilitation and home care settings and its main contribution to patient care is to reduce interface pressures. Specifically, in ICU patients some studies suggest the adoption of support surfaces such as mattresses, overlays or integrated bed systems which are available with different mechanisms. There are many types of support surfaces that promote effective pressure reduction [9].

## Aim

The aim of the present short review was to present the effectiveness of different types of support surfaces for pressure ulcer prevention in intensive care patients.

## Methods

A literature search was undertaken of international databases (PubMed and Cochrane Library). A time limited criteria was applied with respect to articles publication; articles published in the last decade (2010-2020). As key words, the following terms were used: "pressure ulcers", "support surfaces", "intensive care unit", "prevention". Randomized controlled trials (RCTs), which assessed the effectiveness of mattresses for the prevention of pressure ulcers, in intensive care unit (ICU) patients were included in this review.

## Results

Although a number of supportive surfaces have been shown to reduce the incidence of bedsores or facilitate wound healing, compared to standard layers, there is insufficient evidence and limited data to suggest a suitable surface for each patient individually. In an effort to provide clinical guidance for selecting a support surface based on individual patient needs researchers developed an evidence based algorithm. Algorithm design was based on hypothetical scenarios following the process they had defined from the beginning (evaluation of ulcers, reassessment, recommendation for the use of a specific type of support surface and change it when deemed necessary). The target group who can adopt the algorithm includes physicians, nurses and physical therapists. The algorithm was designed for adult patients treated in ICUs or rehabilitation centers. Patients <16 years of age or patients who remain in the ICU <24 hours were excluded from the process. The user of the algorithm follows 3 steps: 1) skin

evaluation, 2) risks assessment of developing PUs, 3) selection of a suitable support surface. The choices are mainly based on the Braden rating [10,11].

The following factors should be taken into consideration in addition to risk assessment of occurrence of PUs so as to select the appropriate support surface: patient's ability to move on the bed, patient comfort, microclimate management ability which refers to the ability of the support surface to manage heat and hydration under the patient and finally, patient's weight and height [12].

Many researchers have compared support surfaces and revealed the effectiveness between different types of support surfaces. Different support surfaces aim to relieve pressure and distribute the surface pressure more evenly [13].

According to the present short review of the literature, researchers made an effort to compare the standard hospital mattress with viscoelastic mattress. It was found that the viscoelastic type of mattress reduced the incidence of PUs in critical ill patients. Moreover, some researchers underline the need for systematic and ongoing assessment of the patient's skin as well as implementation of prevention measures [14].

Bueno de Camargo et al. [9] in their randomized clinical trial tried to analyze whether a viscoelastic mattress support surface can reduce the incidence of stage 2 pressure injuries compared to a standard hospital mattress with pyramidal overlay in critically ill patients. Their studied sample was allocated into two groups: intervention group (usage of viscoelastic mattress) and control group (usage of standard mattress with pyramidal overlay). Their results revealed that the frequency of pressure injuries was higher in the control group compared to the intervention group, with statistical significance.

In another study, Park and Park [15] compared the effectiveness of a viscoelastic foam overlay (VEFO) to a standard hospital mattress for PUs prevention. This randomized controlled trial included participants divided into 2 groups: the experimental group were based on a VEFO on top of the standard hospital mattress. Participants in the control group were placed on a standard hospital mattress. All patients received standard nursing care for PUs prevention. The results showed that the incidence of PUs development was significantly lower in experimental group participants to those in the control group.

The benefits of pressure redistribution mattresses combined with repositioning were evaluated by Jiang et al. [16] in their multicenter study. They underlined that these intervals are very important to PUs prevention and enhance the effectiveness of clinical nursing care. Current PUs prevention repositioning protocols recommend repositioning every 2 hours; with viscoelastic mattresses it is possible to reduce repositioning frequency by extended the time from 2 to 4 hours [17].

## Conclusions

Intensive care team members should be empowered to be properly trained in ICU patient PU care. At the same time, it is advisable to be informed about the new prevention strategies and to be trained in new prevention techniques and methods

of care for the effective treatment of PUs. The costs directed for the treatment of patients with PUs are increasing, requiring health professionals applying their fundamentals to support the efficient allocation of human, material, structural and financial resources. Coping strategies can be developed through an

organized team that will evaluate, document and implement all supportive measures for prevention and treatment. Proper practice, assessment of the risk of developing pressure ulcers and taking precautionary measures to avoid the occurrence of ulcers are a priority for health professionals.

