

Clinical Evidence to Prevent Pressure Ulcer at High Risk Patients: Systematic Review

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Abstract

Background: Pressure ulcer (PU) has clinical complications for patients, in addition to cost and quality related consequences for healthcare organizations. PU is defined as a pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other devices. The estimated prevalence of PUs among 918,621 patients declined from 13.5% in 2006 to 9.3% in 2015. **Aim:** The objective of this review is to evaluate the effectiveness of dressing and topical agent to prevent pressure ulcer, for hospitalized adults are at risk to develop a pressure ulcer. **Methods:** The review considered the randomized clinical trial (RCT), quasi pretest-posttest, and descriptive studies published in English. Participants in the studies were adult, aged over 18 years, considered to be a risk to develop PU, have no PU at the onset of the study, and managed at any healthcare setting. The primary outcome measured in the included studies was considered as the incidence of hospital acquired pressure ulcer (HAPU). **Results:** The review result out of five RCT and three non-RCT studies. **Conclusion:** The reviewed trials showed low certainty of imprecision. No definite preventive intervention to prevent PU among patients who at risk to develop PU. And the non-RCT studies, the findings indicate significant results of two studies, but due to the methodological context of non-RCT studies, the findings may not be granted to be generalized. The external factors at each study may affect the effectiveness of the intervention. Also, third study showed no significance of the intervention between groups.

Keywords

Pressure Ulcer, Prevention, Dressing, Topical Agent

1. Background

Pressure ulcer (PU) has clinical complications for patients, in addition to cost

and quality related consequences for healthcare organizations. According to (National Pressure Ulcer Advisory Panel [NAUAP], 2014) PU is defined as a pressure injury is localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device [1]. It defined the stages of developing the PU from stage 1 (non-blanchable erythema of intact skin) to stage 4 (full-thickness skin and tissue loss).

An international attention to PU prevention includes investment of new guidelines or clinical practices by frequent assessment, regular and structured positioning and turning patients. Agency for Healthcare Research and Quality (AHRQ) considered the Hospital Acquired Pressure Ulcer (HAPU) as quality indicator of good nursing care. The estimated prevalence of PUs among 918,621 patients declined from 13.5% on 2006 to 9.3% on 2015 [2]. It is strongly recommended that a comprehensive skin assessment is effective to prevent PUs to patients at risk to develop PUs [1].

Many studies investigated different preventive measures to prevent PUs, [3] reported that applying cushions filled with Tragacanth gel on bony prominence areas is more effective to prevent PUs than cushions filled with foam. Thus, the first sign of erythema in the tragacanth gel cushion group was on sixth day for 33 patients out of 47 patients. But, the first erythema sign in the foam cushion group was on fifth day for all the 47 patients. Another approach to prevent PUs is pressure mapping [4] by continuous bedside pressure mapping system display over the pressure points for the patients at risk to develop PUs. It been used for patients since admission for fourteen days in addition to standard care. But, the results showed no significant differences between the intervention and control group.

Many factors are contributed to develop PU; immobility, old age, terminal illness, sepsis, incontinence, lack of sensory perception, poor nutrition and hydration, and some medical conditions affecting blood flow (Diabetes, vascular insufficiency) (Mayo Clinic, 2019). Furthermore, organizational factors as well as patients factors would contribute to develop PUs. For example, patients at rehabilitation ward are at risk to develop PU higher than patients at medical or surgical wards [5]. For example, patients at rehabilitation ward are at high risk to develop PU higher than patients at medical or surgical wards due to additional factors such as immobility and other chronic diseases.

Objective

The objective of this review is to evaluate the effectiveness of dressing and topical agent to prevent pressure ulcer, for hospitalized adults are at risk to develop pressure ulcer.

2. Methods

2.1. Selection Criteria

The review considered the randomized clinical trial (RCT), quasi pretest-posttest, and descriptive studies published in English. Participants in the studies were adult, aged over 18 years, considered to be risk to develop PU, have no PU at the

onset of the study, and managed at any healthcare setting. The primary outcome measured in the included studies was considered as the incidence of hospital acquired pressure ulcer (HAPU).

