

Effect of Implementing Fluid and Electrolyte Resuscitation Educational Package on Nurses' Performance and Outcomes of Patients with Burn

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Abstract

Background: Care of patients with burn includes resuscitating fluid and electrolyte in order to reach the balanced level which consider the key components to achieve the optimal outcomes of patient care. Maintaining safety of patients with burn is one aspect of nursing care that involve the accuracy of fluid and electrolyte resuscitation, particularly among patients who needing intensive care. In critical care and departmental settings, nurses respond to the needs of patients with burn utilizing the evidence-based nursing practice. As a result, the nurse needs to be aware of and react accurately to fluid and electrolyte resuscitation among that group of patients. **Aim:** the aim of the study, was to evaluate the effect of implementing fluid and electrolyte resuscitation educational package on nurses' performance and outcomes of patients with burn. **Design:** a quasi-experimental research design (pre- and posttest design) was utilize in the current study. **Setting:** The study was carried out at Mansoura University Hospitals' Plastic and Reconstructive Burn Center. **Subjects:** A convenience sample of 45 nurses who are working in burn department and ICUs in the previously mention setting, A convenient sampling of 45 Patients that had been admitted to the burn departments and ICUs were included in the study subject. **Results:** according to the current study finding complications of fluid and electrolyte imbalance reduced post educational package implementation compared to the baseline data with significance p- value (0=006). As well, the nurses knowledge scoring level and the observed practices scores were improved than they had been before, with highly statistically significant differences. **Conclusion:** The implementation of fluid and electrolyte resuscitation educational package had positive effect on improving nurses' performance with satisfactory outcomes among patients with burn. **Recommendation:** Educational package should be applied for all nurses to optimize their performance on fluid and electrolyte resuscitation among patients with burn.

Keywords: Fluid and Electrolyte, Resuscitation, patients with burn outcome, Nurses' Performance, Educational Package.

Introduction

Body fluids and electrolytes participate in maintaining the body's homeostasis and stable internal environment through uses of quantity of adaptive reactions connected with

these activities (Feher, 2017). It transports nutrients, electrolytes, and oxygen to cells and shift waste products away. Extracellular fluid (ECF) and intracellular fluid (ICF) compartments can be distinguished from total body water (TBW). (Giustiniani, Sanchez &

Galloway, 2022). When plasma electrolytes are balanced, the blood has the proper balance of ions, especially sodium, potassium, and magnesium. (**Begg, 2017**).

Monitoring of fluid and electrolyte include assessing, recording and calculating the intake and output. The quantity of fluid taken orally or through an intravenous infusion is referred to as intake. While output refers to the volume of fluid that the body expels through faces, sweat, urine, and breathing. Depending on the intake, urine output should be at least 0.5 ml/kg body weight/hour and fluid intake could be ranged from 1500 to 2500 ml per day. (**Asfour, 2016**).

When skin comes into touch with a heat source, burn occurs. Burns could develop from a variety of causes. Accordingly, fire or flame, scalds, hot objects, electrical, and chemical agents all are the most frequent causes of burns. Burn In terms of severity, injuries vary greatly. With more burn surface area, morbidity and mortality tend to rise. It is crucial to appropriately classify a burn, since it can help in confirm the outcome and direct initial management (**Warby & Maani, 2021**).

The primary management for patients **with burn**. is triage and acute resuscitation in the first 24 to 48 hours. Fluid and electrolyte resuscitation guidelines are based on the parkland burn formula. The core of resuscitation strategies is to reduce resuscitation complications (**Awad, Mohamed & Hamed, 2021**).

Fluid and electrolyte resuscitation considered supportive therapy to restore intravascular volume and maintain physiological parameters, such as mean arterial pressure and urine output, within normal limits(**Johnson, 2016**).

Resuscitation complications may include dehydration and/or over hydration, both of which could have clinical effects on patient with burn. Inaccurate monitoring of the fluid balance could lead to many complications, as hyper or hypovolemia, hyper or hyponatremia, hyper or hypokalemia. All these complications will

exacerbate the condition of patients and increase the mortality rate (**Johnson, 2016; Lam, Huong & Tuan, 2018**).

In severely burned patients' posttraumatic changes release systemic effects. Microvascular integrity is lost, and a plasma-like fluid leaks into the interstitial space, producing edema. (**Ruth & Mogileeswari, 2016**).

Circulating blood volume decreases dramatically during burn. In addition, evaporative fluid loss through the burned wound which may reach 3 to 5 liters or more over 24 hours period until the burned surface are recovered. During burn, serum sodium levels vary in response to fluid resuscitation. Hypernatremia is common during the first week of the acute phase. While hyperkalemia results from massive cell destruction. Hypokalemia may occur later with fluid shift and inadequate potassium replacement. (**Vincent & Mahendiran, 2015**).

At the time of burn injury some red blood cells may be destroyed leading to anemia. Also blood loss during surgical procedure and ongoing hemolysis are a further contributing factors to occurrence of anemia. Blood transfusions for patients with burn are required periodically to maintain adequate hemoglobin levels for oxygen delivery. (**Schaefer & Lopez, 2022**). The average water loss in patient with burns is about 100-300 ml per hour. The amount of water loss may reach as high as 350 ml per hour among patients with extensive burn. There is a need to not only replace water loss but also to provide for the energy requirement (**Lam, Huong & Tuan, 2018**).

According to the WHO, there are 11 million burn injuries of all kinds per year, 180,000 of which lead to death. According to the American Burn Association (ABA) National Burn *Repository 2019*, reports that, overall, flame burns still the most injuries in the USA are, with scalds second while chemical and electrical burn injuries occur much less commonly (**WHO, 2018**).

