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The Effect Of Capacity Building Of Nurses' Staff On Reducing Hospital Acquired Pressure Injury (Haps) In King Salman Hospital

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Abstract

Background: A Hospital-Acquired Pressure Injury (HAPI) is considered a nursing care quality indicator. HAPI prevention poses an essential challenge at King Salman Hospital, where the HAPI rate was 0.45% at the end of 2024, and the cost per HAPI case was 2500 SAR/day. The benchmark approved for King Salman Hospital is 0-3.9%.
Aim of the study: To decrease HAPIs below the current incidence rate, reaching 0-0.2% by the end of 2025.
Method: Quasi-experimental research design was utilized to conduct this study to reduce hospital-acquired pressure injury through using focused group training (n=217 nurses) for building the capacity of nurses' staff to reduce HAPI, the use of the turning clock strategy & increase the number of supplies needed in all departments reporting an incidence of HAPI.
Result: The findings indicated that the HAPI rate at the end of December 2024 was 55 cases with an incidence rate of 0.45, and decreased by more than 80% from the beginning of January 2025 to the end of December 2025 to reach 6 cases with an incidence rate of 0.047.
Impact: Improved patients' quality of life, increased patient safety, decreased average length of stay, decreased cost of extended hospitalization, and finally increased patient satisfaction.

Keywords: Pressure Injury, Hospital-Acquired, Patient Safety, Patient Satisfaction, Staff Education and Training.

Introduction:

Hospital-acquired pressure injuries (HAPIs) are localized injuries to the skin and underlying tissue, primarily caused by prolonged pressure, often in patients with limited mobility. According to the National Pressure Injury Advisory Panel (NPIAP), HAPIs can significantly impact patient outcomes and healthcare resource allocation. The prevalence of HAPIs in hospitalized patients ranges from 3% to 15%, emphasizing the need for effective prevention strategies [(1)].

Pressure injuries are often considered a result of poor quality of care**.** Furthermore, complications from HAPI can be fatal and life-threatening [(2)]. Therefore, nurses play a crucial role in assessing patients' needs, informing the care plan, and delivering standardized care to patients, which means nurses are in a desperate situation. There is a need for continuous training to prevent and manage pressure injuries [(3)].

King Salman Hospital in Riyadh has taken an evidence-based approach to address the high costs and risks associated with HAPIs. As of 2024, the hospital's HAPI rate was 0.0.45%, with treatment costs averaging 2500 SAR per day per case. To bring this rate closer to the approved benchmark (0-3.9%) and ideally lower, the hospital set a target of achieving a 0-0.2% HAPI incidence by the end of 2025. Research indicates that capacity-building initiatives, such as structured training programs that strengthen knowledge and attitudes in assessing and preventing pressure injuries, can reduce HAPI rates significantly by fostering effective nursing practices [(4)].

Capacity building in nursing involves comprehensive training programs, ongoing education, and the provision of resources necessary to enhance the competencies of nursing staff. According to Gaballah & El-Deen(2021)[5], effective capacity building incorporates evidence-based practices, interdisciplinary collaboration, and leadership development. Studies have shown that well-structured training programs can improve knowledge, attitudes and ultimately decreased incidence rate of HAPI [6].

One notable study conducted by Kathirvel, Kaur, Dhillon &Singh, 2021[7] involved a hospital-wide initiative focusing on capacity building through simulation training. The results indicated a marked decrease in HAPIs, attributed to improved nurse knowledge and attitude in risk assessment and prevention strategies. Furthermore, a cohort study by Kara& Kahyaoglu (2021) [8] reported that facilities investing in ongoing education and mentorship for staff nurses saw a 40% reduction in HAPI rates over two years.

Despite the positive outcomes associated with capacity building, several barriers hinder its implementation. Time constraints, staffing shortages, and lack of institutional support are commonly cited challenges **[9].** Moreover, there is often resistance to change among staff nurses, which can impede the adoption of new practices. Addressing these barriers is crucial for the success of capacity-building initiatives.

Significance of the study

Hospital-acquired pressure Injuries (HAPI) are a serious health issue that places a significant social and economic impact both nationally and worldwide. HAPI is still one of the biggest health concerns worldwide. For every 1,000,000 patients who develop HAPI, 65,000 die as a result of complications, representing a major health burden worldwide **[3].**

Although HAPI is an avoidable consequence, it is a large and costly concern for health care systems. Between 2016 and 2018, hospital-acquired complications, including pressure injury among increased fourfold in hospitalized patients **[14.15].** The care management of HAPI is considered a public health concern that extends in the hospital stay from 4 to 30 days, increasing cost and negatively affecting the patient's quality of life.

Aim of the study:

This study aims to:

Study the impact of these capacity-building interventions on HAPI rates in King Salman Hospital

Objectives*:*

1-Measuring outcomes such as decreased HAPI incidence.

2 -Understanding the relationship between structured nurse training and HAPI rate.