2.2. Types of Intervention

Any direct wound intervention, could be topical or commercial wound dressing applied to bony prominence areas. The intervention of RCTs, descriptive, or comparative were included in this review, to compare with two different interventions, or to compare the intervention with the standard care, or to compare the intervention with placebo.

2.3. Electronic Searches

We searched the following electronic database to evaluate the effectiveness use of topical agent of different dressings to prevent pressure ulcers: EBSCO CINHAL Plus (Cumulative Index to Nursing and Allied Health Literature, 2010 to 30 March 2019), the Cochrane Central Register of Controlled Trials (CENTRAL). We selected the English language to retrieve the included studies.

2.4. Selection of Studies

According to Cochrane guidelines for systemic reviews of interventions, firstly we assessed the titles. Then, abstracts' eligibility was assessed to be included in the review. Next, we reviewed the available full version of studies. The excluded studies that used different interventions rather than topical agent or direct dressings to prevent pressure ulcer. These interventions as; massage, electromagnetic waves, nutritional management, redistributing of pressure sites, wheelchair cushions, improve self-management and self-efficacy of patients, using risk assessment tool, and follow preventive evidence-based practices. Last, we completed a PRISMA flowchart to summarize the selection process (**Figure 1**).

2.5. Data Extraction and Management

Two reviewers independently reviewed the following data from the eligible studies: author, title, care setting, inclusion/exclusion criteria, participants' characteristics, study design, method of randomization, intervention details, type and frequency of dressing, outcome measure, length follow-up, and conclusion as reported by authors. According to Cochrane methods [6] we considered the risk ratio (RR) with confidence interval (CI) of 95% for dichotomous variables. For continuous variables, the mean difference with confidence interval (CI) 95%. Disagreement was resolved through discussion, or with third party judgment if needed.

3. Quality Assessment Tool

3.1. Summary of Findings' Tables and GRADE Assessment of the Certainty of Evidence

The GRADE system rates the quality of the evidence, and summary the findings.

