

Effect of Implementing Pressure Ulcer Prevention Bundle on Occurrence of Hospital-Acquired Pressure Injuries.

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Abstract Background: Critically ill patients in the Intensive Care Unit (ICU) are considered to be at the greatest risk for pressure ulcer development, A pressure ulcer is a 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. OBJECTIVE: This study was aimed to identify evidence-based care to prevent pressure ulcer in critical care sitting by using full comprehensive prevention measures included in one prevention bundle, and measure the effect in reduction of hospital acquired pressure injury. SETTINGS/DESIGN: Quasi-experimental before and after study design conducted in intensive care unit of King Abdullah Medical City, Makkah. SUBJECTS AND METHODS: The study sample was all patient in intensive care unit with high or very high risk for pressure injury based on Waterlow assessment tool, when patient enrolled in the study on admission with high or very high risk or patient status changed during ICU stay to become high risk or very high risk for pressure ulcer patient will stay under this intervention for whole stay period in ICU. RESULTS: Study result show a significant reduction (55%) of pressure ulcer rate, before and after pressure ulcer bundle implementation, which show the effectiveness of pressure ulcer bundle implementation on ICU patient. CONCLUSION: Looking to result of pressure Injury rate in pre and post intervention, The study found the effectiveness of pressure injury prevention bundle implementation on ICU patient; this result been achieved with presence of high compliance to the element of bundle by ICU nurses. In conclusion use bundle of prevention interventions will decrease rate of pressure injury in intensive care department.

Keywords: intensive care units, Pressure injury prevention bundle, Hospital Acquired pressure injury

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1. Introduction

A pressure ulcer is a 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.[1] Pressure ulcers are more likely to occur in people who are seriously ill, have a neurological condition, impaired mobility, impaired nutrition, poor posture, or deformity. The use of equipment such as seating or beds which are not specifically designed to provide pressure relief can also cause pressure ulcers [2].

The development of hospital acquired pressure ulcers (HAPU) has been linked to increased rates of readmission (within 30 days of discharge), and an increase in mortality rates within 30 days of discharge (Lyder et al, 2012) [3]. The average cost to heal a pressure ulcer (PU) can range significantly, depending on severity, from hundreds of dollars to over one hundred thousand dollars (Meddings et

al, 2015) [4]. Critically ill patients in the Intensive Care Unit (ICU) are considered to be at the greatest risk for pressure ulcer development as they are likely to be immobile; present with higher severity of illness; require mechanical ventilation, associated sedation, and pharmacological drugs; which could all potentially reduce peripheral circulation. Therefore, the identification of patients at the risk of pressure ulcer development in the ICU is essential [5]. Guideline recommendations for preventing pressure ulcers include methods for identification and risk assessment and preventive measures including skin assessment, nutrition, repositioning, and choosing appropriate support surfaces [6]. In regard of support surfaces and relief pressure intervention, guideline recommend considering use a reactive air mattress or overlay for individuals at risk for developing pressure injuries and recommend use a pressure redistribution cushion for preventing pressure injuries in people at high risk [6]. Guideline recommend as well to do Incontinence Care, Skin Care and Use barriers when indicated,

Implement a skin care regimen that includes, Keeping the skin clean and appropriately hydrated Cleansing the skin promptly after episodes of incontinence, Avoiding use of alkaline soaps and cleansers, Protecting the skin from moisture with a barrier product [6]. One of bony prominent area which consider is a risk of pressure ulcer is a Heel, Heel pressure injury very difficult to be healed, prevention guideline recommend, For individuals at risk of heel PI elevate the heels using a specifically designed heel suspension device or a pillow and Use a prophylactic dressing as an adjunct to heel offloading and other strategies to prevent heel pressure injuries [6]. Nutrition and hydration very essential in reduction of pressure ulcer incidence, for that ASPEN and ESPEN recommend to provide 1.2 to 1.3 g protein/kg body weight/day, Provide 25 to 30 kcal/kg body weight/ day and ensure nutrition requirement been adjusted in case BMI above 30 [11]. For that, the idea came to collect all together in one bundle, this idea been implemented in other studies inside and outside kingdom, with some few changes in bundle considering adding new technology and explain more the element of the bundle [12].