Burns are a serious health issue in Egypt and are linked to high mortality and morbidity rates. More than 100 burn victims need inpatient care each year, according to statistics from the Burn center at Mansoura University Hospitals (2019), where this study was conducted (**statistics and medical records department at the burn center, Mansoura university, 2018**)

Role of nurse in fluid and electrolyte resuscitation is very important. As the nurse plays a crucial role in the healthcare team by assessing and detecting changes in fluid and electrolyte levels among patients with burn. (**Bedi, Sarabahi & Agrawal, 2019**)

So, the nurse should have critical and reliable knowledge and competence performance regarding fluid and electrolyte resuscitation. Therefore, it is very important for nurses who work in burned department and Intensive Care Units (ICUs) to perform correct, accurate, appropriate assessment and monitoring of body fluid to promote patients' safety and managing patients with burn accurate fluid resuscitation (**Hassan, El-sayed, Mohammad & Sobeh, 2021**).

Significant of the study:

Burn is a wide-reaching community health problem secretarial for an estimated 180000 deaths yearly common among low- and middle-income countries. Likewise, death rate from burns in low and middle income is now 7 over times more than among high income countries (**WHO, 2018**). And through researchers' observations in practical setting in burned departments and Intensive Care Units a lot of patients have severe complications from their hydration status impairments when not provided for them a correctly and safety interventions in timely manner. Re-expanding the intravascular volume, providing sufficient sodium to restore cellular trans membrane potential, replacing other extracellular electrolytes, preventing life-threatening electrolyte disturbances that could cause cardiac arrhythmias, correcting hypoproteinemia, and raising colloid oncotic pressure are all part of

fluid resuscitation's goal of helping the patient to get through the first 24 to 48 hours after a burn. The accurate monitoring of fluid and electrolyte guides nursing interventions to achieve physiological stability. Therefore, fluid balance should be monitored and recorded accurately for patients with burn for 24-hs. Maintaining fluid resuscitation plays an important role in managing patients with burn. So, the researchers attend to evaluate the effect of implementing fluid and electrolyte resuscitation educational package on nurses' performance and outcome of patients with burn.

Operational definition of performance in this study included measuring the knowledge and practices.

Aim of the study:

This study's aimed to evaluate the effect of implementing fluid and electrolyte resuscitation educational package on Nurses' performance, and outcomes of patients with burn.

Research hypothesis:

H1. Nurses' performance will improve after resaving the fluid and electrolyte resuscitation educational package.

H2. Outcomes of patients with burn are expected to be improved after implementation of the educational package to the nurses.

Research Design:

To attain the aim of the study, a quasi-experimental research design (pre- and posttest design) was used.

Setting:

The current research was carried out in the Plastic & Reconstructive Burn Center at Mansoura University Hospitals. Burn center composed of five floors. Each floor consists of 5 wardrooms respectively, each room equipped with 4 beds. Two ICU rooms in the third and fourth floor each one contained 3 beds, one

emergency room in the first floor which provides optimal resuscitation care for patients with burn.

Sampling technique:

Software called G*Power was used to determine the sample size (Faul, Erdfelder, Lang, & Buchner, 2007). G*Power predicts that we would require 45 participants in a paired samples t-test in order to detect an effect size of Cohen's $d=0.43$ with 80% power ($\alpha=.05$, two-tailed).

Subjects:

The current study involved two groups of subjects (nurses and patients) as follow:

A convenient sampling of 45 Patients that had been admitted to the burned departments and ICUs and fulfilled the subsequent inclusion criteria: Adult patients willing to share in the study, from both sexes, conscious, up to communicate and collaborate with the program, receiving intravenous fluid administration or are at risk for body fluid and electrolyte imbalance during the period of data collection, with no chronic diseases or other co-morbid diseases, and/or mental disabilities.

In the previous mentioned setting, burn departments and intensive care units employed 45 nurses as a convenience sample. The current study involved nurses from both genders with different ages, educational background, and years of experience.

Data Collection Tools

Two tools were used to collect study data:

Tool I- A structured interview questionnaire:

Developed by the researchers after reviewing the related recent literatures to estimate nurse's knowledge and practice

regarding fluid and electrolyte resuscitation for patients with burn. It composed of two parts as the following:

Part (I): Concerned with demographic data about the nurses and consisted of (8) items: gender, age, educational qualifications, years of experience in burn unit, marital status, and previous participation in program or workshops about burns and training courses about fluids and electrolytes resuscitation for patients with burn.

Part (II): Concerned about demographic data for the patients, including age, gender, residence, social status, level of education, occupation, family income and living status.

Part (III): Concerned about burn parameter data, including, the date of admission, length of hospitalization, the origin of burns, the circumstances of the injury, the total body surface area, and the burn degree.

Tool II: Fluid and electrolyte resuscitation Knowledge Questionnaire.

Nurses' knowledge (pre/posttest): Section A: developed by the researchers after reviewing the related recent literatures to assess nurse's knowledge concerning fluid and electrolyte resuscitation for patients with burn. As well as electrolyte function, fluids and electrolyte imbalance forms, causes, clinical manifestation, complications, recommended management to each one, and nursing role. It formed of 16 MCQ questions,

Scoring system:

Each of the 16 questions had a set of possible answers. The correct answer received one mark, while the unknown, incorrect, or missed answer received zero. To determine the overall score for the nurse level of knowledge, the scores were added together. The range of the overall knowledge score was (0 to 16 marks). Three levels were used to categorize the knowledge score level.

▪ Poor = scores just under 50% of total scores (0 - less than 8 marks)

- Fair= 50–75% of the total number of sores (8 to 12 marks)

- Good= scores more than 75% of total scores (more than 12 marks)

Tool III: Fluid and Electrolyte Resuscitation Observational Checklist (pre / post-test):

This tool established by the researcher after reviewing the related relevant literature to assess nurse practice as regards fluid and electrolyte resuscitation for patients with burn through the following:

- Nurses' practice regarding to the measurements of the patients' intake and output.
- Nurses' practice regarding to fluid and electrolyte replacement therapy for patients with burn.
- Nurses' practice regarding to blood or plasma transfusion.