3- Contributing valuable insights into effective HAPI prevention strategies in hospital settings.

Research Hypothesis

This study hypothesized that staff nurses' knowledge and attitudes regarding HAPI preventive measures in their work settings would improve after implementing the designated focused group training, and that this improvement would positively affect the HAPI rate.

Subjects and Methods

Research design:

A quasi-experimental research design was utilized to conduct this study

Setting:

This study was performed at the Critical and inpatient departments, which reported the incidence of HAPI at King Salman Hospital

Duration:

14 months were taken to conduct the study.

Sample:

In this study, a convenience sample was utilized, which included all available staff nurses at King Salman Hospital who were working in the departments reporting incidence of HAPI (ICU, Step down

ICU(C1), cardiac &Palliative Department(C2), Surgical departments (A1, A2), medical departments (B1, B2)). The sample size was 217 staff nurses.

Inclusion Criteria

1. Registered staff nurses (RNs/Licensed Nurses) currently employed at King Salman Hospital who provide direct bedside patient care in one of the study departments: ICU, Step down ICU(C1), cardiac & palliative Department(C2), Surgical departments (A1, A2), medical departments (B1, B2).
2. Employed on a permanent, contract, or full/part-time basis and scheduled to work shifts in the target units during the data collection period.
3. Employed in the current unit for ≥ 3 months before study enrolment (to ensure familiarity with unit practice.
4. Aged ≥ 18 years, mentally competent to give informed consent, and able to read/communicate in the language(s) used in the study materials (Arabic and/or English).
5. Willing to provide written informed consent to participate in the study and complete study procedures (surveys, observations, or interviews as applicable).

Exclusion Criteria

1. Non-bedside Roles: Nurses whose primary duties are administrative, managerial, or educational and who do not perform routine direct patient care (e.g., Nurse Managers who do not roster/cover bedside shifts), unless they also regularly work bedside shifts in the listed units.
2. Students/Trainees: Nursing students, interns, or trainees in clinical rotation.
3. On Extended Leave: Nurses on planned leave (medical, maternity, sabbatical, or annual) for >2 consecutive weeks during the data collection period (unavailable for participation/follow-up.
4. Inability to Consent: Individuals unable to provide informed consent due to cognitive impairment or language barrier not covered by study materials.

Tool:

The tool was adopted from validated questionnaires from Beeckman, Defloor, Schoonhoven & Vanderwee. (2021) [16], including (Pressure Injury Knowledge Assessment Tool& Attitude toward Pressure Injury Prevention instrument). The tool was an online self-report electronic questionnaire; therefore, participants could submit their participation at their convenience. The usage of a valid questionnaire consisted of three sections [16]. The first section addressed the socio-demographic data of participants, such as age, sex, and marital status. The second section addressed knowledge about pressure injury and its prevention, while the third section addressed the attitudes of the participants toward pressure injury prevention. In the second and third sections. The tools used were originally in English; therefore, translation was not needed.

I- Section (1): Socio-demographic characteristics of the studied staff nurses:

It was adapted by the researchers based on recent relevant literature [17.18]; included age, gender, marital status, clinical experience years, educational level (qualifications), and….. etc.

II- Section (2): The pressure injury knowledge assessment questionnaire:

It consists of (26) multiple-choice items regarding pressure injury, with a maximum score of 26 where each item is scored as (1). These 26 items reflect five themes related to pressure injury Etiology and development, classification and observation, nutrition, risk assessment, reduction in the magnitude of pressure and sharing, and reduction in the duration of pressure and sharing. In this instrument, a 3-point Likert scale was used (1 = poor, 2 = average, 3 = good); the maximum score value was 78, and the minimum score value was 26, with a higher score indicating better knowledge. The scores for negatively worded questions were reversed. In this instrument, a mean score of ≥75% is considered satisfactory [16].

III- Section (3): Attitude toward Pressure Injury Prevention:

The instrument consists of (13) items. This instrument consists of five subscales, which are personal competency to prevent pressure injury, priority for pressure injury prevention, impact of pressure injury, responsibility for pressure injury prevention, and confidence in the effectiveness of pressure injury prevention. To collect the data, a 2-point Likert scale was used (1 = negative, 2 = positive); the maximum score value was 26, and the minimum score value was 13, with a higher score indicating a

more positive attitude. The scores for negatively worded questions were reversed. In this instrument, a mean score of ≥75% is considered satisfactory [16].

Pilot study:
To confirm the applicability and relevance of the study tools, a pilot study was performed with twenty-two staff nurses (10%) of all staff nurses in the previously mentioned critical and inpatient departments, to estimate the time required to complete the study tools and to recognize any probable barriers that may interfere collection of data. Staff nurses who took part in the pilot study were included in the entire study.

Tool's reliability:
The reliability of the tools was checked using Cronbach's Alpha. The reliability coefficient for the tool section (II) was 0.77, and for section (III) was 0.84.

