



Pressure ulcers related to medical device in intensive care in Indonesia: A prospective study[☆]



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KEYWORDS

Pressure ulcers;
Medical devices;
Braden scale

Abstract

Objectives: The aim of this study was to describe the MDrPU on patients with prolonged bed rest in the ICU.

Method: A prospective cohort design was used in this study. We used non probability consecutive sampling. A total of 32 samples were included in this study. The Braden scale and NPUAP staging were used to predict the risk of pressure ulcers, and ulcers staging in 5 days. Statistical analysis were conducted using Chi-Square, Fisher Exact, and ROC Curve.

Result: The result showed the prevalence of medical devices was 21.9%. Most pressure ulcers related to medical devices was stage 2 (57.1%) with the most common area for the wounds was on fingers (37.5%). Braden scale prediction score also showed specificity (56%) and sensitivity (92%).

Conclusion: Numerous risk factors for pressure ulcer development were identified and Braden scale could to predict the risk of pressure ulcers related to medical devices.

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Introduction

Pressure ulcers related to medical devices (MDrPU) are defined as localized injuries caused by tissue compression and long-term pressure from medical devices. The pressure

generated by this medical device is generally very compatible with the pattern or shape of the tool.¹ A study reported that there was an incidence of pressure ulcers in the occipital region of the cervical neck collars 33% after 5 days of use, and 44% when the neck brace was used for more than 5 days.²

A researcher who published the first prospective data on medical device injuries in children between the ages of 21 days and 8 years said the overall incidence of pressure sores was 27%, with 8% of children experiencing pressure sores from medical devices. For example, oxygen saturation devices (pulse oximetry), Biphasic positive airway pressure (BIPAP) ventilators, and endotracheal

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Table 1 Demographic of the patients.

Variable	Wound group (n = 7)	No wound group (n = 25)	P-value
Age	46 ± 9.80	51 ± 15.88	0.447 ^a
<i>Gender</i>			
Male	2 (28.57%)	14 (56%)	0.394 ^b
Female	5 (71.43%)	11 (44%)	
<i>BMI</i>			
Underweight	1 (14.29%)	2 (8%)	0.235 ^c
Normal	5 (71.42%)	22 (88%)	
Overweight	0 (0%)	1 (4%)	
Obesity	1 (14.29%)	0 (0%)	
<i>Temperature</i>			
Normal	2 (28.58%)	19 (76%)	0.032 ^{b,*}
High	5 (71.42%)	6 (24%)	
<i>Braden scale</i>			
Mild	0 (0%)	3 (12%)	0.005 ^{c,**}
Moderate	0 (0%)	11 (44%)	
High	1 (14.29%)	7 (28%)	
Very high	6 (85.715)	4 (16%)	

BMI, body mass index; percentage, mean ± SD.

^a Independent *t* test.

^b Fisher exact.

^c Chi square.

* *P* < 0.05.

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(ET) tubes are the most common devices (74%).³ Another study reported from the results of his study that the prevalence of pressure sores due to medical devices were identified in 1631 (9.1%), with the most common anatomic location for device-related pressure sores was the ears (20%), followed by the sacral/coccyx, heel area, and buttocks.⁴

Various pressure injuries can be prevented by utilizing evidence-based nursing practice. However, identifying and preventing pressure injuries associated with medical devices is still considered as a difficult thing to do since the needs for the device can be significant and cannot be easily released, especially for patients with worsening conditions. The opportunity for pressure sores in patients with bed rest condition is considered as considerably large because each patient requires at least one medical device for their treatment. As a result, every patient is at risk of injury due to medical devices. The prevalence of pressure sores due to medical devices in Indonesia has still not been found, especially in West Kalimantan. Therefore, researchers were interested in conducting a study entitled prospective study: description of pressure sores due to medical devices in patients with prolonged bed rest in the Intensive Care Unit of Soedarso Hospital Pontianak. The research questions are as follow:

1. What is the prevalence of pressure sores due to medical devices in patients with prolonged bed rest in the ICU Unit of Soedarso Hospital Pontianak?
2. What is the degree of pressure sores due to medical devices in the ICU Unit of Soedarso Hospital Pontianak?

3. What are the causes of pressure sores due to medical devices in patients with old bed rest in the ICU Unit of Soedarso Hospital Pontianak?
4. What is the predicted score on the Braden scale for the risk of pressure sores due to medical devices?

Method

This research used descriptive quantitative research with a prospective cohort study design. This study was conducted from April 25 to June 20, 2019. Non probability consecutive sampling was used in this study. The population in this study was all patients who were treated on the first day of their treatment in the ICU Unit at Soedarso Hospital Pontianak. The inclusion criteria of this study were the patients older than 18 years who used medical devices until 5 days in the ICU. A total of 32 samples were included in this study.

The instrument used in this study was an observation sheet which was conducted prospectively in 5 days of treatment containing the assessment of the Braden scale and NPUAP staging.

