

Effect of Skincare Bundle Protocol on nurses' Performance Regarding Prevention of Skin Breakdown

Eman Fathy Amr¹, Nayera Mohamed Tantaewy², Rasha Mohamed Abo Hadida³, Hayah Abou Elazayim Bayumi⁴, Yasmin Fathy Mohammed Abed Elazeem⁵, Sheren Elsayed Shrief⁶
Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, Beni Suf University¹, Assistant Professor of Critical Care and Emergency Nursing, Faculty of Nursing, Mansoura University², Lecturer of Pediatric Nursing, Faculty of Nursing, Alexandria University³ Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, South Valley University⁴ Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, Alexandria University⁵, Assistant Professor of Medical-Surgical Nursing, Faculty of Nursing, Beni Suf University⁶

Abstract

Background: Skin breakdown includes non-blanchable erythema without underlying tissue loss, abrasion, and deep and extensive pressure ulcers. Hospitalization can cause skin breakdown due to medication, food, and mobility changes. **Aim:** To assess the effect of skincare bundle protocol on nursing performance regarding prevention of skin breakdown. **Research Design:** A quasi-experimental design was used. **Setting:** This study was conducted in Orthopedic Surgery Departments and traumatology Departments at El Hadara Orthopedic and Traumatology University Hospital, adult intensive care units at Main University Hospital and pediatric intensive care units at El-Shatby University Hospital of Alexandria **Sample:** composed of 120 nurses working in the previous mentioned settings **Tools tool I:** Nurses' knowledge toward skin care bundle for prevention of skin breakdown. **Tool II: Skin care bundle observational checklist** to assess nurses' practices toward skin care bundle application. **Results:** A statistically significant difference in nurses' knowledge and practices about the skin care bundle between pre and post-protocol implementation was found. **Conclusion:** The study proved that; skincare bundle protocol improved nurses' practices toward prevention of skin breakdown. **Recommendations:** Publication and dissemination of the skincare bundle protocol to improve nurses' performance toward skincare to prevent skin breakdown and decrease its complications.

Key words: Skincare, bundle Protocol Nurses, Performance, Skin breakdown.

Introduction

The epidermis, dermis, and subcutaneous fat tissues make up the three layers of skin. Skin serves as a barrier between a person and their surroundings. The largest organ in the body is the skin, covers an area of 2 square meters and contributing between 12 and 15 percent of the body's weight. It serves as a barrier, shielding the body from damaging environmental factors and preventing the loss of vital bodily components and sensation (Lawton, 2020).

The concept of skin breakdown, which includes all symptoms of skin disturbance, including non-blanchable erythema, scrape, and small to severe lesions, is represented in the

alterations to unbroken skin and pressure ulcers. The two main risk issues for skin breakdown are prolonged hospitalization and degree of bad health (Palmer, 2019, Tayyib et al, 2021). Skin injury is now regarded as one of the top five preventable patient safety issues and one of the top five causes of harm to patients. It is also increasingly being referred to as a gauge of the calibre of treatment delivered by medical facilities (Thomas, 2018).

According to the European Pressure Ulcer Advisory Board (EPUAP), 4 to 13% of general pediatric inpatients in the United States have pressure ulcers, 16.9 to 53% for PICU patients, and 29.2% and 72% for inpatients. The rate of childhood ulcers develops in the ICU

and is at greatest risk in infants less than Three months. The main types of skin damage are moisture damage, mechanical damage, and pressure damage. (Krupp & Monfre, 2017). Adults and children who are admitted to the intensive care unit are a vulnerable population who run the risk of suffering from skin damage such as: Immobility, hemodynamic instability, hypertensive treatment, hypoesthesia, medical and mechanical devices, and cardiovascular weakness secondary to some organ failure (Still et al., 2018). Therefore, whatever their cause, pressure ulcers have a severe impact on the patient. These problems include pain and despair, which can lead to slower wound healing, prolonged hospitalization, intense nursing and medical care, treatment, and financial strain. In addition, infections, non-healing pressure ulcers, may indicate underlying osteomyelitis, dehydration, anemia, electrolyte imbalances, and malnutrition, which often cause complex pressure ulcers. Infections can manifest as systemic sepsis, leading to surrogate mortality. Therefore, it is important to carefully assess pressure ulcers, as good skin care is a hallmark of quality care. (Hanson et al., 2020).