This observation checklist was classified into 3 categories; all of these categories composed of 25 steps. One mark was awarded for each correctly done step as the following:

1. Measurements of the patients' intake of fluid therapy (It included 10 items = 10 marks)
2. Measurements of the patients' output of fluid therapy (It included 7 items = 7 marks)
3. Fluid and electrolyte replacement therapy (It included 8 items = 8 marks)

The total practice score of the practice ranged from (0 to 25 marks) and was summed up for each nurse. The practice level was categorized into two categories as:

- **Unsatisfactory**= scores less than 75% of total scores (0 - less than 18.75 marks)
- **Satisfactory**= scores 75% of total scores and more than (18.75 to 25 marks)

Scoring system: The practice score was assigned as follows for each step: Done correctly = one mark and 0 = Not done or done

incorrect.

Tool IV: The Burn Specific Health Scale-Brief (BSHS-B):

The only particular burn outcome metric is the BSHS-B. It was first created by Blades et al., 1982 and later condensed (BSHS-B) by Munster et al., 1987. Most recently, the condensed version of (BSHS-B) was created by Kilda et al., 2001 and adopted to include only five elements in order to achieve the goal of the current study and is regularly and widely used in the burn area to assess the physical and psychological function of patients with burn.

For the psychological status, this scale was divided into 5 categories (affect, body image, interpersonal relationship, Heat sensitivity, and work); each category contained 24 items.

Scoring system: five- point scale with 5 continua (extremely, quite a bit, moderately, a little a bit and not at all). Each item was given a score in SPSS as extremely = zero, quite a bit = 1 mark, moderately = 2 marks, a little a bit = 3 marks and not at all = 4 marks as the following:

1. **Affect** (It included 7 items = 28 marks)
2. **Body image** (It included 4 items = 16 marks)
3. **Interpersonal relationship** (It included 4 items = 16 marks)
4. **Heat sensitivity** (It included 5 items = 20 marks)
5. **Work** (It included 4 items = 16 marks)

The total score of the scale for the psychological status ranged from (0 to 96 marks) and was summed up for each patient.

Content validity and reliability:

A panel of five professionals and specialists in the fields of medical surgical and critical care nursing from the nursing faculty at

Mansoura University conducted the study tools contents validity to determine the extent to which the study tools what face supposed to be measured. Minor changes were made in accordance to expertise suggestions, and the final form was agreed upon.

Testing reliability:

The reliability of the tools was examined using the Cronbach's Alpha coefficient test, and it was found that each of the four tools had relatively homogenous items based on the moderate to high dependability of each instrument. The reliability of the Burn Specific Health Scale-reliability Brief is 0.878, that of the knowledge tool is 0.70, that of the practice tool is 0.828, that of the complications tool is 0.70, and the tools' reliability is between 0.70 and 0.90.

Ethical Consideration & Human Rights:

The Mansoura University Faculty of Nursing's ethical and research committee will provide written clearance. Each participant given the opportunity to give their informed permission after being informed of the study's purpose and goals. After the researcher had explained the nature and goals of the study to obtain the cooperation, of the nurses and patients who agreed to take part in the current study provided their verbal agreement. The confidentiality of the data obtained was protected, and patients' privacy was safeguarded. The patients had the freedom to leave the research at any time without penalty.

The administrative design:

An official report was sent to the head of the Plastic and Reconstructive Burn Centre at Mansoura University Hospitals including the study title, aim, and objectives & granted an official consent. Also, patients' privacy was maintained, and data collection was done in a confidential manner.

Pilot Study

A pilot study was conducted on 10 % (5) of total number of participants to explore and

confirm the feasibility, objectivity, applicability, clarity, adequacy, content validity, and internal consistency of the study tools as well estimate the time needed to fill in the tools approach or instrument. The results of the pilot study will be used to check the proposed statistical and data analysis methods. Participants involved in the pilot study were excluded from the main study sample.

Field work:

From October 2020 to May 2021, a total of 8 months were spent in Data gathering which was organised into four phases (assessment, designing, implementation, and evaluation).

I: Assessment phase

The researchers collect baseline data regard the patients' studied groups and staff nurses who met the study criteria.

For nurses:

Collection of the data through personal interviews, and nurses' agreement was taken after the explanation of the study objectives. Demographic data, fluid and electrolyte resuscitation Knowledge Questionnaire and observational checklist were obtained as pretesting by researcher to assess needs, strength and weak points for nurses' knowledge and practices that need more emphasized on the study program.

For patients:

Collection of the data through personal interviews, and patients' agreement was taken after the explanation of the study objectives. Demographic data was collected, burn parameter data sheet were obtained as pretesting by researcher to assess needs of the head of the Plastic and Reconstructive Burn Centre at Mansoura University Hospitals granted official consent. Patients' privacy was maintained, and data collection was done in a confidential manner. The patients were cared by the trained nurses. The time required to complete the questionnaire ranged from 10 to 15 minutes.

Phase II: Designing fluid and electrolyte resuscitation educational package

Based on the needs, and educational requirements of the nurses, the researcher created fluid and electrolyte resuscitation educational package employing various methodologies. The most important elements of fluid and electrolyte resuscitation were also reviewed using current nursing textbooks and associated literature. It contained both theoretical and practical elements and was written in simple Arabic language with illustrations.

The teaching strategies:

For all nurses to understand the same educational information, lectures, group discussions, demonstrations, re-demonstrations, and practical training were utilized.

Phase III: Implementation of the educational package

For nurses included in the study educational intervention were delivered in two sessions:

- Theoretical sessions focused on nursing assessment measures, nurses' roles in maintaining fluid and electrolyte balance for The head of the Plastic and Reconstructive Burn Centre at Mansoura University Hospitals granted official consent. Patients' privacy was maintained, and data collection was done in a confidential manner and functions of the electrolyte, also was discussed.

- Practical sessions concerned by the fluid parameter measurement, fluid disturbance indications, fluid balance and nursing measurement. Every practical session was completed while working shifts. Six to eight nurses each small groups. Practical sessions were done in the nurses' working area to facilitate the training. Enough time was given for clarification and discussion.