Ethical Considerations
1. Approvals: King Saud Medical City IRB, KSH research committee.
2. Consent: Digital consent forms.
3. The subjects will be informed that they are voluntarily participating, and confidentiality and anonymity will be kept.
4. This study was conducted by the Declaration of Helsinki.
5. Subjects' confidentiality and data security are ensured in the study.
6. The sample is anonymous about the study aim.
7. The researchers are the ones who will save the data.
8. The sample will be told of the probable research utilization.
9. The primary investigator is responsible for the participants' privacy and confidentiality.
10. Data encrypted will be stored on KSH servers.
11. Data will be collected via secure online survey platforms. All collected data will be de-identified and stored in password-protected electronic files accessible only to the principal investigator and authorized research team members. Identifiable personal information will not be collected, ensuring strict confidentiality and data protection.
12. No patient treatment plan will be affected, nor will confidentiality be threatened.
13. The confidentiality and anonymity of the data collected will be maintained and will only be made accessible to research team members. The entire research population will be treated equally in this study.
14. The demographic data, e.g., gender, age, academic qualification, and years of nursing experience in nursing, will be obtained for the purpose of describing the characteristics of the population, and will not be intended for any inclusion/exclusion from the study.
15. The study will not do adversely affect the rights and welfare of subjects.
16. The subjects will be provided with pertinent information after participation whenever possible.

Field work:
The study took place from the start of January to the end of December 2025.
Phase I (Assessment):
•Pre-Intervention
-Baseline pre-intervention assessment of nursing staff knowledge and attitude related to HAPI prevention through a self-report electronic questionnaire (QR code) was sent to the targeted sample by a message to their official email.
-HAPI incidence rates & total number of cases for HAPI before intervention (collected from hospital records over a set period).
Phase II (Planning phase)
Capacity building construction is in the form of three interventions:
A. **The first intervention**: focused group training, workshops & lectures to enhance the preventive measures of HAPI for staff nurses.

B. **The second intervention:** using the turning clock strategy for all patients who in high risk for HAPI or the patients who already have HAPI to be turned all at the same time and be all in the same position.
C. **The third intervention:** working on the availability of all the needed supplies (air mattress for high-risk patient, wound care supplies for prevention and treatment of pressure injuries) for the prevention and treatment of HAPI. Based on baseline data obtained from pre-intervention assessment and relevant literature review, the educational intervention was developed by the investigator.

Phases III (Implementation phase)
The HAPI prevention interventions were established in response to the nursing needs and requirements identified in the assessment phase. The researchers also created the teaching materials and the media (videos, handouts & photos). The schedule of training sessions was organized depending on time available, number of nurses in the shift, and available resources, and then the staff nurses were split into small groups (7 groups) depending on their shift to conduct the training sessions, with each group consisting of seven or eight nurses. Each group took one week. They take into account the use of English as a language appropriate to the nursing staff's level. Reinforcement and motivation through training sessions are intended through training sessions to improve cooperation in this study.
The total number of sessions for each group of nurses investigated in this study was four, including two sessions for the theoretical portion and two sessions for the practical portion. The theoretical portion included information about the skin structure and physiology, the definition, causes, risk factors, signs / symptoms, stages, common locations and complications of HAPI. The practical portion was included assessment of risk, skin and nutrition, raising the head of the bed ≤ 30º, care of the skin, positioning, turning and moving, pressure relief, and range of motion exercises. The session lasted 30 to 45 minutes, with 10 minutes set aside for questions and feedback.

Each session began with a review on the prior session as well as the learning objectives of the new issues. Based on the studied nurses' requirements feedback and teaching were provided to confirm their understanding. Each nurse taken a printed copy of the Braden scale which served as a teaching method used for the theoretical part, while practical teaching methods which included demonstrations and re-demonstrations, videos, posters, and handouts as media.

Phase IV (Evaluation phase):
•Post-Intervention:
-Repeat assessment of staff nurses' knowledge and attitude after finishing the learning interventions.
-HAPI incidence rates & total number of cases of HAPI post the interventions.
Outcome Measures
•Primary Outcome: Reduction in HAPI incidence rate post-intervention.
•Secondary Outcomes: Improvement in staff nurses' knowledge, attitude, and adherence to HAPI prevention practices.

Data Analysis
Before further statistical analysis, the data were checked for homogeneity and normality using the Shapiro test. Mean and standard deviation (Mean, SD) were used to describe continuous variables, whereas number and percentage were used to describe categorical variables. To compare categorical data, the chi-square test was utilized, whereas the independent t-test and paired sample t-test were used to examine continuous variables. $p< 0.05$ was used to establish statistical significance. Pearson Correlation was also utilized to demonstrate the relationships between variables. The IBM SPSS version 25.0 was used for all analyses.