The prevalence of skin lesions was as high as 27% in the pediatric intensive care unit (PICU), with the majority of ulcers developing within two days of admission. The prevalence rates of pediatric patients hospitalized but not in critical condition ranged from 0.47 percent to 13 percent (Schlüer et al., 2019). However, in adult ICUs there were about 20% developed pressure ulcers among bed-ridden ICUs hospitalized patients in the first 2 days postoperatively (Molon & Estrella, 2021). The first activities of preventing skin breakdown are the initial identification of patients, who are vulnerable to developing them. The earliest phases of skin breakdown development may show good prognosis and no external noticeable signs of damage. Therefore, the health care professional's duty has vital role in giving an immediate prevention plan to individuals at risk (Diab, 2017). Early and frequent evaluations, the choice of appropriate preventative measures, the treatment of existing skin conditions, and routine reevaluation of prevention and treatment strategies are all components of comprehensive skin care for patients (Melnyk & Fineout, 2021).

The SKIN bundle is a resource kit created to help with the evaluation and planning of care for patients at risk for developing pressure ulcers. Abbreviations indicate that the components of this bundle include skin, surface, keep moving, incontinence nutrition and hydration. It covers all areas of care in the community and is encouraged when patients are at risk for pressure ulcers, as indicated by the use of assessment tools or clinical judgment. The goal of the plan is to completely prevent pressure ulcers, identify problems early, prevent exacerbations, and promote healing (EPUAP, 2017). The nursing staff plays a critical role in putting into practice precise, doable rules that help standardize skin care and lower the frequency of skin damage. Therefore, it is necessary to provide staff education and training to inform employees of new standards for evaluating, monitoring, preventing, and treating skin damage (Schlüer et al., 2019).

Significance of the study:

The prevalence of skin damage is a criterion that hospitals evaluate and recognize as a patient safety issue because it can increase morbidity and mortality. With proper measures, most skin damage can be prevented.

Preventing skin damage is easier than treating and there are many identified risk factors that can be modified to prevent skin damage. Since the 20th century, skin injury has been acknowledged as one of the priciest and most disabling consequences. In addition to delaying rehabilitation, illness, and discharge, pain and skin damage can increase the risk of disability and death (Shiny, 2018).

International research has indicated that nurses' understanding of pressure ulcer prevention is lacking. It does not adhere to best practice principles, which is evident in practice (Beekman et al., 2021). The previous study did not include any statistical data on the frequency of skin injury. According to the study's authors, both pediatric and adult study participants who developed pressure ulcers experienced higher medical expenses, longer hospital stays, and higher rates of morbidity and mortality. A lot of the pressure ulcer prevention

that nurses practice is based on custom rather than scientific research. In order to give the most effective care, nurses in the critical care unit must deal with skin care for the most fragile patients. So, implementation of the protocol results in a significant decrease in skin breakdown, and the length of hospital stay. Additionally, lack of using assessment tool for early detection of skin breakdown and inappropriate care or deserting of patients suffering or at risk for skin breakdown are leading to negative effects.

Aim:

The study aimed to assess the effect of skincare bundle protocol on nurses' performance regarding prevention of skin breakdown.

Hypothesis:

The researchers' hypothesized that; an improvement in the nurses' performance will positively affect the prevention of skin breakdown after implementation of skincare bundle protocol.

Methods

Research design:

A quasi-experimental design one-group pre-posttest design.

Setting:

The research was performed in Orthopedic Surgery Departments and Traumatology Departments at El Hadara Orthopedic and Traumatology University Hospital, adult intensive care units at Main University Hospital and pediatric intensive care units at El-Shatby University Hospital of Alexandria

Subjects:

120 nurses working in the previously described settings made up a convenience sample, which was dispersed as follows: 40 nurses working in El Hadara Orthopedic and Traumatology University Hospital, 36 nurses, working in pediatric ICUs at El-Shatby University Hospital and 44 working in adult ICUs at Main University Hospital affiliated to Alexandria University.

Tools:

Tool I: Knowledge of nurses about the body skin and prevention of skin breakdown questionnaire

The researchers constructed this tool based on a survey of the literature and guided by **Gray-Siracusa & Sehrier (2011), Quigley and Noonan (2012), Galvin and Curley (2021), Kipps (2017), Agarwal et al., 2020 & Zuo and Meng (2018)** which included the following parts: **Part I:** was used to assess the characteristics of the nurses. It included age, educational qualification, marital status, years of experience, and training courses. **Part II:** Knowledge of nurses about the body skin and prevention of skin breakdown, it included 15 open ended questions regarding the following: (definition, anatomy and physiology, and function of the skin), skin breakdown (definition, causes, types, risk factors, common sites, degree, clinical manifestation and preventive methods of skin breakdown and skin care bundle protocol (definition, importance and components).

Scoring system of knowledge:

The score ranged from one to two, unsatisfactory knowledge gets "(1)" and satisfactory knowledge gets "(2)". The total score was 30, which represents 100% and categorized into two levels as follows: More than or equal 85% was considered satisfactory, and less than 85% was considered unsatisfactory.