The analysis used in this study was a univariate analysis used to determine the percentage of the prevalence of pressure ulcers due to medical devices, medical devices that cause pressure ulcers, the location of pressure sores due to medical devices, and the characteristics of research respondents. While the bivariate analysis used in this study was the Chi-Square Test, Fisher Exact, and ROC (Receiver Operating Characteristic) Curve.

Table 2 Distribution of wound based on the medical device (n = 7).

Location	f	%
Manset	1	12.5%
Oxygen therapy (NRM)	1	12.5%
OPA	1	12.5%
SPO2 (Pulse Oxymetry)	3	37.5%
Nasogastric	1	12.5%

Table 3 Wound based on the location (n = 7).

Location	f	%
Arm	1	12.5%
Finger (hand)	3	37.5%
Lip	1	12.5%
Ear	1	12.5%
Nose	1	12.5%

Table 4 Time (day) of occurrence the wound and NPUAP stadium (n = 7).

Day	Npuap
3	2
5	5
3	2
3	1
5	2
2	2
3	1

This study was approved by the ethics committee of STIK Muhammadiyah Pontianak (Number: 95/II.I.AU/KET.ETIK/III/2019)

Research finding

In demographic of patients, there was statistically significant difference namely temperature and Braden scale, however another variable there was no statistically significant difference (Table 1).

The prevalence rate of pressure ulcers due to medical devices in ICU Soedarso Hospital Pontianak is 21.9%, with the number of patients affected by pressure sores due to medical devices was 7 out of 32 patients treated at ICU Soedarso Hospital.

The degree pressure ulcers due to medical devices found were at degree 2 (57.1%) with an average day of injury occurring around 3 days (Table 4).

The tools that caused the emergence of pressure ulcers in patients were most commonly found in the use of pulse oximetry, which was as many as 3 patients (37.5%) on finger (Table 3). Furthermore, there were oxygen therapy devices such as NRM (non-rebreathing mask), tension cuffs, NGT, and OPA, which also caused pressure ulcers in 1 patient (12.5%) (Table 2).

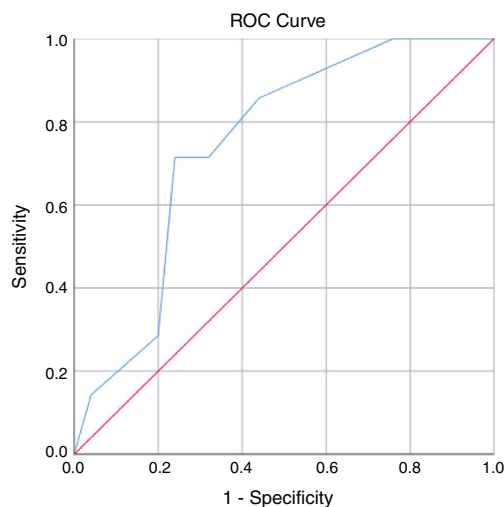


Figure 1 The Receiver Operator Characteristic curve of the Braden Scale for pressure ulcer related to medical devices within 5 days follow-up (n = 7).

Aside from tools, other causes found in this study were age, increased body temperature, and daily supportive Braden scale scores.

The Braden Scale prediction value was 74.6% with a specificity value of 56% and a sensitivity value of 92%. This means that the Braden scale can only be used to assess the risk of pressure sores, even though its use is still relatively moderate (Fig. 1).

Discussion

The prevalence of pressure ulcers due to medical devices

Prevalence associated with pressure ulcers due to medical devices in hospitals according to the researchers has not existed yet, particularly in Indonesia. Even though every patient in the hospital who are installed a medical device would be at risk of experiencing pressure ulcers due to medical devices. Based on the results of research conducted by researchers, it was found that the prevalence was 21.9%.

Pressure ulcers caused by medical devices were first discovered by Davis et al. (1995) who reported that the incidence of pressure ulcers in the occipital region of the cervical neck collars was 33% on 5 days of use, and this number increased to 44% when the brace the neck was used for more than 5 days.⁵ Another study also declared in the results of their study that of 113 samples there were 39 patients (34.5%) who suffered pressure ulcers due to medical devices. In addition, a research also explained that out of 175 patients in the ICU, 70 (40.0%) patients suffered pressure-related injuries during treatment at the hospital.⁶

The average age of patients in the results of this study falls into the elderly category. This is supported by the results of research by Nam MH (2012) and Choi WY (2012) which says that the incidence of pressure sores due to medical devices that occur in the elderly in the ICU is 65.5% in contrast to the percentage of the incidence of pressure sores due to medical devices that occur in pediatric circles, which

is only 18.8%.^{7,8} This is because the elderly have a high risk of experiencing pressure sores. In old age, there is a change in the quality of the skin where there is a decrease in skin elasticity and reduced circulation to the dermis.

The devices which caused pressure ulcers

Based on the research findings, it can be the medical instrument that causes pressure sores in the Soedarso Hospital Pontianak ICU is pulse oximetry of 3 people (37.5%) with the overall degree of injury being degree 2. The average length of use of medical devices until the occurrence of a wound is 3 days.