Limitations of the study:
This study has a few limitations. The first limitation was the use of a convenience sample. Although a convenience sample may impact the generalizability, it is more accessible to participants and inexpensive. However, it would be valuable to expand this study by including more hospitals in all the provinces of Saudi Arabia. Furthermore, this study only investigated staff nurses from critical and

inpatient departments, and it would be helpful to investigate this research phenomenon by including all staff nurses in King Salman Hospital. Also, a quasi-experiment does not rely on random assignment. Instead, subjects are assigned to groups based on non-random criteria.

Results

Table (1): It was cleared that more than two-fifths (46.1%) of studied staff nurses were in the age group 30 - < 40 years old with a mean age of 31.86±7.19 years. In relation to qualifications, the majority (80.6%) of them had a bachelor's nursing degree, and more than half (52.5%) of them had experience ranging from 0 to 5 years. Concerning gender, most (94.9%) of them were females. About their marital status, slightly less than three-fifths (58.5%) of them were married. As well as more than two-thirds (66.8%) of them were non-Saudi.

Figure (1): Displays that, less than one-fifth (16.8%) of staff nurses were distributed in intensive care units according to their current area of work (n=217).

Table (2) Elaborates that there was a highly statistically significant difference among mean scores of studied staff nurses' knowledge regarding hospital-acquired pressure injuries at pre- and post -post-intervention phases with (P<0.001). The total mean score of knowledge pre-intervention was (34.53±3.95) and improved to reach (42.22±3.18) after implementation of the intervention.

Figure (2) displays that less than a third (30.0%) of studied staff nurses had good knowledge regarding HAPI prevention at pre-intervention, it improved to the majority (80.7%) of them had good knowledge regarding acquired pressure injuries at post-intervention phases.

Table (3) clarifies that there was a marked improvement in the attitude of studied staff nurses toward acquired pressure injuries with a highly statistically significant difference (p<0.001) between pre- and post-intervention phases.

Figure (3) displays that less than one third (30.0%) of staff nurses had a good attitude toward hospital-acquired pressure injuries at pre-interventions, it improved to more than the majority (80.7%) of them had a good attitude at post-interventions**.**

Table (4): Clears that, after implementation of interventions, the total number of cases decreased from 55 cases to 6 cases throughout the study phases, respectively, by more than an 80% decrease in HAPI rate.

Figure (4): Shows that the total number of cases of HAPI was (55) cases pre-intervention implementation and improved to reach 6 cases post-intervention implementation, with more than an 80% decrease in HAPI.

Table (5) clarifies that there was a highly statistically significant relation between total knowledge score regarding hospital-acquired pressure injuries and (age, qualifications, and years of experience) of the studied staff nurses at the pre-intervention phase (P≤0.001). Furthermore, there was a highly statistically significant relation between total knowledge score and qualifications and years of experience of the studied staff nurses at post-intervention phases (P≤0.001). There was a statistically significant relation between total knowledge score and age of the studied staff nurses at post-intervention phases (P≤0.05).

Table (6): Demonstrates that there was a highly statistically significant relation between total attitude score regarding acquired pressure injuries and (qualifications and years of experience) of the studied staff nurses at the pre-intervention phase (P≤0.001). There was a statistically significant relation between total knowledge score and age of the studied staff nurses at pre-intervention phases (P≤0.05). Additionally, there was a highly statistically significant relation between total attitude score and (qualifications and years of experience) of the studied staff nurses at post-intervention phases (P≤0.001).

Table (7): Displays that there was a highly significant statistical positive correlation between the total score of knowledge and total score of attitudes of the studied staff nurses at pre-intervention and post-intervention phases (P≤ 0.001).

Table (1) Table (1): Distribution of the studied staff nurses according to their socio-demographic characteristics (n=217).

Socio-demographic characteristics	No	%
Age (in years):		
20 - < 30	88	40.6
30 - < 40	100	46.1

40 - 50	20	9.2
> 50	9	4.1
Mean ± SD = 31.86±7.19		
Min.= 20	**Max.= 55**	
Qualifications:		
PCT	8	3.7
Diploma nursing	16	7.4
Bachelor nursing	175	80.6
Master's degree and more	18	8.3
Current area of work:		
A1	32	14.7
A2	32	14.7
B1	35	16.1
B2	33	15.2
C1	30	13.8
D1	19	8.8
ICU	36	16.6
Years of experience:		
0-5 years	114	52.5
5-10 years	50	23.0
> 10	53	24.4
Gender:		
Males	11	5.1
Females	206	94.9
Marital status:		
Married	127	58.5
Unmarried	90	41.5
Nationality:		
Saudi	72	33.2
Non-Saudi	145	66.8

Table (2): Mean Scores of studied staff nurses' knowledge regarding acquired pressure injuries at pre- and post-intervention phases (n=217).