Tool II : Skin care Bundle Observational Checklist used to assess practices among nurses toward prevention of skin breakdown through the protocol implementation phases. This tool adopted from **Gray- Siracusa & Sehrier (2011)**, it includes the following skin care bundle items: Surface, Keep turning, Incontinence care and nutrition.

Scoring system:

A scoring system for each of practice items done correctly was scored "2", and not done "1". The practice contents were divided into 31 steps. The total score of practice' steps responses was 62 equal 100%, accordingly 95%

or more was considered competent, and less than 95% was considered incompetent.

Validity and Reliability:

The validity of the tools has been confirmed by five experts. Two were pediatric nursing professors, the other two were medical surgical nursing professors, and one was a critical care professor at Alexandria University, faculty of Nursing, who reviewed the instruments for content accuracy. Utilizing Cronbach's alpha to evaluate internal consistency and construct validity led to the development of the reliability test, which has a Cronbach alpha of 0.82.

Administrative design:

An official consent was gained from the administrator of the settings for conducting the research. The purpose, nature, importance and expected outcome of the research were clearly explained.

Pilot study:

Prior to the start of data collecting, a pilot study was undertaken, and eight nurses, or 10%, were randomly chosen from the facilities. It was done to gauge the amount of time needed to finish the tool and to confirm the question's precision, applicability, and relevancy. The people who took part in the pilot study were included in the main sample because no modifications were made as a result of the pilot study's findings.

Ethical considerations:

To earn the trust of the participating nurses, the study's goal was explained to them. All nurses who accepted to take part in the programme verbally consented and acknowledged that they had the right to revoke their participation at any moment without providing a reason.

Protocol implementation phases

Phase 1: Assessment was done using the previous mentioned tools for data collection

Phase 2: Development of the protocol: Based on the findings from the evaluation phase, the researchers developed the protocol. It was changed and improved in light of relevant literature. **Gray- Siracusa & Sehrier (2011), Quigley and Noonan (2012), Galvin and Curley (2021), Kipps (2017) & Zuo and Meng (2018).**

Field work:

The researchers implemented the procedure over a nine-month period, from the beginning of January 2021 to the end of September 2021. The participants were met by the researchers three days a week (Sundays, Mondays, and Tuesdays) in the locations mentioned above beginning at 9:00 a.m. To 2.00 p.m. Nurses completed the questionnaire in roughly 15 minutes, but researchers needed 20 minutes to complete the checklist.

Phase 3: Implementation of the protocol :(1)

The protocol was applied on four sessions, two sessions for theory and two sessions for practice; each session took about 30 minutes. First session contents: aim of the program, knowledge related to definition, anatomy and physiology, and function of the skin. Second session contents: knowledge related to skin breakdown, definition, causes, types, risk factors, common sites, degree, clinical manifestations and preventive methods of skin breakdown; and skin care bundle was concerned with definition, importance and elements. Third session contents: Practices' sessions include the following items: Braden scale assessment. Fourth session contents: SKIN bundle care practice application. Implementation of the program phase was done using different methods of teaching: which included lecturers and discussions for theory, and followed by role play demonstration and re-demonstration for practices using simple Arabic language with many professional medical expressions for nurses and distributed into groups each included about 8-10 nurses. As well, audio-visual aids were used such as power point, posters, leaflets for theory and real equipment and videos for practice; the protocol

was distributed as a handout at the end of sessions.

Phase 4: Evaluation phases: Evaluation of the nurses was done immediately after completing the protocol implementation, while the follow-up evaluation was done after one month from beginning of the protocol by using the same pre-protocol tools.

Statistical Design:

Based on how the numbers and percentages were distributed, the data was arranged, amended, recorded, tallied, and then examined. The Social Science Statistics Package (SPSS) version 26 was used to conduct the statistical analysis on a computer. In order to compare quantitative variables, Pearson's correlation coefficient was used (n). The following factors were used to determine the results' significance: it is statistically insignificant difference; while $P < 0.05$, it is statistically significant difference; and $P < 0.001$, it is considered highly significant.

Results

Table (1) reports that about the socio demographic characteristics (50%, 52.3% and 50%) of the studied nurses' working at PICU and nurses working at adult ICU their and orthopedic departments age ranged between 25- <30 years. Regarding nurses' level of education, half (50.0%) of nurses working at PICU and adult ICU and 45% in orthopedic department had secondary and technical nursing education respectively. As regards of marital status, this

table reveals that, most of them (94.4% 93.2% and 70%) of nurses' working at PICU , at adult ICU and orthopedic departments respectively are married. In addition, the majority (86.1 %, 79.5% and 67.5 %) of nurses' working at PICU , at adult ICU and orthopedic departments respectively have more than 5 years of experience while, the majority (88.9%, 86.4% and 87.5%) of nurses' working at PICU , at adult ICU and orthopedic departments respectively didn't attend any training courses.