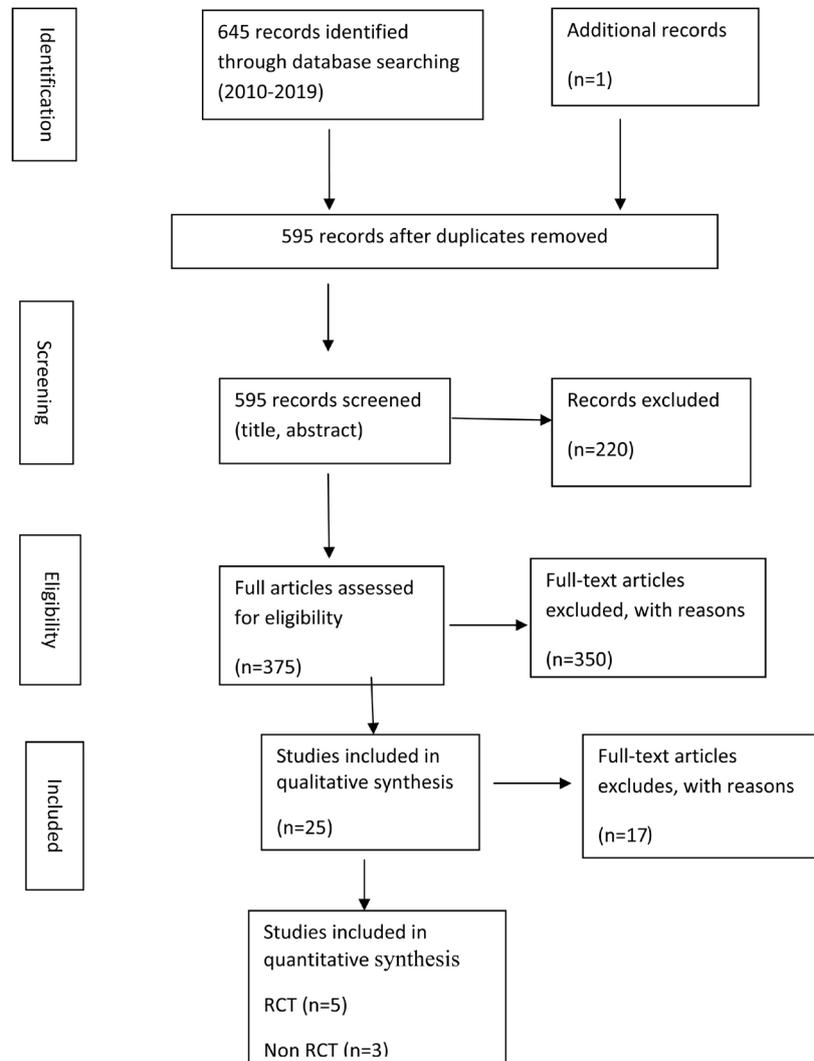


Figure 1. Flowchart of summarization selection process.

Table presents the results of the most important outcomes in the reviewed studies [7]. The GRADE system rates the quality of evidence for each outcome, from a rating of *high* to *very low*. The GRADE baseline is *high* rates for RCTs, and *low* for non-RCTs. The assessment criteria to consider in baseline rating for downgraded, or upgraded are: risk of bias, inconsistency, indirectness, imprecision, and publication bias (mainly for RCTs) [7].

The summary table of findings (**Table 1**) includes: 1) The comparison between the intervention and control with similar intervention. 2) The comparison of different interventions of similar group at the same time limit. 3) The incidence of pressure ulcer. Our search identified 8 studies.

3.2. Data Synthesis

Randomized Clinical Trials Results

Five studies are RCTs with total of 1846 participants [8]-[13]. Results are summarized in **Table 1** “summary of findings”.

Table 1. Topical treatment versus other intervention or standard care for preventing pressure ulcers.

Authors & year	Outcome measure/ Follow up/ Assessment tool	Illustrative comparative risks		Relative effect CI 95%	Number of participants	Quality of evidence	Comments
		Assumed risk	Corresponding risk				
		Other /or standard intervention	Intervention				
[12] (inferiority study)	Incidence of pressure ulcer: olive oil vs Hyperoxygenated Fatty Acid. Follow up: up to 16 weeks. Assessment tool: Braden scale	HOFA: 394 Sacrum 8 (3.08) Rt heel 5 (1.92) Lt heel 3 (1.15) Rt trochanter 4 (1.54) Lt trochanter 1 (0.38)	Olive oil:437 Sacrum 8 (2.55) Rt heel 4 (1.27) Lt heel 3 (0.96) Rt trochanter 0 (0) Lt trochanter 1 (0.32)	R.R = 0.83 (0.42 - 1.64)	831	Low Due to risk of imprecision.	No difference in the findings between intervention of olive oil and control group of HOFA group.
[8]	Incidence of pressure ulcer: silicon foam dressing vs fatty acids oil spray in addition to standard care. Follow up: 14 days Assessment scale: Braden scale	Silicon foam dressing (n = 129) 3.9% (n = 5). Standard care (n = 202) 5% (n = 10)	Fatty acid oil (n = 130) 5.4% (n = 7)	Not estimated	397	Low Due to risk of imprecision.	Silicon foam dressing group showed lower incidence of pressure ulcer in comparison with Fatty acid oil group.
[13]	Incidence of pressure ulcer: new topical agent (PARZINE-4A-SKR) vs placebo. Follow up: 14 days. Assessment scale: Braden scale	Average on Braden scale: 12.65 ⁺ - 1.82 (median = 12, extremes = 8 - 15).	Average on Braden scale: 12.28 ⁺ - 1.80 (median = 12, extremes = 5 - 9).	R.R = 0.82 (0.29 - 2.36)	194	Low Due to risk of imprecision.	No statistical significance of the intervention in comparison with the placebo.
[10]	Incidence of pressure ulcer: Aloe-Vera gel vs standard care. Follow up: 10 days. Assessment tool: Braden scale.	40 participants Frequency of PU = 8 (21.1%)	40 participants Frequency of PU = 2 (5.1%)	Not estimated	80 participants	Low Due to risk of bias and imprecision.	There was better outcomes in prevention pressure ulcer among intervention group (2/40 - 5.1%) in comparison with control group (8/40 - 21.1%).
[11]	Development of pressure ulcer during the period of the study. Follow up: 6 months (after discharge).	Standard care: (n = 182) Incidence rate per 1000 patient days: 5.9 (2.8 - 12.4)	Five layered soft silicon foam (n = 182) Incidence rate per 1000 patient days: 0.7 (0.1 - 5.2)	Not estimated	184 participants	Low Due to risk of bias and imprecision.	Silicon foam dressing had lower incidence of pressure ulcer in comparison with the standard dressing (0.7% vs 5.9%)