Knowledge domains	No. of items	Min./Max. score	Pre-intervention	Post-intervention	Paired t-test	P-value
			Mean ± SD	Mean ± SD		
Etiology and development	6	0/12	8.03±1.91	9.44±1.75	21.04	0.000**
Classification and observation	5	0/10	7.21±2.07	8.29±1.54	20.06	0.000**
Risk assessment	3	0/6	3.71±0.97	5.05±0.89	35.61	0.000**
Reduction in the amount of pressure	7	0/14	9.72±2.27	11.42±1.80	30.77	0.000**

Preventive measures to reduce the duration of pressure/shear	5	0/10	5.86±1.61	8.00±1.59	27.59	0.000**
Total score	**26**	**0/52**	**34.53±3.95**	**42.22±3.18**	**58.32**	**0.000****

Figure (1): Distribution of studied staff nurses according to their total knowledge score regarding acquired pressure injuries at pre- and post-intervention phases (n=217).

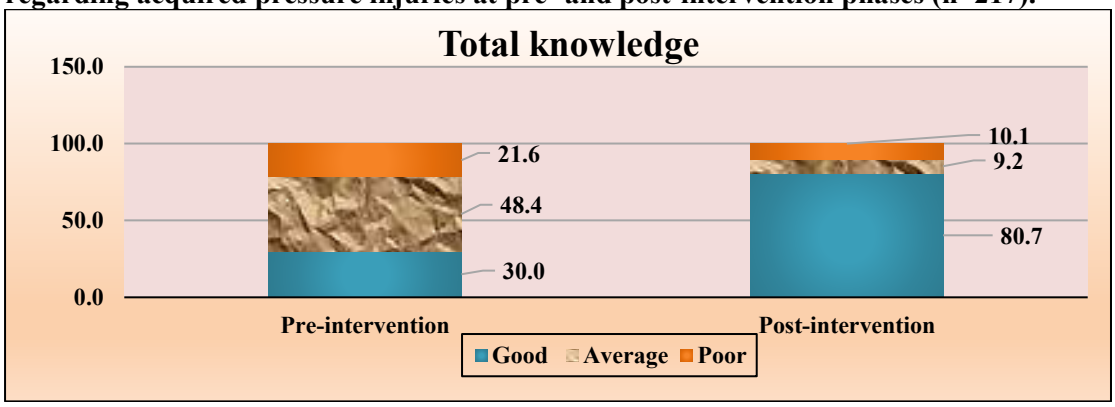

Table (3): Distribution of studied staff nurses according to their attitude toward acquired pressure injuries at pre and post-intervention phases (n=217).

Attitude items	Pre-intervention						Post-intervention						X^2	P-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
I feel confident in my ability to prevent pressure Ulcers	100	46.1	76	35.0	41	18.9	179	82.5	25	11.5	13	6.0	62.64	0.000**
I am well trained to prevent pressure ulcers	55	25.3	38	17.5	124	57.1	210	96.8	7	3.2	0	0.0	236.01	0.005*
Pressure ulcer prevention is too difficult.	83	38.2	64	29.5	70	32.3	25	11.5	30	13.8	162	74.7	79.92	0.003*
Others are better than I am	80	36.9	60	27.6	77	35.5	177	81.6	33	15.2	7	3.2	102.78	
Too much attention goes to the prevention of pressure ulcers	72	33.2	79	36.4	66	30.4	190	87.6	17	7.8	10	4.6	134.45	0.000**
Pressure ulcer prevention is not that important	85	39.2	68	31.3	64	29.5	19	8.8	27	12.4	171	78.8	108.29	0.000**
Pressure ulcer prevention should be a priority	65	30.0	66	30.4	86	39.6	164	75.6	32	14.7	21	9.7	94.08	0.000**
A pressure ulcer almost never causes discomfort for a patient	48	22.1	105	48.4	64	29.5	16	7.4	26	12.0	175	80.6	115.19	0.000**
The financial impact of pressure ulcers on a patient should not be exaggerated	57	26.3	113	52.1	47	21.7	118	54.4	90	41.5	9	4.1	49.65	0.000**
The financial impact of pressure ulcers on society is high	39	18.0	44	20.3	134	61.8	88	40.6	75	34.6	54	24.9	61.02	0.000**
I am not responsible if a pressure ulcer develops in my patients	47	21.7	121	55.8	49	22.6	23	10.6	20	9.2	174	80.2	150.64	0.000**
I have an important task in pressure ulcer prevention	51	23.5	119	54.8	47	21.7	173	79.7	33	15.2	11	5.1	137.44	0.001**
Pressure ulcers are preventable in high-risk patients	73	33.6	106	33.6	38	17.5	165	76.0	20	9.2	32	14.7	94.77	0.000**
Pressure ulcers are almost never preventable	36	16.6	55	16.6	126	58.1	10	4.6	16	7.4	191	88.0	49.44	0.000**

Figure (2): Distribution of studied staff nurses according to their total attitude score toward acquired pressure injuries at pre- and post-intervention phases (n=217).