Figure (1) illustrates that, 93% and 90% of the studied nurses had satisfactory knowledge at immediately post protocol implementation and at follow up respectively, compared to only 20% of nurses who had satisfactory knowledge pre protocol implementation.

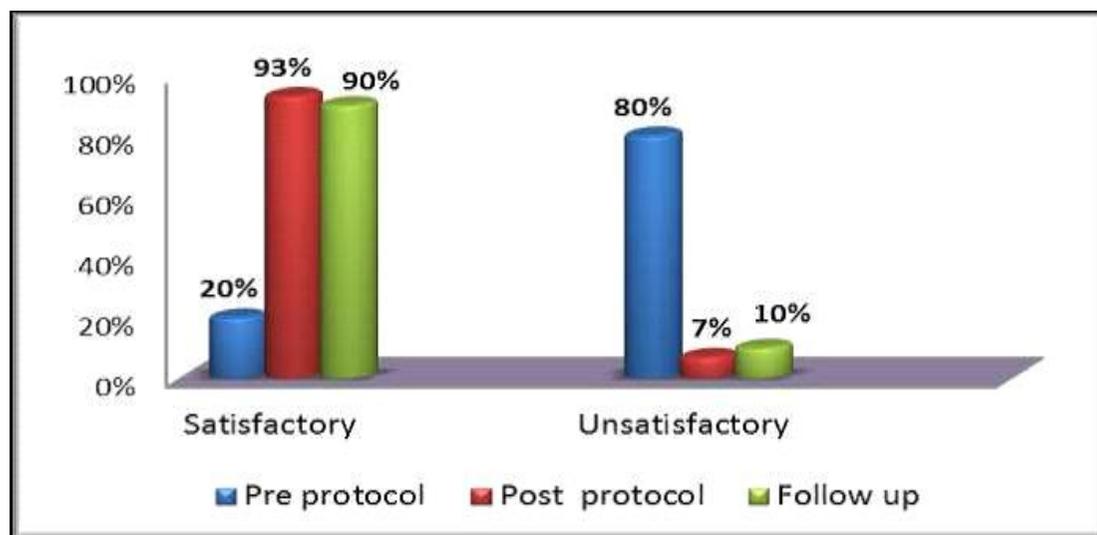
Figure (2) Shows implementations in nurses' total practices from 75%, 8%, and 10% being incompetent at pre, post and at follow up respectively to 25%, 92%, 90% being competent at pre, post and follow up skin care.

Table (2): Showed that there was a significant positive Correlation between nurse knowledge and practice regarding Skin and Prevention of Skin Breakdown (pre, post and follow up) with a statistically very significant difference at $p < 0.001$.

Table (3) shows that, there was a highly statistical significance positive correlations between knowledge scores, practice and nurses' age, educational qualification, years of experience and training courses at the post- and follow up protocol implementation ($P < 0.001$).

Table (1): Distribution of Nurses Regarding Their Socio Demographic Characteristics (N=120).

Items	Nurses working at PICU (n=36)		Nurses working at adult ICU (n=44)		Nurses working in orthopedic departments N=40	
	No	%	No	%	No	%
Age in years						
<20	2	5.5	2	4.5	5	12.5
20: < 25	3	8.3	4	9.1	15	37.5
25: < 30	18	50.5	23	52.3	20	50
Educational qualification						
Diploma nursing education	14	38.9	16	36.4	20	50
Secondary and technical nursing education	18	50.0	22	50.0	18	45
Bachelor of nursing	4	11.1	6	13.6	2	5
Marital Status						
Single	2	5.6	3	6.8	12	30
Married	34	94.4	41	93.2	28	70
Years of experience						
< 1	1	2.8	3	6.8	1	2.5
1-5	4	11.1	6	13.6	12	30
> 5	31	86.1	35	79.5	27	67.5
Training courses						
Yes	4	11.1	6	13.6	5	12.5
No	32	88.9	38	86.4	35	87.5