The five RCTs' participants were adults patients (>18 years) who were admitted to hospitals free from any sign of skin lesion. All included participants were free of pressure ulcers before study involvement. The included studies used Braden scale to assess participants' eligibility, and the acceptable scale range to participate in the study varies to be (13 - 15) [8] [11] [12] [13], and Waterlow scale

in addition to Braden scale [10].

The setting where the studies were conducted was; two studies in Spain [12] [13], one study conducted at eight medical-surgical wards in Academic Acute Tertiary hospital in Singapore [8], one study conducted at orthopedic unit in Iran [10], and one study conducted at critical care unit at A magnet hospital, but did not mention the country of [11].

The included studies used randomization of participants' allocation [8] [10] [11], but two studies used multicenter, parallel randomization [12] [13]. The blinding method used in these studies were; triple-blinding in two studies [10] [12], double-blinding in one study [13], non-blinding in one study [11], and in one study the blinding method was single for research coordinator [8].

Aloweni, *et al.*, [8] assess in their study the effectiveness of a prophylactic silicon foam dressing and tropical application of fatty acid in addition to standard preventive measures. The intervention groups received; 1) the standard care (repositioning, positioning devices, diaper change, and barrier cream). 2) In addition to standard care, Silicon Foam dressing, Mepilex Border Sacrum™, that applied to the sacral area. Wound nurse specialist changes the dressing every seven days or when seals. 3) fatty acid oil plus standard care received Linovera Oil® which consists of hyperoxygenated fatty acid, that applied onto sacral area three times daily.

Kalowes, *et al.*, [11] assess the effectiveness of 5-layered soft silicon foam dressing versus a control group receiving the standard care. The intervention group received Mepilex Border Sacrum foam dressing™ over sacral areas, the dressing had changed every three days or when dislodge. The control group received the standard care (Total Care SpO2RT 2 Therapy Bed [Hill-Rom, Inc], repositioning, and incontinence skin care).

Lupinaez-Perez, *et al.*, [12] assess the inferiority of application of hyperoxygenated fatty acid (HOFA) to an intervention group with application of an olive oil composition to the control group, in addition to the usual care for both groups. The HOFA applied topically and included Equisetum Arvense, Hypericum Perforatum and perfume. The olive oil procedure consisted in applying a magistral formula, in liquid spray form, containing 97% extravirginolive oil and 3% Hypericum Perforatum and Peppermint. The olives used for this product is the "Picual", both products have similar appearance.

Hekmatpou, *et al.*, [10] assess the effectiveness of Aloe-Vera oil vs placebo in preventing PUs for immobilized patients. The researcher applied the Aloe-Vera from dark glass container and rubbed onto skin twice daily over the pressure points along 10 days duration. The control group received the placebo (water and starch gel) that was similar to the Aloe-Vera consistency, and at same protocol.

Verdú & Soldevilla, [13] compared the efficacy of (IPARZINE-4A-SKR) to prevent PUs over a placebo. The product applied to an intervention group every 12 hours, with gentle massage until it was completely absorbed over high risk areas of PUs. The placebo applied to the control group at same steps.