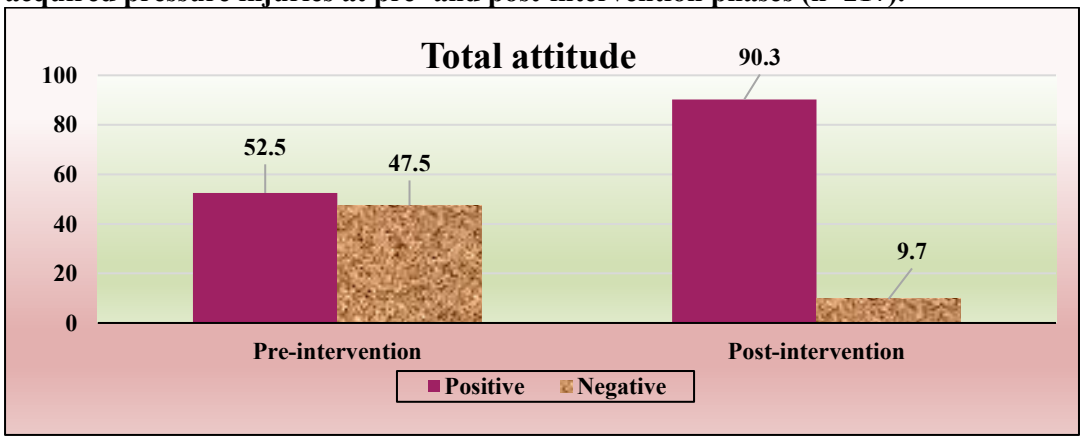

Table (4): Number of cases suffered from acquired pressure injuries in each department at pre and post-intervention phases (n=217).

Departments	Pre-intervention	Post-intervention	Paired t-test	P-value
	No.	No.		
Surgical department(A1)	7	0	26.36	0.000**
Surgical department(A2)	1	2		
Medical department(B1)	13	0		
Medical department(B2)	15	2		
Stepdown ICU(C1)	2	0		
Cardiac care unite& Palliative Department (C2)	4	0		
ICU	13	2		
Total	55	6		

Figure (3): Number of total cases suffered from acquired pressure injuries in each department at pre- and post-intervention phases.

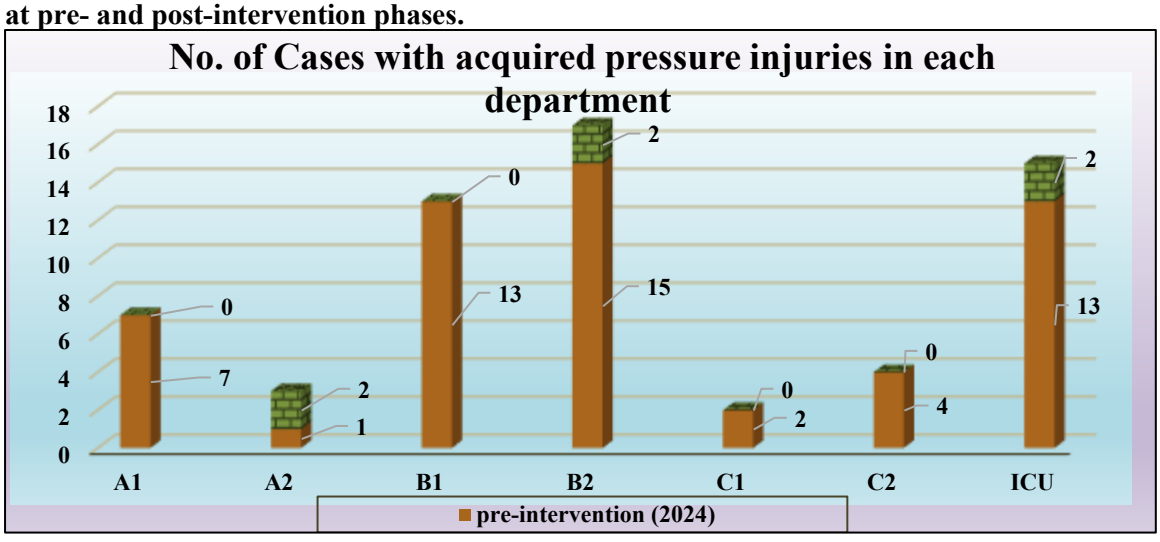

Table (5): Relation between total knowledge score and selected socio-demographic characteristics of the studied staff nurses at pre-intervention and post-intervention phases (n=217).