- The educational package delivered throughout two months, every week one session and every session last about forty to fifty minutes. The nurses assigned to small groups

(6-8 each group) Teaching media as models, computer, and data show machine were utilized during the teaching sessions. The session implemented after providing the patients with burn their regular care, between the morning and afternoon shifts.

V1: Evaluation phase

Nurses' performance was reviewed pre and immediately post after implementation of the educational package using the previously mentioned study tools. Evaluation of the studied patients with burned condition done concerning occurrence of fluid and electrolyte complications were also done after the implementation of the educational package via tool IV.

Statistical analysis

Data collected, were sorted, coded, organized, classified, and transferred into forms specifically created to be fed into computers. The statistical programmed SPSS (Statistical Product for Service Solutions) v23 was used to conduct the statistical analysis.

Descriptive statistics were used to show the data as frequencies and percentages. For continuous variables, the arithmetic mean and standard deviation (SD) were employed, while for categorical variables, percentages were used.

Changes over time for qualitative variables were calculated using the Chi-square (χ^2) of association. Quantitative factors were compared between 2 paired members of one group using the T test and the Wilcoxon sign ranked test. T-test in pairs for variables with normally distributed data. For variables whose data did not follow a normal distribution, the Wilcoxon Signed Ranks test was employed. ANOVA was also used to compare groups both inside and between them.

Two quantitative variables were correlated using the Pearson correlation coefficient test to see whether there was a positive or negative correlation. If $P > 0.05$, the results were considered not significant; if $P = 0.05$, they were considered significant.

Results:

Table 1: showed how the studied nurses were distributed based on their demographic characteristics: out of 45 nurses, total study 75.6% were female. In addition, studied group aged between 30 -< 40 years old (48.9%). In addition, 95.6% of them were married. As regard to level of education only (42,2%) were graduated from faculty of nursing.

Table 2: distribution of demographic characteristics of studied patients: out of 45 patients, it was found that 48.9% were female and the mean and stander deviation of age group 40.91 ± 6.98 , while more than half (66,7%) living in rural area and married, followed by more than half (55.6%) had manual work, while the majority of them (88,9%) had enough income. Furthermore, most of the study subjects (95,6%) were living with family.

Table 3: displayed the distribution of the patients under study according to their burn parameters, with the mean number of days spent in the hospital ranging between 3.64 ± 1.49 . Slightly more than three quarter (75.6%) of studied patients were had thermal burn, while 86.7% of them had accidental burn, also, more than half (55,6%) of studied patients with third degree, slightly less than half (48,9%) of patients had burned body areas in head and neck. Regarding to type of treatment 93,3% had conservative treatment. The majority of time of fluid replacement was after hospital (95,6%), while more than half needed psychological rehabilitation and had complication after burn. (71,1%), (86,7%) respectively.

Figure (1): showed that distribution of studied patients according to their complication of fluid and electrolyte imbalance pre and post educational intervention ,out of 45 studied patients, above half of patient 32(71.1%) had hyperkalemia compared to 17(37.8%) post educational intervention with highly significant difference with p value (0.00).the majority of studied patients had hypovolemia30(66.7%)pre

educational intervention compared to post educational intervention 17(37.8%) with significance p- value (0=006). As regarding hypernatremia,14(31.1%) pre intervention compared to post intervention 8(17.8%)

Table (4): revealed the distribution of the studied nurses according to their knowledge scores regarding the fluid and electrolyte resuscitation for the burned patient pre and post the implementation of educational package, the majority of studied nursing after educational intervention had a good score knowledge 31 (68.9%), 10(22.2%)had fair practice and4 (8.9%) had poor knowledge with significance p- value ($p < 0.05$) and mean total score of knowledge post intervention 13.26 ± 3.16 , compared to pre educational intervention 36(80%) had poor knowledge ,and 9(20%) had fair knowledge ,with mean of total score of knowledge 5.06 ± 2.5 .

Table (5): Demonstrated an apparent increase in the subtotal mean observed practice score post educational package regarding fluid and electrolyte resuscitation for burned patients, as compared to pre intervention ($15.8 \pm 4.14 - 22.6 \pm 2.38$) respectively. All throughout the assessment, there were statistically significant differences in nurses' practices with p value (0.00).

Table (6) showed that total mean difference of the pre and post educational package regarding to practice level about the burn specific health -brief scale, where (36.35 ± 12.36) pre-educational intervention compared to (52.73 ± 16.83) post educational intervention with high statistically significant difference with p value= (0.00).

Table (7): reflected that there was a statistically significant difference with ($p = 0.00$) in the overall knowledge and observed practice scores of the studied nurses regarding the implementation of the fluid and electrolyte resuscitation educational package for patients with burn after educational intervention.

Table (1) Distribution of studied nurses according to their demographic characteristics

Item	N= (45)	%
Sex		
Male	11	24.4
Female	34	75.6
Age by years		
20 - <30	21	46.7
30 - < 40	22	48.9
40 - < 50	2	4.4
Marital Status		
Married	43	95.6
Unmarried/ Single	2	4.4
Level of education		
Nursing School	6	13.3
Technical nursing institute	5	11.1
Technical health institute	11	14.4
Faculty of nursing	19	42.2
Post-graduate	4	8.9

Table (2) Distribution of studied patients according to their demographic characteristics

Item	N= (45)	%
Sex		
Male	23	51.1
Female	22	48.9
Age by years		
30 - < 40	24	53.3
40 - < 50	14	31.1
50 and more	7	15.6
M(SD)	40.91(6.98)	
Residence		
Rural	30	66.7
Urban	15	33.3
Marital Status		
Single	14	31.1
Married	23	51.1
Divorced	2	4.4
Widow	6	13.3
Level of education		
Illiterate	8	17.7
Read and write	13	28.9
Primary	3	6.7
Preparatory	8	17.8
Secondary	6	13.3
University	7	15.6
Occupation		
Manual work	25	55.6
House wife	14	31.1
Employee	6	13.3
Family income		
Less than enough	5	11.1