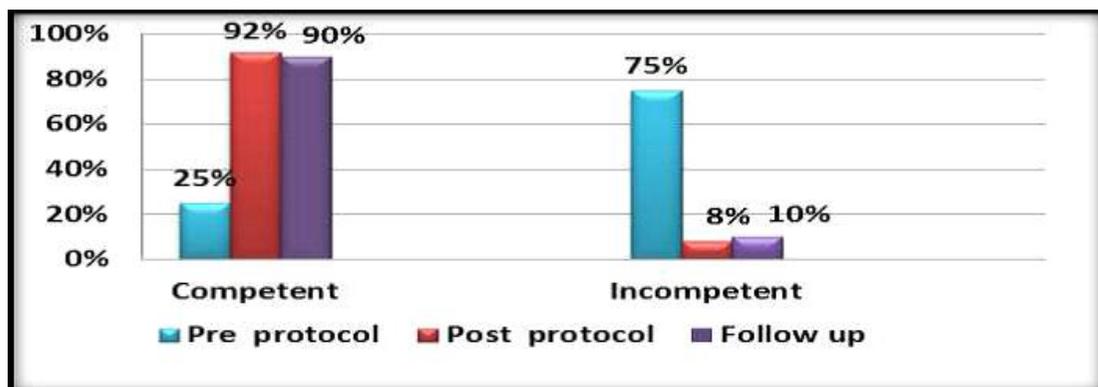
Figure (1): Distribution of The Studied Nurses According to Their Total Knowledge Regarding Skin and Prevention of Skin Breakdown (pre, post and follow up) (N=120).

X² = 12.31 P value= 0.001* @ X² = 13.31 P value= 0.001*

Nurses Knowledge Pre versus post

@ Nurses Knowledge Pre versus follow-up

Figure (2): Distribution of the studied nurses according to their total practices regarding skin care bundle (pre, post and follow up) (N=120).



$\chi^2 = 12.03$ P value= 0.001* @ $\chi^2 = 13.22$ P value= 0.001*

Nurses practice Pre versus post

@ Nurses practice Pre versus follow-up

Table (2): Correlation between Nurses Knowledge and Practice Regarding Skin and Prevention of Skin Breakdown (pre, post and follow up) (N=120).

Correlations		Pre Knowledge	Post Knowledge	Follow-up Knowledge
Pre practice	R	0.380		
	P-value	P< 0.001		
Post-practice	R		0.423	
	P-value		P< 0.001	
Follow-up practice	R			0.595
	P-value			P< 0.001

Table (3): Correlation coefficient between nurses' total knowledge/practices regarding protocol implementation (pre, post & follow-up) characteristics and nurses' demographic (N=120).

Variables		Age		Educational qualification		Years of experience		Training courses	
		R	p	r	p	r	p	r	P
Knowledge	Pre program	0.72	<0.05*	0.145	<0.05*	0.377	<0.05*	0.166	<0.05*
	Post program	0.544	0.001**	0.245	0.001**	0.246	0.001**	0.435	0.001**
	Follow up	0.451	0.02*	0.364	0.001**	0.422	0.001**	0.413	0.001**
Practices	Pre program	0.22	<0.05*	0.24	<0.05*	0.172	<0.05*	0.120	<0.05*
	Post program	0.433	0.001**	0.405	0.001**	0.263	0.001**	0.322	0.001**
	Follow up	0.532	0.001*	0.42	0.001**	0.344	0.001**	0.481	0.001**

* Statistically insignificant ($p > 0.05$) ** Highly statistically significant correlation ($P < 0.001$)

Discussion:

In general, preventing pressure ulcers means taking into account the roles of nurses, and all nurses should be on the lookout for PU-

risk patients. The people who work in health care must be able to compare the care they give to the standards that make sure the patient gets the best care possible (Peterson et al. 2015). The aim of this study was to evaluate the effect

of skincare bundle protocol to improve nurses' practices toward prevention of skin breakdown. The current research outcomes exhibited that the majority of nurses age was ranged between 25-<30 years. Regarding to nurses' level of education, half of them had technical nursing education. As regards marital status, the study results revealed that, most of them were married. In addition, the majority of nurses have more than 5 years of experience while, the majority of nurses didn't attain any training courses. This study findings were supported by Bassuni and Bayoumi (2017) stated that more than half staff nurses' total years of experiences extended between four to seven years, whereas for fewer than one quarter of them, it ranged between one to three years of experiences

The results of this study showed that, compared to before the skin care bundle protocol was put into place, almost all of the people in the study sample knew enough and were doing things well enough right after the protocol was put into place and during the follow-up. Also, nurses had very different levels of knowledge and practices about the skin care bundle protocol (P value 0.001), which was statistically very clear. This is due to the fact that nursing staff did not have sufficient knowledge and practice of skin care packages and the accurate identification of risk factors associated with the development of pressure sores (bedsores), the first step towards effective prevention. It may be the cause. On the other hand, all the steps in the skin care package are performed continuously for the patient, and their caregiver chooses only one or two steps to perform from the package, so the package does not perform correctly. After applying the protocol, the care package runs as a system and achieves the maximum effect than the sum of their parts.