This study was aimed to identify evidence-based care to prevent pressure ulcer in critical care sitting by using full comprehensive prevention measures included in one prevention bundle, and measure the effect in reduction of hospital acquired pressure injury.

2. Subjects and Methods

A quasi-experimental, pre- and post-intervention research design used to conduct this study in King Abdullah Medical City in the Intensive care unit, which is a 32-bed medical surgical ICU. The study sample was all patient in intensive care unit with high or very high risk for pressure injury based on Waterlow assessment tool, excluding patient who admitted with pressure injury or can't be positioned because of his medical condition or presence of devices limiting interventions, the sample size was 277 during 6 months period from 2, July 2022 until 31, December 2022, all of those selected patients should got same intervention precaution through implementation of pressure ulcer prevention bundle, bundle contain eight elements, 1). Support Surfaces (relief of pressure), 2). Keep Repositioning and relief pressure, 3). Incontinence Care, 4). Skin Care and Use barriers, 5). Nutrition and hydration, 6). Check medical devices, 7). Assess risk and skin daily, 8). Reduce Head of bed < 30 and Elevate Heel. In the bottom of the bundle further description made to explain what required from each element in the bundle, and in the back page the evidence behind selection each element of the bundle. For support surfaces nurse should make sure patient has air mattress, cushion or gel pads in high risk bone prominent areas, ventilation mattress and soft pillows to reduce pressure and ensure comfort patient's position, for element of keep Repositioning and relief pressure it required from nurse to ensure two hourly positioning with maintaining good ventilation for risky areas and to ensure early mobilization if patient able to move out of bed, for Incontinence Care, Skin Care and Use barriers nurse has to ensure early treatment for incontinence and use proper catheter if required, they may

consider use skin barriers or lubricant if still required, in regard of nutrition and hydration nurse should ensure with dietitian during daily reassessment that patient got required caloric intake (25-50 KCAL/kg/day) and (1.2 to 1.3 g protein /kg / day) with considering obesity adjustment, to avoid medical devices related injury nurse should keep medical devices away from patient skin as much as possible and it has to be contacted to patient's skin nurse should keep foam dressing or protection barrier to avoid injury caused by share or pressure, in order to detect any skin change and do required precaution nurse should full assess skin at least daily if changes in skin status to notify responsibly discipline and mange patient to avoid further deterioration, to reduce pressure on bony prominent area and to avoid friction and shear, nurse should keep head of bed not more than 30 degree, and last element in the bundle to give focus on heel as it is very high risky area and required frequent assessment and use pressure release devices to avoid pressure injury.

Before start intervention procedure, department's educators provided education and competency assessment for the ICU staff nurses on the use of pressure injury prevention bundle. When patient enrolled in the study on admission with high or very high risk or patient status changed during ICU stay to become high risk or very high risk for pressure ulcer, patient will stay under this intervention for whole stay period in ICU the time of transfer staff will handover data collection tool to ICU head nurse who will collect it and measure compliance to the bundle at the end of the month, over all compliance will be calculated based on the number of "Yes" mentioned on the intervention implementation from overall intervention days, if "No" mentioned in the one of bundle element consider incompliance and that full day consider zero when calculate compliance rate. For rate of pressure injury, wound care team will do weekly round on all high and very high risk patients for pressure injury and will identify patient who had pressure injury in additional to that ICU nurses will report to wound care patients who had skin discoloration or peeling to assess and confirm presence pressure injury, when confirmation of hospital acquired pressure injury done by wound care they report it to nursing quality and department charge/head nurse initiate pressure ulcer notification, nursing quality department release monthly report with departmental hospital acquired pressure injury rate.

Rate of pressure ulcer will be calculated based on the incidence numbers divided on number of patients at the end of the study pressure ulcer rate been calculated based on study inclusion and exclusion criteria.