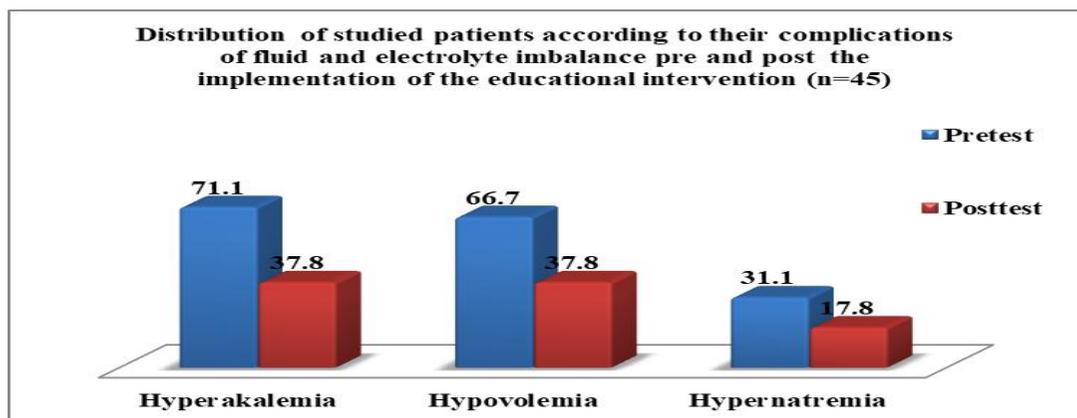
Enough	40	88.9
Living status		
Live alone	2	4.4
Live with family	43	95.6

Table (3) Distribution of studied patients according to their burn parameters data

Item	N= (45)	%
Length of hospital stay by days		
1	2	4.4
2	6	13.3
3	15	33.3
4	10	22.2
5	11	24.4
10	1	2.2
± SD		3.64±1.49
Cause of burns		
Thermal burn	34	75.6
Chemical	6	13.3
Electrical	5	11.1
Circumstances (mode) of burns		
Accidental	39	86.7
Suicidal	4	8.9
Other	2	4.4
Degree of burns		
Third	25	55.6
More than third	20	44.4
Burned body areas*		
Head and neck	22	48.9
Upper limbs	32	71.1
Anterior trunk	20	44.4
Anterior trunk	8	17.8
Lower limbs	11	24.4
Treatment*		
Conservative	42	93.3
Surgical (skin graft)	3	6.7
Time for fluid replacement		
Immediately after burn	2	4.4
After hospitalization	43	95.6
Need of psychological rehabilitation		
	32	71.1
Complication of burn		
	39	86.6

* The total number could be more than 100% as the studied patients can receive more than treatment

Figure (1): Distribution of studied patients according to their complications of fluid and electrolyte resuscitation pre and post the implementation of the educational intervention



(n=45)

Table (4): Distribution of the studied nurses according to their knowledge scoring level related to the fluid and electrolyte resuscitation for the burned patients pre and post the implementation of the educational package.

Knowledge level	Test time N = 45				% Of change	Test of significance	P-value*
	Pre (Time 1)		Immediately post (Time 2)				
	N	%	N	%			
Total score of knowledge = 16 marks							
Good	0	0	31	68.9	162	x ² = 56.653	0.000
Fair	9	20	10	22.2			
Poor	36	80	4	8.9			
±SD	5.06±2.5		13.26±3.16			t=17.654	0.000

Good = scores more than 75% of total scores.

Fair = scores 50% to 75% of total scores.

Poor = scores less than 50% of total scores.

P Significance

(SD) = Mean (Standard Deviation)

t for Paired t test

x² for Chi-square test

* Significant (p≤ 0.05).

Table (5): Distribution of the studied nurses according to the satisfactory level of their observed practice related to the fluid and electrolyte resuscitation for the patients with burn pre and post the implementation

Practice level	Test time N = 45				% of change	Test of significance	P-value*
	Pre (Time 1)		Immediately post (Time 2)				
	N	%	N	%			
Measurements of the patients' intake of fluid therapy (10 marks)							
Satisfactory	39	86.7	45	100	23	$\chi^2=6.429$	0.026
Unsatisfactory	6	13.3	0	0			
± SD	8.08±1.44		9.97±0.14				
Measurements of the patients' output of fluid therapy (7 marks)							
Satisfactory	7	15.6	32	71.1	84	$\chi^2=28.281$	0.000
Unsatisfactory	38	84.4	13	28.9			
± SD	3.17±1.64		5.86±1.32				
Fluid and electrolyte replacement therapy (8 marks)							
Satisfactory	12	26.7	35	77.8	50	$\chi^2=23.558$	0.000
Unsatisfactory	33	73.3	10	22.2			
± SD	4.55±2.16		6.75±1.5				
Total practice score (25 marks)							
Satisfactory	8	17.8	43	95.6	43	$\chi^2=55.43$	0.000
Unsatisfactory	37	82.2	2	4.4			
± SD	15.8±4.14		22.6±2.38				

Satisfactory = scores 75% of total scores and more.

Unsatisfactory = scores less than 75% of total scores.

±SD= Mean± Standard Deviation

χ^2 for Chi-square

t for Paired t-test

*Significant ($p \leq 0.05$)

nurses and patients according to their demographics was done in the first part, followed by the study of patients' burn parameters and complications in the second part, and the study of nurses' knowledge levels pre and post the implementation of the educational package. Fourth part studied nurses according to the satisfactory level of their observed practice pre and post the implementation of the educational package, fourth part Mean difference between the Burn Specific Health Scale-Brief pre and post the implementation of the educational intervention. Six-part, Correlation between knowledge and observed practice scores of the studied nurses, Relation between demographic and occupational characteristics of the studied nurses and total practice pre and post the implementation of the educational package.