Socio-demographic characteristics	Total knowledge															
	Pre-intervention								Post-intervention							
	Good n= (65)		Average n= (105)		Poor n= (47)		Chi-square test	P-value	Good n= (175)		Average n= (20)		Poor n= (22)		Chi-square test	P-value
	No	%			No	%			No	%	No	%	No	%		
Age (years):																
20 - < 30	12	18.5	50	47.6	26	55.3	48.37	0.000**	65	37.1	9	45.0	14	63.6	20.53	0.002*
30 - < 40	34	52.3	55	52.4	11	23.4			90	51.4	6	30.0	4	18.2		
40 - 50	12	18.5	0	0.0	8	17.0			11	6.3	5	25.0	4	18.2		
> 50	7	10.8	0	0.0	2	4.3			9	5.1	0	0.0	0	0.0		
Qualifications:																
PCT	0	0.0	0	0.0	8	17.0	80.38	0.000**	0	0.0	1	5.0	7	31.8	74.75	0.000**
Diploma nursing	4	6.2	1	1.0	11	23.4			7	4.0	5	25.0	4	18.2		
Bachelor nursing	50	76.9	104	99.0	21	44.7			151	86.3	13	65.0	11	50.0		
Master degree and more	11	16.9	0	0.0	7	14.9			17	9.7	1	5.0	0	0.0		
Years of experience:																
0-5 years	16	24.6	72	68.6	26	55.3	81.77	0.000**	84	48.0	12	60.0	18	81.8	18.89	0.001**
5-10 years	8	12.3	31	29.5	11	23.4			50	28.6	0	0.0	0	0.0		
> 10	41	63.1	2	1.9	10	21.3			41	23.4	8	40.0	4	18.2		

Table (6): Relation between total attitude score and selected socio-demographic characteristics of the studied staff nurses at pre-intervention and post-intervention phases (n=217).

Socio-demographic characteristics	Total attitude											
	Pre-intervention						Post-intervention					
	Positive n= (114)		Negative n= (103)		Chi - square test	P-value	Positive n= (196)		Negative n= (21)		Chi - square test	P-value
	No	%	No	%			No	%	No	%		
Age (years):												
20 - < 30	40	35.1	48	46.6	10.17	0.013*	76	38.8	12	57.1	3.36	0.339
30 - < 40	53	46.5	47	45.6			92	46.9	8	38.1		
40 - 50	4	3.5	16	15.5			19	9.7	1	4.8		
> 50	7	6.1	2	1.9			9	4.6	0	0.0		
Qualifications:												
PCT	0	0.0	8	7.8	25.25	0.000**	3	1.5	5	23.8	33.35	0.000**
Diploma nursing	0	0.0	16	15.5			12	6.1	4	19.0		
Bachelor nursing	93	81.6	82	79.6			163	83.2	12	57.1		
Master degree and more	11	9.6	7	6.8			18	9.2	0	0.0		
Years of experience:												
0-5 years	55	48.2	59	57.3	13.23	0.001**	98	50.0	16	76.2	6.31	0.042
5-10 years	33	28.9	17	16.5			46	23.5	4	19.0		
> 10	16	14.0	37	35.9			52	26.5	1	4.8		

Table (7): Correlation between total score of knowledge and total score of attitudes of the studied staff nurses at pre- and post-intervention phases (n=217).

Variables	Total knowledge score			
	Pre-intervention		Post-intervention	
	r	P-value	r	P-value
Total attitude score	0.754	**0.000****	0.682	**0.000****

Discussion:

Numerous studies have shown that treating pressure injuries early results in benefits for both the patients and the healthcare system. For this reason, educating staff nurses is essential to both preventing and treating hospital-acquired pressure injuries [19]. So, this study aimed to study the impact of these

capacity-building interventions on HAPI rates in King Salman Hospital, measuring outcomes such as decreased HAPI incidence rate.

This study demonstrates a highly statistically significant improvement in the domains of knowledge and attitude of staff nurses after the implementation of the interventions. Less than one-third of staff nurses had good knowledge regarding HAPI prevention at pre-intervention, but the majority of them had good knowledge regarding HAPI prevention at post-intervention. The highest mean score of staff nurses' knowledge at the post phase was related to a reduction in the amount of pressure.

From the investigator's point of view, this improvement in the knowledge of staff nurses could have resulted from utilizing creative teaching approaches that can facilitate the interactions and collaboration in the learning process; however, increasing knowledge acquired by staff nurses could be explained by the fact that learning was not a passive experience, and courses created an interactive environment. Also, staff nurses put their concentration on learning more about HAPI prevention, and the priority was to early detect and prevent any new HAPI cases. In addition, the several cycles of repetition had created truly dynamic interactive educational sessions. Due to not all knowledge is reserved in the long-term memory as a biological fact, and needs to be periodically refreshed and updated.

This result was in line with what was found by Munoz (2021) [20], who discovered statistically significant improvements in knowledge about PI management and prevention. In addition, this result was confirmed by the work of Awali et al., (2018) [21], who demonstrated that, as compared to the pre-intervention, staff nurses' knowledge grew and stayed high throughout the study period for expanding the findings. On the contrary, the discovery is disagreement with Zeb et al., (2015) [22], they found that, even in the absence of the intervention's implementation, the majority of nurses have solid knowledge.