The results of the current study were supported by those of *Zuo and Meng (2018)* who mentioned that critical care nurses should recognize proper measures to avoid the development of pressure ulcers, The study's findings demonstrated that, in comparison to before the skin care bundle protocol was implemented, practically everyone in the study sample knew enough and was performing their tasks adequately both during the follow-up and

immediately after the protocol's implementation. Additionally, nurses' knowledge and practises about the skin care bundle routine varied greatly (P value 0.001), which was statistically extremely evident. In a similar study *Galvin and Curley (2021)* highlighted that, Ideally, changes and expectations of the training guideline program or new guidelines are provided by a team of medical professionals who reduce the incidence of skin damage through the effective behavior of the intervention guideline program. Therefore, the risk of mortality for patients in the intensive care unit is reduced. They also categorized that strategic changes should be based on changing factors that precede the occurrence of skin damage.

The findings are congruent with *Tweed and Mike (2018)* who stated that, After the training program, the knowledge level of nurses improved. This finding is in agreement with that of another study carried out by *Cahill et al. (2020)* who showed that, A high level of healthcare professional compliance with a particular guideline or protocol was significantly associated with the deeper familiarity, satisfaction, and understanding of clinical guidelines..

Additionally, *Roxana (2017)*, In the study on reducing pressure ulcers in pediatric patients, it was indicated that nursing education and training programmes are crucial for enhancing nurses' expertise and performance and enhancing patient outcomes and avoiding skin damage issues. Also, *Kipps (2017)* who mentioned that Singing a new song my role in reducing the incidence of pressure ulcers in children. Performance of the Braden Scale in a pediatric population is similar to that consistently reported for the Braden Scale in adult patients in a study done by *Curley et al. (2018)*.

These results are accordance with *Parnham (2022)* who noted that, Pressure ulcers can be reduced by assessing the risk level of patients in the Pediatric Intensive Care Unit (PICU) and implementing appropriate pressure ulcer prophylaxis protocols. A thorough pressure ulcer risk assessment and pressure ulcer prevention (PI) plan will ensure that nurse

have an appropriate prevention strategy in place. Similar *Liu (2022)* who stated that, The Braden pressure ulcer risk prediction scale is important for the continuous assessment of the risk of developing pressure ulcers in all children in the ICU. As well, the current study results agreed with *Diab (2017)* who verified that, There were differences in nurse performance before and after the program, improving nurses' knowledge and practice related to post-intervention and follow-up of training programs in the ICU.

The present findings also support the idea of several studies as those of *Horner (2018)*, who stated that more educational sessions and continuous training, evaluation, and providing feedback to participants will improve understanding of the effectiveness of the intervention and familiarity with the bundle, and improve nurses adherence to the intervention. In the same line *Behairy & El-Mokadem (2017)* the skin intervention protocol was effective in the prevention and treatment of incontinence-related dermatitis (IAD), with a significant reduction in IAD incidence by days in the high-risk group, according to a study that was carried out in the medical and surgical departments at one of the Ministry of Health Hospitals in the center region of Saudi Arabia.

These results agreed with those of *Schindler et al. (2021)*, who verified that, Since the introduction of the skin care prevention program, improvements in nurse practice have been observed, reducing the incidence of pressure ulcers by 66%. These results show that pressure ulcers can be prevented by identifying patients at risk and implementing appropriate preventive strategies. In addition, the introduction of skin care packages has significantly improved the incidence of pressure ulcers in the study done by *Schindler (2020)* about "More than S.K.I.N Deep: Decreasing pressure ulcer development in the pediatric intensive care unit". Finally, this demonstrates the importance of practicing pressure ulcer prevention strategies. Based on coordinated assessments by medical institutions and clinicians, a practically effective pressure ulcer prevention package has been highly effective in reducing pressure ulcer development in critically ill patients in the ICU. This was supported by study done by (*Tayyib et al, 2021*)

Effectiveness of pressure ulcer prevention strategies for adult patients in intensive care units: a systematic review protocol "and *Gray-Siracusa and Sehrier (2011)*, in their study about "Use of an intervention bundle to eliminate pressure ulcer in critical care units".

There was a significant positive Correlation between nurse knowledge and practice regarding Skin and Prevention of Skin Breakdown (pre, post and follow up) with a statistically very significant difference. This was in agree with *Hashad R and Hassan R.(2018)* who proved that a significant positive association between nurse knowledge and practice before, immediately after, and during follow-up, with a statistically significant difference at $p < 0.001$

Regarding to the correlation between nurses' total knowledge and practices pre/post and follow up protocol implementation regarding prevention of skin breakdown and their socio-demographic characteristics. The current study showed that, there were highly statistical significance positive correlations between knowledge scores, practice and nurses' age, educational qualification, years of experience and training courses at the post- and follow up protocol implementation ($P < 0.001$).