The first part included demographic variables, regarding demographic characteristics; the current study showed that three quarter of the studied nurses were female. In addition, studied group aged between 30 -< 40 and they were mostly married. In relation to level of education about 50 % of them were graduated from faculty of nursing. On study done by **Melo, & Lima, (2017)** they agreed with the current study regarding that "Cost of nursing most frequent procedures performed on severely burned patients" and discovered that the majority of nurses were women, but more than half graduated from technical nursing institute. Also, **Hassan, El-sayed, Mohammad & Sobeh, (2021)** reported in their study that fewer than half of the nurses had diploma in nursing. While this finding disagreed with **Awad, Mohamed & Hamed, (2021)** and **El-Sayed, Gomaa And Abdel-Aziz, (2015)** in their studies which mentioned that the studied nurses 'age was $30 \geq 40$. Also, our findings disagreed with **El-Sayed, El-guindi and Omar, (2019)** in study about "Nursing Core Competencies of Staff Nurses Providing Care for Patients with Burn" which they discovered that most of the staff nurses' age was ranged from 20 to 30years old. Moreover, in a study done by **Sheta and Mahmoud, (2018)** under the title "effectiveness of structured educational program on knowledge and practice regarding body fluid balance for patients" they mentioned

that more nurses in their study had diploma school in nursing education.

Regarding demographics, characteristics the current study revealed that adult patients included in the study sample were between the ages of 30 and 40years old. it was found also that near to half were female, more than half living in rural areas, married, had manual work, with enough income and living with family. Similar findings are reported by **Youssef (2016)** who revealed that the highest percent of burn injuries were present among adult, married and manual workers. Furthermore, to some extent this may be similar to the results of **Hagag, 2011 and Regan & Hotwagner 2022** who reported that a higher ratio of burns was present in females who were housewives. Actually, they also added that these women got burned during preparing meal for her family by using the traditional cooking supplies. In other hand, these results in some points contradict the results of study done by **Abd El-Azeem, (2016)** at Minoufiya University who found that two thirds of participants were young adult and male.

Second part Concerning by parameters data about patients' burn, the present study showed that length of stay in hospital between 3 and 4 days, and the highest proportion of burns caused by thermal source, some patients had accidental burns with third degrees in neck and head and they received conservative treatment and fluid resuscitation after hospital admission. So, they had complications and need psychological support. Basically, there was clinical evident that flame is the most common source of fires caused by gas leakage resulting from unsupervised and careless handling without safety precautions at work and home. This point of view is confirmed by **WHO, (2017)** which reported that there are number of risk factors for burns. Correspondingly, similar findings of studies conducted at Ain shams university, Mansoura university, and Alexandria university, by the following researchers **Youssef (2016), Al-Sekely (2014), and Sayed-Ahmed, (2013)** respectively. As, they discovered that most patients had burns that were accidental and their burn injuries were caused by flame. The current study finding

agree with **Hassan (2015)** who claimed that greater than 50% of the study participants had higher than 25%TBSA from partial and full thickness burns. Moreover, **Basely, (2013)** and **Timothy, Schaefer, Karen& Szymanski, (2021)** reported that most of the studied subject had 2nd and 3rd degree of burns, and most common site of the body affected by burns was the upper limbs followed by lower limbs.

As regards to complications of fluid and electrolyte imbalance pre and post educational package of studied patients, according to the current study findings, the majority of patients had hyperkalemia hypovolemia and hypernatremia pre educational package implementation and decrease postimplementation of the educational package with highly significant difference between the both finding. These results were validated by **(Asfour, 2016)** who stated that (66.67%) of study sample had correct answer regarding Nurses' action for patients who had hypovolemia.

Third part of the present research showed that the studied nurse's level of knowledge regarding to the fluid and electrolyte resuscitation monitoring for the patient with burn pre and post implementation of the educational package, the majority of studied nursing after educational intervention had a good score compared to the result of the pre-test with highly significant statistical relation. This result agreed with **Olszewski et al., (2017)**, who reported that knowledge level was strongest regarding fluid resuscitation and calculation, with an improvement in knowledge level regarding fluid rate maintenance and calculation after reading the burn handbook.

Fourth part concerning with the nurses' knowledge about fluids and electrolytes resuscitation for patients with burn, the present study results showed that there were improvements in nurses' knowledge level regarding fluids and electrolytes resuscitation for patients with burn after implementation of the educational package. From the researchers' point of view is that the educational package which delivered in many sessions for nurses based on their assessed needs create a great

effect on nurses' knowledge about fluid and electrolytes resuscitation for patients with burn post implementation of the educational package. Also, this result answers the first hypothesis in this study. This study was agreed with another study done by **Sheta & Mahmoud, (2018)**, who documented that there were highly significant differences between pre and post program implementation in relation to total mean score of nurses' knowledges regarding body fluid balance assessment.

Fifth part is nurses' practices; concerning about the total scores of nurses' practices regarding monitoring fluid and electrolyte resuscitation for patients with burn pre and post educational package implementation, the current study also revealed that, the most of nurses had satisfactory practices score post educational package regarding measurement of fluid intake and output and replacement therapy with highly significant statistical relation after the implementation of the educational package.

So, it is cleared that the educational package helped nurses for improving their performance competently and correctly. Also, this result answers the first hypothesis in this study. These findings validated by **El Sayed & El Sayed, (2021)**, who mentioned that the majority of nurses had satisfactory practices post program implementation compared with unsatisfactory level preprogram implementation.

Concerning the burn specific health -brief scale that measuring studied nurses practice, The present research illustrated that there was a highly statistical significance difference between pre and post educational package implementation regarding to practice, as there was improvement in the mean scores of affect, body image and work after educational package implementation. This findings agreed with a study conducted by **Heydarikhayat, Ashktorab , Rohani and Zayeri,(2018)**, who reported that patients were called to check up on them and that the intervention group's mean scores for simple abilities, body image, treatment plans, and half a year after discharge were significantly higher than the controls'.

Also **Rezaei, Jalali, Heydarikhat and Salari, (2020)** reported that tele-nursing group after the intervention compared to the control and face-to-face education groups, had a significant rise in the mean scores for hand function, body image, interpersonal relationships, heat sensitivity, work, and sexuality.