3.3. Non-Randomized Trials Results

Our search found three non-randomized clinical trials (**Table 2**). Total number of participants were 433 patients. One of these studies was quasi-experimental study assess the effectiveness of using intravenous bags as compared with a commercially available heel suspension foam boot especially designed to offload the foot (Heelift; DM Systems Inc, Evanston, Illinois) for patients at high risk of pressure ulcers [14]. The results showed significant effect of using the pressure-relief suspension boot. Thus, non of patients used the pressure-relief suspension boot experienced any signs or symptoms of PUs, whereas 6 out of 15 patients who used the intravenous bag developed PUs signs and symptoms. This study had some methodological limitations that may affect its quality. The sample size is small (n = 30). The participants recruited to this study were patients admitted for knee and hip surgery, this will affect the generalization of the results. Also, the patients in intravenous bag had high response dose of PU incidence rate; that 6 out of 15 patients experienced PUs, which is higher than the result of the International PU Prevalence Survey 2006-2015 which is 9.3% [2].

The second study of a prospective, nonrandomized, quasi-experimental observational study was conducted to compare the effectiveness of implementation of prophylactic silicon adhesive hydrocellular sacral foam dressing [15]. This study was conducted in three ICU wards, patients are at risk of PUs, the sample size of this study is (n = 243). The results indicate the obvious decreasing in the incidence rate from 7.6 to 3.4 per 1000 population. But there are many consideration in methodology such as; the non-randomization sampling, repositioning of the patients was not monitored, and units increased training programs of preventive

Table 2. Characteristics of non-randomized clinical trial studies.

Source	Design	No. & characteristics of Participants	Aim/Outcome measures	Results
[14]	Quasi-experimental design	30 participants post knee and hip orthopedic surgery.	To compare the effectiveness of pressure-relieving suspension bag with intravenous bag for heel pressure relief.	The pressure-relieving suspension boot (Heelift; DM Systems Inc, Evanston, Illinois) was better to prevent PUs at high risk patients.
[15]	Prospective, non-randomized, quasi-experimental observational study	243 patients in three units, admitted for surgery	To assess the effectiveness of applying the Allevyn Gentle Border Sacrum Dressing to prevent PUs incidence	The intervention reduce the PUs incidence in the three units per 1000 patients days: First unit: 13 - 5.38 Second unit: 7.4 - 3.96 Third unit: 6.98 - 3.4
[9]	Exploratory, descriptive, cross-sectional.	160 participants	To compare the performance and effectiveness of a hydrocolloid dressing (HD) and a transparent polyurethane film (PF) in preventing pressure ulcer (PU) development.	The incidence of pressure ulcer in Polyurethane group (8.7%). Polyurethane dressing: First dressing changed after 5 days for 23 (28.7%) patients, and after 10 and 12 days for 34 (42.5%) and 11 (13.8%) patients respectively. Hydrocolloid dressing: First dressing changed after 2 days for 13 (16.3%) patients, and after 7 days for 21 (26.3%) patients. significantly lower than Hydrocolloid dressing group (15%).

measures during the study period, which may decreased the incidence rate of PUs.

The third study [9] aimed to assess the effectiveness of Hydrocolloid dressing (HD) in comparison with Transparent polyurethane film (PF). A total of 160 patients were recruited in this study, 80 patients were in each group. Participants were observed to evaluate the effectiveness of treatment by the incidence of PUs, reasons to change the dressing, number of dressing per area, and total number of dressing during the study period. The results showed that in HD group the first dressing was after two days for 13 (16.3%) patients, then after seven days for 21 (26.3%) patients. In PF group the first change after five, ten, and twelve days for 23 (28.7%), 34 (42.5%), and 11 (13.8%) respectively. The incidence rate was decreased significantly in PF group was 8.7%, and in HD group was 15%. Despite the significant effect of PF to decrease the incidence of PUs, but there are some differences between groups, it would be better to have control group.