This study findings agreed with those of *Bayoumi and Bassuni (2017)*, who mentioned that In their study on Saudi nurses' degree of knowledge regarding pressure ulcer preventive methods, there was a statistically significant correlation between the nurses' many years of experience and their level of knowledge. However, this study result was congruent with *Tweed and Mike (2018)*, who found that, no association was detected between demographic data and test scores. Additionally, the current study results were in the same line with *Diab (2017)* who confirmed that there were no statistically significant differences in nurse performance and years of experience, or nurse performance and nationality, before and after the intervention program. The current study result was in the same line with that of *Mersal (2018)* who stated that, there was a statistically significant difference between individual characteristics and the overall average of caregiver knowledge and practice associated

with the prevention of immovable complications.

Conclusion

The study proved that; skin care bundle protocol improved nurses' performance toward prevention of skin breakdown.

Recommendations

- Publication and dissemination of the skin care bundle protocol to improve nurses' performance toward skin care to prevent skin breakdown and decrease its complications.

- Skin care bundle to be effective, must be performed by nurses as systems and simultaneously

- Nurses must be trained to apply Braden scale to assess pressure ulcer risk level in children and adults as a first step in prevention and management of skin breakdown.

- Continuous updating of in-service training or on job training programs for nurses in pediatric and adult settings about skin care to prevent and manage skin breakdown.

References:

Agarwal, S., Classen, D., Larsen, G., Tofil, N.M., Hayes, L.W., Sullivan, J.E., Storgion, S.A., Coopes, B.J., Craig, V., Jaderlund, C., Bisarya, H., Parast, L. & Sharek, P. (2020): Prevalence of adverse events in pediatric intensive care units in the United States. *Pediatric Critical Care Medicine*, 11(5): 568-578.

Bayoumi, M.M. & Bassuni, E. (2017): Saudi Nurses' Level of Knowledge Regarding to Pressure Ulcer Preventive Measures. *International Journal of Prevention and Treatment*, 5(1): 7-11.

Beckman, D., Defloor, T., Schoonhoven, L. & Vanderwee, K. (2021): Knowledge and attitudes of nurses on pressure ulcer prevention: a cross-sectional multicenter study in Belgian hospitals. *Worldviews Evid Based Nurs*, 8(3):166– 176.

Behairy, A. & El-Mokadem N.M. (2017): Effect of Skin Intervention Protocol on

Incontinence-Associated Dermatitis among Patients with Fecal Incontinent IOSR *Journal of Nursing and Health Science (IOSR-JNHS)*. 6(6-9):24-31.

Cahill, N.E., Suurdt, J., Ouellette-Kuntz, H. & Heyland, D.K. (2020):

Understanding adherence to guidelines in the Intensive Care Unit: development of a comprehensive framework. *J Parenter Enter Nutr*, 34(6):616-624.

Curley, M.A.Q., Quigley, S.M. & Lin, M. (2018): Pressure ulcers in pediatric intensive care: Incidence and associated factors. *Pediatric Critical Care Medicine*, 4(3): 284-290.

DeLaune, S.C. & Ladner, P.K. (2011): *Fundamentals of Nursing, Standards and Practice*. 4th ed. US: Delmer.

Diab, S. (2017): Effect of Educational Guideline on Prevention of Skin Breakdown in Pediatric Critical Care Unit at Al-Jouf City *International Journal of Novel Research in Healthcare and Nursing*, 2(2): 12-24.

European Pressure Ulcer, National Pressure Ulcer Advisory Panel, & Advisory Panel and Pan Pacific Pressure Injury Alliance, (2017): Prevention and treatment of pressure ulcers: clinical practice guideline. In: Haesler Emily, editor. Osborne Park, Western Australia: Cambridge Media.

Galvin, P.A. & Curley, M.A. (2021): The Braden Q+ P: a pediatric perioperative pressure ulcer risk assessment and intervention tool. *AORN Journal*, 96(3): 261- 270.

Gray- Siracusa, K. & Sehrier, L. (2011): Use of an intervention bundle to eliminate pressure ulcer in critical care. *Journal of Nursing Care Quality*, 26(3): 216-220.

Hanson, D., Langemo, D.K., Anderson, J., Thompson, P. & Hunter, S. (2020): Friction and shear consideration in pressure ulcer development. *Advances in Skin and Wound Care*, 23(1): 21-24.

Horner, S.D. (2018): Best practices for improving intervention fidelity that every nurse should know. *J Spec Pediatr Nurs*, 17(2):171-174.