3. Results

Table 1 shows number of pressure incidence, number of patients and rate of pressure ulcer. Patients who been enrolled during intervention period 277 in six months period 6 of them developed pressure ulcer during stay in ICU under intervention with rate (2.17%), 274 patients who matched inclusion criteria in six months pre-intervention 13 among them developed pressure ulcer during ICU stay with rate (4.75%), rate show (54%) reduction in intervention period compared to pre intervention period.

Table 2 shows the compliance to bundle implementation during intervention period, monthly compliance were moving from 87.8% to 99% and overall compliance for whole period 94.7%.

Table 3 shows comparison for variables may effect pressure ulcer rate before start intervention and after starting the intervention, include Age, Sex, BMI and Waterlow score, result of variable show that it is closed to each other.

Table 1. Rate based on patients' number

	Before starting intervention	After starting intervention
Number of patients	274	277
Incident number	13	6
Incident rate	4.75%	2.17%

Table 2. Monthly Compliance for Pressure ulcer Bundle

Month	Compliances
July	95.9%
August	98.8%
September	87.8%
October	99.0%
November	90.8%
December	95.8%
Total	94.7%

Table 3. Comparison of variables related to pressure ulcer

	Six months Before	Six months after
Age (Mean)	63.3	57.3
Sex, n (%)		
Female	132 (48.2)	110 (39.7)
Male	141 (51.5)	167 (60.3)
BMI (Mean)	29.1	27.9
Waterlow score (Mean)	25.7	22.4

4. Discussion

Pressure ulcer injury prevention consider one of the important patient safety concern, Individuals who developed PUs were more likely to die during the hospital stay, have generally longer hospital lengths of stay, and be readmitted within 30 days after discharge [3]. The application of a group of pressure ulcer prevention measures ("PRESSURE bundle") coincided with a reduction in the incidence and prevalence of sacral pressure ulcers in critically ill patients who are at risk for developing pressure ulcers [12].

A quasi-experimental, pre- and post-intervention research design used to conduct this study in King Abdullah Medical City in the Intensive care unit, Bundle component contain the most important prevention actions in order to decrease risk of pressure ulcer, after implementation of intervention average pressure ulcer rate show reduction from 4.75 to 2.17 pressure ulcer incidence rate per patient, with around 54% reduction in hospital acquired pressure ulcer rate, patients intervention period was on average of 10 days, with range from 2 days to 70 days period.

In order to ensure about effectiveness of intervention in the reduction rate, analysis for the most important variables been studied in the pre-post groups, variables show close to each other's and no significant change in both groups, although waterlow score show higher rate in pre-intervention group which reflect higher risk of pressure ulcer, but this difference still consider insignificant as all patients who been recruited in the study high or very high risk for pressure ulcer.

This result achieved with 94.7% compliance for bundle implementation over intervention period, implementation compliance were fluctuating between 87.8% to 99% during intervention period, compliance rate been calculated from full bundle implementation days over enrollment days, proper education and encouragement made compliance to the bundle higher.

To prevent pressure ulcer injury to happen healthcare workers has to manage all preventable risk factors, which maintain healthy skin and ensure proper blood circulation to bony prominent area, doing all together make result of pressure ulcer injury much less, and idea of bundle to remained nurses to look for all of those element and ensure proper implementation. Nurses should be fully aware about proper way to implement each element of the bundle.

Some of those interventions required special resources for pressure release, skin ventilation and care which required hospital administration support to ensure availability of those items, taken in consideration incremental costs to hospitals regarding treating HAPIs could be about \$10 708 per patient. Most of which is represented by the extensive cost of treating Stages 3 and 4 HAPIs. Decreasing the probability of HAPI progression across stages has been demonstrated to have the greatest effect on lowering costs. Prevention efforts and early interventions may be the most cost-effective for hospitals [13].

5. Conclusion

Looking to result of pressure Injury rate in pre and post intervention, The study found the effectiveness of Pressure injury prevention bundle implementation on ICU patient; this result been achieved with presence of high compliance to the element of bundle by ICU nurses. In conclusion use bundle of prevention interventions will decrease rate of pressure injury in intensive care department.

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Conflicts of Interest

There are no conflicts of interest.

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