The six-part related to correlation between knowledge and practice scores of studied nurses pre and post educational package implementation. This result means that there was an increase in nurses' knowledge that led to an increase in practice level also this may be due to effective, clear demonstration and re-demonstration of practice during the training sessions. This result agreed with **Mohamed, Mohamed & Taha, (2019)**, who stated that, there were highly statistically significant positive correlations between the studied nurses' total knowledge and total practices regarding monitoring fluid and electrolyte replacement therapy for patient with burn pre and post program. Also, this is confirmed with **Mahrn, Mahgoub & Abass, (2019)**, who demonstrated that there was statistically significant relation between nurses' knowledge score and level of practice regarding body fluid balance assessment post intervention. These findings are supported by the study done by **the Bedier, EL-Ata, and Shehab, (2016)** who cleared that following the implementation of the educational program, the overall mean practice score rose from 18 (3.30) before the program to 87.09 (14.55) after three months and 77.71 (11.54) after six months. So, it is cleared that there is strong correlation between knowledge and practice scores of studied nurses' pre and post implementation of the fluid and electrolyte resuscitation educational package.

Conclusion:

The current findings provide valuable data to nurses, educationalist, policy makers to guide future practices and better outcomes for patients with burn by highlighting the importance of education on fluid and electrolyte resuscitation for patients with burn. As the implementation of the educational package has

positive effect on strengthen nurses' performance and more satisfactory outcomes. Besides, burn-related complications were less common after the intervention.

Recommendations:

- To improve all nurses' performance regarding fluid and electrolyte resuscitation for patients with burn, an educational package should be implemented.
- Apprising nurses' performance and newly coupled nurses about fluid and electrolyte resuscitation for patients with burn.
- Provision in-service educational training and stressing evidence-based practices regarding fluid and electrolyte resuscitation for patients with burn
- Comparable study could be done with greater sample size is suggested to achieve generalization of the finding and wider application of the educational package.

References:

- Abdel-Azeem, N.B. (2016):** Pulmonary complications for predicting mortality among burn victims with major burn. master thesis. faculty of medicine. Minoufiya university.
- AL-Sekely, S.M.M. (2014):** A prospective study of patients with burn injuries admitted to burn unit at Alexandria main university hospital. master thesis. faculty of nursing Alexandria university.
- Asfour, H. (2016):** Fluid Balance Monitoring Accuracy in Intensive Care Units. Alexandria university IOSR Journal of Nursing and Health Science 5(4): 53-62 Available at www.iosrjournals.org Retrieved on 11-12-1019.
- Aslam, S., Afzal, M., Kousar, R., Waqas, A., & Gilani, S. A. (2017):** The assessment of nurses' knowledge and practices about fluid and electrolytes monitoring and

- administration among patients, International Journal of Applied Sciences and Biotechnology; 5(2): PP. 208-215.
- Awad MO, Sabah Said Mohamed SS& Hamed SM. (2021):** Effect of an Educational Program on Nurse's Performance Regarding Monitoring Fluid and Electrolyte Replacement for Burned Patients. Egyptian Journal of Health Care, 2020 EJHC,11 (4).
- Bayuo, J., Agbenorku, P., Amankwa, R., &Agbenorku,M.(2018):** Epidemiology and outcomes of burn injury among older adults in a Ghanaian tertiary hospital. *Burns Open.* ;2:98–103.doi:10.1016/j.burnso.2017.12.003.
- Bedi , MK., Sarabahi S & Agrawal, K.(2019):** New fluid therapy protocol in acute burn from a tertiary burn care centre. *Burns: journal of the International Society for Burn Injuries* 45(2). DOI:10.1016/j.burns.2018.03.011
- Bedier N.A, Ata A, Shehab M.S. (2016):** Effect of educational program on nurses' practice related to care of patients undergoing nasogastric tube feeding. *International Journal of Caring Sciences.*;9(2):432.
- Begg, D. (2017):** Disturbances of thirst and fluid balance associated with aging. *Physiology & behavior*, 178, 28-34.
- Blades,Mellis,N.,&Muster,A.M.(1982):**A burns specific health scale;22(10);8725DOI:1097/00005373-198210000-00012:
- Diacon, A., &Bell, J. (2014):** Investigating the recording and accuracy of fluid balance monitoring in critically ill patients. *S Afr J Crit Care*; 30(2):55-7.
- El Sayed, HI. & El Sayed, AI.(2021):** Nursing Efficiency in Maintaining Fluid and Electrolyte Balance at Pediatric Intensive Care Units.American Journal of Nursing Science. 10 (6), 254-263.doi: 10.11648/j.ajns.20211006.13.
- El-Sayed, A., EL-Guindi, F & Omar, H., (2019):** Nursing Core Competencies of Staff Nurses Providing Care for Burned Patients ,Master Degree in nursing science, Faculty of Nursing, Ain Shams university, PP113-116.
- El-Sayed, z., Gomaa, A. & Abdel-Aziz, M. (2015):** Nurses' Knowledge and Practice for Prevention of Infection in Burn Unit at University Hospital: Suggested Nursing Guidelines, Thesis for Master Degree in nursing science, Faculty of Nursing, Cairo university, pp154-156.
- Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007):** G*Power 3: A flexible statistical power analysis program for the social, behavioral and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Feher, J. (2017):** Quantitative human physiology: an introduction: Academic press:111-114. Effect of Post-Hospital Discharge Follow-up on Health Status in Patients with Burn Injuries: A Randomized Clinical Trial.
- Giustiniani PR, Sanchez NR & Galloway ST. (2022):** Fluid and electrolyte balance considerations for female athletes.European Journal of Sport Science. 22, (5).
- Hagag,O.H.T.(2011):** Bacterial profile of burn wound infection with special reference to extended spectrum beta-lactamases.masterthesis.high institute of public health.alexandria university.
- Hassan H , El-sayed EL, Mohammad SY & Sobeh D.(2021):** Assessment of nurses' knowledge and practice regarding fluid and electrolyte imbalance in CRITICAL CARE UNITS. *Port Said Scientific Journal of Nursing*, 8 (2).
- Hassan,S.M.F.(2015):** Burn patients Knowledge Regarding Rehabilitation: proposed rehabilitative guidelines. Master thesis. Faculty of nursing. cairo university.