Hashad R and Hassan R.(2018).The Effect of Implementing A designed SKIN Care Bundle Protocol on Modifying Nurses' Practices toward Pediatric Intensive Care

- Unit Patients. *Journal of Nursing Didactics*, 8: (02) February.
- Kipps, S. (2017):** Singing a new song: My role in reducing the incidence of pressure ulcers in children. *Wounds UK*, 10(3): 76-79.
- Krupp, A.E. & Monfre, J. (2017):** Pressure Ulcers in the ICU Patient: An Update on Prevention and Treatment Topical Collection on Skin, Soft Tissue, Bone and Joint Infectious Diseases. *Curr Infect Dis Rep*, 17(3): 11.
- Lawton S. (2020):** Skin 2: accessory structures of the skin and their functions. *Nursing Times*, 116 (1): 44-46.
- Liu, F. (2022):** The clinical application of cluster nursing strategy in ICU patients with pressure ulcers. *Chin J Prac Nurs*, 28(15): 36-37.
- Melnyk, B.M. & Fineout-O. E. (2021):** Evidence-based Practice in Nursing and Healthcare: A Guide to Best Practice (2nd ed). Philadelphia: Lippincott Williams & Wilkins.
- Mersal, F.A. (2018):** Caregivers' Knowledge and Practice Regarding Prevention of Immobilization Complications in El-demerdash Hospital Cairo Egypt. *American Journal of Research Communication*: 2(3):78-98.
- Molon, J.N. D., & Estrella, E.P. (2021):** Pressure ulcer incidence and risk factors among hospitalized orthopedic patients: results of a prospective cohort study. *Ostomy Wound Management*, 57(10): 64-69.
- Palmer, L.H. (2019):** Prevention of Skin Breakdown in the Pediatric Intensive Care Unit. College of Nursing. UMI 3561837 Published by ProQuest, University of South Carolina.
- Parnham, A. (2022):** Pressure ulcer risk assessment and prevention in children. *Nursing Children and Young People*, 24(2): 24-29.
- Peterson, J., Adlard, K., Walti, B. I., Hayakawa, J., McLean, E., & Feidner, S. C. (2015).** Clinical nursespecialist collaboration to recognize, prevent, and treat pediatric pressure ulcers. *Clinical Nurse Specialist*, 29 (5), 276-282.
- Quigley, S. and Noonan, C. (2012):** Use the Braden Q Scale to Predict Pressure Ulcer Risk in Pediatric Patients, *Journal of Pediatric Nursing*, 26(6):566-575.
- Roxana, R. (2017):** Preventing pressure ulcers in pediatric patients, *Wound cares ADVISO Journal*, 4(4).
- Schindler, C.A. (2020):** More than S.K.I.N. Deep: Decreasing Pressure Ulcer Development in the Pediatric Intensive Care Unit. P, 85.
- Schindler, C.A., Mikhailov, T.A., Kuhn, E.M., Christopher, J., Conway, P., Ridling, D. & Simpson V.S. (2021):** Protecting fragile skin: nursing interventions to decrease development of pressure ulcers in pediatric intensive care. *American Journal of Critical Care*, 20(1):26-35.
- Schlüer, A. Cignacco, E. Müller, M. and Halfens, R. (2019):** The prevalence of pressure ulcers in four pediatric institutions. *Journal of Clinical Nursing*, 18(23): 3244–3252.
- Shiny, V. (2018):** Prevention of pressure ulcer for immobilized patients among care givers in Bapuji Hospital. *Medical Surgical Nursing*, 48.
- Still, M.D., Cross, L.C, Dunlap, M., Rencher, R., Larkins, E.R., Carpenter, D.L., et al. (2018):** The turn team: a novel strategy for reducing pressure ulcers in the surgical intensive care unit. *J Am Coll Surg*. 216(3):373–379.
- Tayyib, N. & Coyer, F. (2021):** Effectiveness of pressure ulcer prevention strategies for adult patients in intensive care units: a systematic review protocol. *JB I Database of Systematic Reviews and Implementation Reports*, 14(3): 35-44.
- Thomas, D.R. (2018):** Role of Nutrition in the Treatment and Prevention of Pressure Ulcers. 29 (4):466-472.
- Tweed, R.N. & Mike, T. (2018):** Intensive Care Nurses' Knowledge of Pressure Ulcers: Development of an Assessment Tool and Effect of an Educational Program. *American Journal of Critical Care*, 17(4): 338-346.
- Zuo, X.L. & Meng, F.J. (2018):** A care bundle for pressure ulcer treatment in intensive care units. *International Journal of Nursing Sciences*, 2(4):340-347.