The result indicated that there was a highly statistically significant improvement of staff nurse' attitude toward HAPI prevention. Less than half of staff nurse had negative attitude level about HAPI prevention at pre-intervention, it improved to be most of them had a positive attitude level about HAPI prevention at post -post-intervention.

From the investigator's point of view, this improvement might be due to the HAPI prevention intervention that targets teaching staff nurses to be initiative, be creative and innovative, take responsibility, make quick decisions for their actions, and control their own work environment for the early detection and prevention of HAPI. Also, the effective utilization of more than one teaching medium to enhance the knowledge and attitude of staff nurses regarding HAPI prevention.

Concerning the staff nurses' level of attitude under examination, the present search determined that a significant improvement in staff nurses' level of attitude occurred after conducting HAPI prevention intervention. These results were consistent with Sabaq & Mohamed (2018) [23], who discovered a highly statistically significant improvement in staff nurses' compliance with most risk assessment, skin inspection, shifting positions, and nutrition items immediately after intervention.

These results concur with those of Kısacık, & Sönmez, (2020) [24], they claimed that staff nurses' level of attitude in the following areas considerably increased following the implementation of an educational intervention concerning HAPI prevention (assessment of the patient upon entrance, the time period of the patient's turning position using the turning clock strategy, skin protection throughout the transfer, and elevated bed).

In relation to total number of HAPI cases that shows that, the total number of cases of HAPI was improved post intervention implementation compared to pre intervention with more than half numbers decreased in HAPI. From investigator's point of view, this result may be due to the knowledge and attitude is basic for practice as improvement in HAPI prevention may be due to their information and approaches that had been improved through the interventions. It was also noted that there was a marked improvement in staff nurses' outcomes after the interventions, and this indicated the success of the capacity building and its impact on total number of cases of HAPI.

Regarding the relation of socio demographic data, it showed that there was a highly statistically significant relation between total knowledge score regarding hospital acquired pressure injuries and (age, qualifications and years of experience) of the studied staff nurses at pre-intervention phase. Furthermore, there was a highly statistically significant relation between total knowledge score and (qualifications and years of experience of the studied staff nurses at post-intervention phases. While,

there was a statistically significant relation between total knowledge score and age of the studied staff nurses at post-intervention phases.
Regarding the relation between total attitude score and socio demographic data, the result showed that there was a highly statistically significant relation between total attitude score regarding acquired pressure injuries and (qualifications and years of experience) of the studied staff nurses at pre-intervention phase. While, there was a statistically significant relation between total attitude score and age of the studied staff nurses at pre-intervention phases. Additionally, there was a highly statistically significant relation between total attitude score and (qualifications and years of experience) of the studied staff nurses at post-intervention phases.

In terms of clinical experience years, most of the nurses under study have fewer than ten years of clinical experience. The study findings agree with Frasson, Daures & Gelis, (2019) [25], in a published study who reported there was a highly statistically significant relation between total knowledge score regarding hospital acquired pressure injuries and (qualifications and years of experience). Corroborated with Bayoumi, and Bassuni, (2017) [26], who found that there was a statistically significant relation between total knowledge score regarding hospital acquired pressure injuries and age.
This finding contradicted with Lotfi et al., (2019) [27], who observed in their study that there was no statistically significant relation between total attitude score regarding hospital acquired pressure injuries and (age, qualifications and years of experience).
Regarding the correlation between the studied staff nurses' knowledge and attitude level, the result showed a statistically significant positive correlation between total staff nurses' knowledge and attitude in the pre & post intervention implementation. This finding suggested that the attitude may be quickly enhanced, especially if it were connected to an appropriate source of scientific knowledge.
This finding was congruent with Sabaq & Mohamed (2018) [23], Hashad & Hassan (2018) [28]; Mohamed & Weheida (2015) [29], who reported similar outcomes in their studies. Also, this finding is in same line with Truemanm &Whitehead (2010[30]), who demonstrated that staff nurses needed to maintain and attain a high level of knowledge and attitude. In order to be good in their practice, staff nurses must gain information prior to joining the field.

Conclusion

Based on the findings of the current study, it can be concluded that there was a marked improvement, and the result of the present study supported the hypothesis. Furthermore, there was a highly statistically significant positive correlation between staff nurses' knowledge & attitude and the total number of HAPI cases. From the current study results, it was concluded that applying a pressure injury prevention training workshop, turning clock reposition, strict supervision, and other ideal prevention measures for bedridden patients improved the knowledge and attitude of the studied staff nurses in King Salman Hospital.

Recommendations

- Offering an ongoing education and training program to staff nurses who care for patients at high risk of developing HAPI so they may improve their knowledge and attitude with pressure injury prevention.
- The first line of defense against pressure injury is to teach staff nurses how to utilize the Braden scale to assess patients' pressure injury risk.
- Further studies are needed to assess barriers to implementing pressure injury prevention measures.

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