- Heydarikhayat , Ashktorab , Rohani and Zayeri (2018):** Knowledge and Practice Thesis for Doctor Degree in nursing science, Faculty of Nursing, Minia University, PP176-178. **Munster ,A.M., Horowitz, G.L.,& Tudahl, L.A.(1987):** The Abbreviated Burn-Specific Health Scale. The Journal of trauma, 27(4), 425-428.
- Heydarikhayat N, Ashktorab T, Rohani C, Zayeri F. (2018):** Effect of post-hospital discharge follow-up on health status in patients with burn injuries: a randomized clinical trial. *Int J Community Based Nurs Midwifery*; 6(4):293.
- Johnson, P.(2016):** Practical Assessment of Volume Status in Daily Practice. Topics in companion animal medicine, 31(3), 86-93.
- Kildal, M., Anderson, G., Fugl Meyer, A.R., Lannerstam, k., & Gerdin, B. (2001):** Development of brief version of the Burn Specific Health Scale (BSHS-B). Journal of Trauma and Acute Care Surgery, 51(4), 740-746.
- Lam ,N., Huong, H. & Tuan. A. (2018):** Nurse Knowledge Of Emergency Management For Burn And Mass Injuries, *Annals Journal of burns and fire disasters*, 4(3) : 43-54.
- Lawati, M., Dennis, S., Short, S., & Abdulhadi, N., (2018):** Patient safety and safety culture in primary health care: a systematic review. *BMC Family Practice*, 19(1), 104. doi:10.1186/s12875-018-0793-7.
- Mahran, GHK., Mahgoub, AA., Abass, MS.(2019):** The effect of scenario based teaching for critical care nurses and physicians on their knowledge of fluid creep. *Journal of Nursing Education and Practice*. . 9(4), 86:97. DOI: 10.5430/jnep.v9n4p86
- Melo, T. D. O., & Lima, A. F. C. (2017):** Cost of nursing most frequent procedures performed on severely burned patients. *Revista brasileira de enfermagem*, 70(3), 481-488.
- Taha, S.(2019):** Effect of Educational Protocol Regarding Accurate Monitoring Fluid Balance on Critical Care Nurses'.
- Mohammed R, Hassan M, Mohammed I. (2021):** Nurses' Knowledge, Practice, and Attitude Regarding Burn Injury Management. *Minia Scientific Nursing Journal*, 9(1).
- Motamedzadeh, M., Mahmoudi, H., Nehrir, B., & Ebadi, A., (2017):** Patient Safety in Nursing: A Systematic Review. *International Journal of Medical Reviews*, 4, 52-57. doi:10.29252/ijmr-040205.
- Olszewski, A., Yanes, A., Stafford, J., Greenhalgh, D., Palmieri, T., & Sen, S. (2017):** Development and implementation of an innovative burn nursing handbook for quality improvement. *J Burn Care Res J*; 37(1): PP.20–24.
- Rezaei M, Jalali R, Heydarikhayat N, Salari N. (2020):** Effect of telenursing and face-to-face training techniques on quality of life in burn patients: a clinical trial. *Arch Phys Med Rehabil*; 101(4):667–673.
- Ruth, M., & Mogileeswari .P. (2016):** Knowledge and practice regarding fluid and electrolyte replacement therapy for patient with burns. *International Journal of Multidisciplinary Research and Development*; 3(4):217-20.
- Regan A; Hotwagner DT.(2022):** Burn Fluid Management. National Library of Medicine. <https://www.ncbi.nlm.nih.gov/books/NBK534227/>
- Sayed-Ahmed, S.M.E.(2013):** Effect of cognitive behaviour session on anxiety, depression and healing process among burn patients in Hehia burn center. Doctorate thesis (PhD). Faculty of nursing .Zagazig university.

- Schaefer, T J. & Lopez, ON. (2022):** Burn Resuscitation And Management. National Library of Medicine. <https://www.ncbi.nlm.nih.gov/books/NBK430795/>
- Lam NN, Huong HTX, Tuan CA. (2018):** Knowledge on emergency management for burn and mass burn injuries amongst physicians working in emergency and trauma departments. *Ann Burns Fire Disasters.* 30;31(2):138-143.
- Sheta, H. &Mahmoud, M. (2018).** Effectiveness of Structured Educational Program on Knowledge and Practice among Nurses Regarding Body Fluid Balance, *IOSR Journal of Nursing and Health Science,* 7(5):74-83 .
- Smolle, C., Cambiaso-Daniel, J., Forbes, A.A., Wurzer, P., Hundeshagen ,G., Branski, L. K., Huss, F., &Kamolz. L.P. (2017):** Burns. *Mar;* 43(2):249-257.
- Statistical and medical records department at burn center of Mansoura University Hospital. (2018):** Mansoura university. Egypt.
- Timothy J. Schaefer, Karen D. Szymanski. (2021):** Burn Evaluation And Management.National Library of Medicine.
- Vincent, M., and Mahendiran, T.(2015):** Improvement of fluid balance monitoring through education and rationalization, *BMJ QualImprov ;* 4 (1).
- Warby R and Maani CV. (2021):** Burn Classification.National Library of Medicine. <https://www.ncbi.nlm.nih.gov/books/NBK539773>.
- World Health Organization. (2017):**Burn fact sheet.URL:<http://www.who.int/medicentre/factsheets/fs365/en>. Accessed on:28Dec2017.
- World Health Organization. (2018):** Patient safety: making health care safer. Retrieved from Geneva: <https://apps.who.int/iris/handle/10665/255507>.
- Youssef,M.Y.M.(2016):** Psychiatric Morbidities among burn injury patients .PH.D thesis. Faculty of Medicine.Ain Shams University