## References

- 1 European Pressure Ulcer Advisory Panel, National Pressure Ulcer Advisory Panel, Pan Pacific Pressure Ulcer Injury Alliance (2014) Prevention and treatment of pressure ulcers: quick reference guide. Cambridge Media.
- 2 He M, Tang A, Ge X, Zheng J (2016) Pressure Ulcers in the Intensive Care Unit: An Analysis of Skin Barrier Risk Factors. *Adv Skin Wound Care* 29: 493-498.
- 3 Agrawal K, Chauhan N (2012) Pressure ulcers: Back to the basics. *Indian J Plast Surg* 45: 244-254.
- 4 Becker D, Tozo TC, Batista SS, Mattos AL, Silva MCB, et al. (2017) Pressure ulcers in ICU patients: Incidence and clinical and epidemiological features: A multicenter study in southern Brazil. *Intensive Crit Care Nurs* 42: 55-61.
- 5 Brem H, Maggi J, Nierman D, Rolnitzky L, Bell D, et al. (2010) High cost of stage IV pressure ulcers. *Am J Surg* 200: 473-477.
- 6 Boyko TV, Longaker MT, Yang GP (2018) Review of the Current Management of Pressure Ulcers. *Adv Wound Care (New Rochelle)* 7: 57-67.
- 7 Bhattacharya S, Mishra RK (2015) Pressure ulcers: Current understanding and newer modalities of treatment. *Indian J Plast Surg* 48: 4-16.
- 8 Cremasco MF, Wenzel F, Zanei SS, Whitaker IY (2013) Pressure ulcers in the intensive care unit: the relationship between nursing workload, illness severity and pressure ulcer risk. *J Clin Nurs* 22: 2183-2191.
- 9 de Camargo WHB, Pereira RC, Tanita MT, Heko L, Grion IC, et al. (2018) The Effect of Support Surfaces on the Incidence of Pressure Injuries in Critically Ill Patients: A Randomized Clinical Trial. *Crit Care Res Pract* 2018: 3712067.
- 10 Becker D, Tozo TC, Batista SS, Mattos AL, Silva MCB, et al. (2017) Pressure ulcers in ICU patients: Incidence and clinical and epidemiological features: A multicenter study in southern Brazil. *Intensive Crit Care Nurs* 42: 55-61.
- 11 McNichol L, Watts C, Mackey D, Beitz JM, Gray M (2015) Identifying the right surface for the right patient at the right time: generation and content validation of an algorithm for support surface selection. *J Wound Ostomy Continence Nurs* 42: 19-37.
- 12 Black J, Berke C, Urzendowski G (2012) Pressure ulcer incidence and progression in critically ill subjects: influence of low air loss mattress versus a powered air pressure redistribution mattress. *J Wound Ostomy Continence Nurs* 39: 267-273.
- 13 McInnes E, Jammali-Blasi A, Bell-Syer SE, Dumville JC, Middleton V, et al. (2015) Support surfaces for pressure ulcer prevention. *Cochrane Database Syst Rev* 2015: CD001735.
- 14 Coyer F, Gardner A, Doubrovsky A, Cole R, Ryan FM, et al. (2015) Reducing pressure injuries in critically ill patients by using a patient skin integrity care bundle (InSPiRE). *Am J Crit Care* 24: 199-209.
- 15 Park KH, Park J (2017) The Efficacy of a Viscoelastic Foam Overlay on Prevention of Pressure Injury in Acutely Ill Patients: A Prospective Randomized Controlled Trial. *J Wound Ostomy Continence Nurs* 44: 440-444.
- 16 Jiang Q, Liu Y, Yu H, Song S, Li G, et al. (2020) A Multicenter, Comparative Study of Two Pressure-Redistribution Mattresses with Repositioning Intervals for Critical Care Patients. *Adv Skin Wound Care* 33: 1-9.
- 17 Yap TL, Kennerly SM, Horn SD, Bergstrom N, Datta S, et al. (2018) TEAM-UP for quality: a cluster randomized controlled trial protocol focused on preventing pressure ulcers through repositioning frequency and precipitating factors. *BMC Geriatr* 18: 54.