3.4. Evaluate the Quality of Evidence

The most effective framework to evaluate a systematic review is GRADE (Grading quality of evidence and strength of recommendations). GRADE is used to rate the certainty of evidence for a treatment efficacy from high to very low. The GRADE system takes in two types of studies: randomized controlled trials (RCTs) and non-randomized trials [7]. The five criteria to evaluate the RCTs and could downgrade one or two level are (risk of bias, in directedness, inconsistency, imprecision, and publication bias). **Table 3** illustrates the details of each study evaluation criteria.

4. Discussion

No review of PU prevention was conducted to date gathered the RCTs and non-RCTs studies. The previous review [16] aimed to evaluate the effect of dressings and topical agents on pressure ulcer prevention in people at risk to develop PU, and it includes the RCT studies. The aim of this review to assess the effect of topical agents and other commercial dressing products to prevent PU, and it includes the RCT and non-RCT studies. We presented “summary of findings” (**Table 1**) with GRADE rating to evaluate relevant outcomes of five RCTs and “summary of findings” (**Table 2**) to evaluate three descriptive studies. The comparison

Table 3. The criteria to evaluate the RCTs.

	Risk of bias	Indictedness	Inconsistency	Imprecision	Publication bias
[8]	Unclear risk of performance bias in blinding	Low risk of bias	Low risk bias	Unclear risk of imprecision	Low risk bias
[10]	Unclear risk of performance bias in randomization	Low risk of bias	Low risk of bias	Unclear risk of imprecision	Low risk of bias
[11]	Unclear risk of performance bias in blinding	Low risk of bias	Low risk of bias	Unclear risk of imprecision	Low risk of bias
[12]	Low risk of bias	Low risk of bias	Low risk of bias	Risk of imprecision	Low risk of bias
[13]	Unclear risk of performance bias in blinding	Low risk of bias	Low risk of bias	Risk of imprecision	Low risk of bias

based on the measured outcome, which is the incidence of PU. One of the studies assessed the effectiveness of a prophylactic silicon foam dressing and topical application of fatty acid in addition to standard preventive measures [8]. But this study showed low certainty of evidence quality due to risk of imprecision. Another study assessed the inferiority of application of hyperoxygenated fatty acid (HOFA) to an intervention group with application of an olive oil composition to the control group, in addition to the usual care for both groups [12]. This comparison had low certainty of evidence quality due to risk of imprecision. Also, Verdue & Soldevilla [13] compared the efficacy of (IPARZINE-4A-SKR) to prevent PUs over a placebo. The analysis indicates low certainty of evidence quality due to risk of imprecision. But, another study that assessed the effectiveness of Aloe-Vera oil vs placebo in preventing PUs for immobilized patients [10] indicated low certainty of evidence quality due to risk of bias and impression. Furthermore, [11] assessed the effectiveness of 5-layered soft silicon foam dressing versus a control group receiving the standard care. But this evidence was considered to be low certainty quality evidence due to risk of bias and imprecision. The reviewed trials showed low certainty of imprecision. No definite preventive intervention showed significant effect to prevent PU among patients who at risk to develop PU.

Table 3 summarized the non-RCT studies, the findings indicate significant results of two studies [14] [15], but due to methodological context of non-RCT studies the findings may not be granted to be generalized. The external factors at each study, as mentioned previously, may affect the effectiveness of intervention. Also, third study [9] showed no significance of the intervention between groups.

The recommendation of these findings is a plan for further review of different preventive interventions such as: dressing intervention (topical and non-topical) with repositioning, massaging, or others.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Haesler, E. (2014) 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.
- [2] Van Gilder, C., *et al.* (2017) The International Pressure Ulcer Prevalence™ Survey: 2006-2015. *Journal of Wound, Ostomy and Continence Nursing*, **44**, 20-28. <https://doi.org/10.1097/WON.0000000000000292>
- [3] Shakibamehr, J., *et al.* (2019) Effectiveness of Tragacanth Gel Cushions in Prevention of Pressure Ulcer in Traumatic Patients: A Randomized Controlled Trial. *Journal of Caring Science*, **8**, 45-49. <https://doi.org/10.15171/jcs.2019.007>
- [4] Gunningberg, L., *et al.* (2017) Pressure Mapping to Prevent Pressure Ulcers in a Hospital Setting: A Pragmatic Randomised Controlled Trial. *International Journal of Nursing Studies*, **72**, 53-59. <https://doi.org/10.1016/j.ijnurstu.2017.04.007>