The results of the study by Wille et al. (2000) revealed in his study of prospective studies of pressure sores due to medical devices that there was 5% (6 of 125 samples) who had pressure sores due to pulse oximetry.⁹ This is also supported by the National Pressure Ulcers Advisory Panel (NPUAP), European Pressure Ulcers Advisory Panel (EPUAP), and the Pan Pacific Pressure Injury Alliance (PPPIA) (2009) which states that the use of medical devices such as pulse oximetry has a risk of causing pressure ulcers due to tools by (9%).¹

According to Guo L. (2005), the sustained use of medical devices such as neck collars and others, if they were installed more than one day, increases the risk of pressure ulcers by 66%.¹⁰ The same thing was stated by Liu et al. (2006) in his research on infants reporting that when the use of medical devices exceeds 3 days, the risk of skin injury is higher.¹¹

Medical devices can prompt injury because the device that is attached to the patient persists for more than one day and is regularly given a support device such as a plaster so it does not easily come off so that the device continues to press on the skin underneath. Skin that is stressed for a long time by a device that is installed during treatment at the hospital will risk causing injury. This statement is supported by Reger et al. (2007) which stated that the medical device itself will cause pressure. Factors that influence the occurrence of injuries such as humidity and increased body temperature that will change the skin's conditions which will make it easier for medical devices to make scars and wounds in the area under the device.¹²

The majority of patients with pressure sores due to medical devices based on the results of research conducted by researchers at the ICU Soedarso Hospital Pontianak experienced an increase in body temperature, which means there is a significant relationship between body temperature with the chance of the occurrence of pressure sores due to medical devices. This is in line with the results of research by Reger et al. (2007) which asserted that a significant increase in body temperature will induce a sweat response and increase moisture in the skin, especially on the surface of the skin under pressure.¹²

The results of this study are also supported by Suriadi (2007) which declared that there is a significant relationship between increased body temperature and the incidence of pressure sores.¹³ Suriadi (2007) also said that an increase in body temperature alone will not cause significant skin damage, but if an increase in body temperature is accompanied by long-term skin suppression will cause damage to

blood flow and restriction of lymphatic circulation which causes ischemia and develops into injury.¹³ In addition to the reduced elasticity of the skin, the skin is intolerant of the friction and movement forces so that it will easily experience skin damage. Other factors such as poor nutritional status will also cause a decrease in protein which can make the tissue more vulnerable to the effects of pressure.

According to Neloska L et al. (2016) malnourished patients have more prominent bones and are at greater risk of experiencing pressure sores. This study also showed that hypoproteinemia, hypoalbuminemia, low RBC was positively associated with PU prevalence.¹⁴

The predicted Braden scale for pressure ulcers

The Braden scale is employed several times to observe the incidence of pressure sores due to medical devices in a hospital, but its predictive value is still unknown. The results of research conducted by researchers about the prediction value of the Braden Scale for the risk of pressure injuries due to medical devices is 74% with a specificity value of 56% and a sensitivity value of 92%. According to the results of Hidalgo's research (2006) which discusses the predictive value of the Braden Scale on pressure sores in various service units shows the sensitivity of the Braden scale between 70 and 100% and the specificity between 64 and 90%.¹⁵

Braden scale prediction value was also carried out in the research of Suriadi et al. (2007) to evaluate the reliability and validity of the Braden scale in Indonesia. The results obtained that by using a cut off point 12, the sensitivity of the Braden scale reaches 80% and the specificity of 54%. In addition, Suriadi (2008) also explained that the predictive validity of a risk assessment scale can be influenced by the characteristics of a population, it is necessary to evaluate the extent of the predictive validity of the tool in the population concerned before the tool is used.¹⁶

Based on the above exposure there are differences in the Braden scale prediction test site, sample size, and differences in wound characteristics. The conclusion from the results of research conducted by researchers related to the predicted value of the Braden scale score is that the Braden scale has a moderate predictive value because there are still many that have not been detected with the same cause.

Based on the above explanation, the researchers hope this research can be one of the first references in Indonesia about pressure ulcers related to medical devices and can be a bridge for future researchers to conduct more complex research on pressure injuries due to medical devices.

Limitation

The current study had limitation, namely the sample size was small. Thus, the generalizability may be limited.

Conclusion

Based on the expected research objectives, the researcher can draw the following conclusions:

1. The prevalence of pressure ulcers due to medical devices in the Soedarso Hospital Pontianak ICU is 21.9%, which means that in Indonesia, especially in Pontianak, there have been cases of pressure ulcers due to medical devices.
2. Medical devices that cause pressure ulcers in the ICU Unit of Soedarso Hospital Pontianak, are pulse oximetry, tension cuffs, NGT, OPA, NRM, and restraints.
3. The degree of pressure ulcers caused by medical devices in the ICU Unit of Soedarso Hospital is second degree.
4. Braden scale can be utilized to predict the risk of the occurrence of pressure sores due to medical devices even though its use is still relatively moderate.

Conflict of interests

The authors declare no conflict of interest.

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