- [5] Bredesen, I.M., *et al.* (2015) Patient and Organisational Variables Associated with Pressure Ulcer Prevalence in Hospital Settings: A Multilevel Analysis. <https://doi.org/10.1136/bmjopen-2015-007584>
- [6] Higgins, J.P. and Altman, D.G. (2017) Assessing Risk of Bias in Included Studies. In: Higgins, J.P.T. and Green, S., Eds., *Cochrane Handbook for Systematic Reviews of Interventions. Cochrane Book Series*, the Cochrane Collaboration, London, 187-241. <https://doi.org/10.1002/9780470712184.ch8>
- [7] Ryan, R. and Hill, S. (2016) How to GRADE the Quality of the Evidence. Cochrane Consumers and Communication Group.
- [8] Aloweni, F., *et al.* (2017) A Randomised Controlled Trial to Evaluate the Incremental Effectiveness of a Prophylactic Dressing and Fatty Acids Oil in the Prevention of Pressure Injuries. *Wound Practice & Research*, **25**, 24-34.
- [9] Dutra, R.A.A., *et al.* (2015) Using Transparent Polyurethane Film and Hydrocolloid Dressings to Prevent Pressure Ulcers. *Journal of Wound Care*, **24**, 268-275. <https://doi.org/10.12968/jowc.2015.24.6.268>
- [10] Hekmatpou, D., *et al.* (2018) The Effect of Aloe Vera Gel on Prevention of Pressure Ulcers in Patients Hospitalized in the Orthopedic Wards: A Randomized Triple-Blind Clinical Trial. *BMC Complementary & Alternative Medicine*, **18**, 264. <https://doi.org/10.1186/s12906-018-2326-2>
- [11] Kalowes, P. (2016) Five-Layered Soft Silicone Foam Dressing to Prevent Pressure Ulcers in the Intensive Care Unit. *American Journal of Critical Care*, **25**, E108-E119. <https://doi.org/10.4037/ajcc2016875>
- [12] Lupiañez-Perez, I., *et al.* (2015) Topical Olive Oil Is Not Inferior to Hyperoxygenated Fatty Aids to Prevent Pressure Ulcers in High-Risk Immobilised Patients in Home Care. Results of a Multicentre Randomised Triple-Blind Controlled Non-Inferiority Trial. *PLoS ONE*, **10**, e0122238. <https://doi.org/10.1371/journal.pone.0122238>
- [13] Verdú, J. and Soldevilla, J. (2012) IPARZINE-SKR Study: Randomized, Double-Blind Clinical Trial of a New Topical Product versus Placebo to Prevent Pressure Ulcers. *International Wound Journal*, **9**, 557-565. <https://doi.org/10.1111/j.1742-481X.2011.00918.x>
- [14] Bales, I. (2012) A Comparison between the Use of Intravenous Bags and the Heelift Suspension Boot to Prevent Pressure Ulcers in Orthopedic Patients. *Advances in Skin & Wound Care*, **25**, 125-131. <https://doi.org/10.1097/01.ASW.0000412909.81452.b6>
- [15] Byrne, J., *et al.* (2016) Prophylactic Sacral Dressing for Pressure Ulcer Prevention in High-Risk Patients. *American Journal of Critical Care*, **25**, 228-234. <https://doi.org/10.4037/ajcc2016979>
- [16] Moore, Z.E.H. and Webster, J. (2013) Dressings and Topical Agents for Preventing Pressure Ulcers. *The Cochrane Database of Systematic Reviews*, No. 8, CD009362. <https://doi.org/10.1002/14651858.CD009362.pub2>