

NURSES KNOWLEDGE, SKILL AND ATTITUDES TOWARD INSULIN ERRORS FOR DIABETIC CRITICAL ILL PATIENTS

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ABSTRACT

Background: The medical errors that caused death within 48 hours of the error involved insulin therapy. commonly to maintain the safety of critically ill patient, nurses are trained to care and be equipped with knowledge, skills and attitude to be the instrument of care. **Aim:** The purpose of this study was to assess nurses, knowledge, skill and attitudes toward insulin error for diabetic critical ill patient. **Setting:** This study was conducted in three of the ICUs of Assiut University Hospital. **Sample:** Eighty critical care nurses, working in the above mentioned settings, who apply insulin therapy administration, were recruited sequentially in this study. Eighty patients who were needed to insulin therapy and assigned to the observed nurses were included in this study. **Tools:** Three tools were used to collect the required data; nurses' insulin therapy performance checklist, nurses 'structured questionnaire sheet for assessment of nurse's knowledge and nurses, attitude related to insulin errors. **Results:** Ten (12.5%) nurses' have satisfactory performance and 70 (87.5%) of them have unsatisfactory. Concerning their knowledge, it is found that 20 (25%) of nurses had satisfactory knowledge, while 60 (75%) of them had unsatisfactory knowledge. most of studied nurses 25 (31.25%) had making

procedural errors, while 10(12.5%) demonstrated wrong route and charting errors. Positive attitudes also found toward the nurse workload become excessive, her performance is impaired (68.75%)and fatigue impairs performance during emergency situations (82.5%) . Negative attitudes were found toward documentation insulin therapy errors decrease punishment (42.45%). negative attitudes were reflected in disbelief that insulin assignment systems reduce insulin errors (43.75%). are in need for improvement.

Conclusion: *It was observed that the relationship between nurses' performance and their years of experience about insulin therapy there is statistically significant relationship between nurse's performance and their years of experience ($F=4.045$, $P=0.024$).*

Keywords: *Nurse; knowledge; skill; attitudes; insulin errors; diabetic ill patients; critical care unit*

INTRODUCTION

Hyperglycemia is most diabetes mellitus who display a worse diabetes mellitus (1). An estimated 23.6 million Americans (nearly 8% of the U.S. population) have diabetes mellitus. In 2007, approximately 17.9 million people have been diagnosed with the disease, and 5.7 million remain undiagnosed (2).Among adults diagnosed with type 1 or type 2 diabetes, 14% take insulin only, 13% take both insulin and oral medication, 57% take oral medication only, and 16% do not take either insulin or oral medication(3). The global prevalence of DM in the year 2010 among adults has been estimated to be 6.4%. It is estimated that by the year 2030, Egypt will have at least 8.6 million adults with diabetes making it the country with the tenth largest population of diabetics in the world 1.Diabetes is the eleventh most important cause of premature mortality in Egypt, and is responsible for 2.4% of all years of life lost

.Similarly; diabetes is the sixth most important cause of disability burden in Egypt. Diabetes is associated with reduced life expectancy, significant morbidity due to related micro vascular complications, increased risk of macro vascular complications (ischemic heart disease, stroke and peripheral vascular disease), and diminished quality of life . The recent WHO Stepwise survey of non-communicable diseases in Egypt, showed the prevalence of known diabetes to be 6.0%(4).However, even without diagnosed diabetes mellitus, in-hospital wards and in intensive care units and it carries a higher risk for increase in-hospital morbidity and mortality. Insulin administration has been used in patient hospitalized with critical illnesses, other than hyperglycemic crises to improve clinical outcomes (5). Type 2 diabetes is characterized by defects in both insulin secretion and Insulin action. Insulin has conventionally been administered via the subcutaneous route from vials and using syringes (6). Its therapeutic benefits are undeniable when health care processes are designed with appropriate safeguards. However, preventable harm associated with errors involving insulin use continued to be a problem in many hospitals. Insulin consistently appears as a top offender, leading to the most harmful and severe adverse events on the list of high-alert drugs published by the United States Pharmacopeia and Institute for Safe Medication Practices. Special safeguards to reduce the risk of errors associated with these drugs are recommended, including strategies such as improving access to information about the drugs, standardized ordering, storage, and administration of them, and automated or independent double- checks to verify appropriate administration (7). Studies spurred that 33% of the medical errors that caused death within 48 hours of the error involved insulin therapy. With this, the American Association of Clinical Endocrinologists and the American College of Endocrinology brought together national and international thought leaders in patient safety in endocrinology and metabolic disorders (8). Insulin therapy is a cornerstone of treatment in

type 1 diabetes and, in many cases, also critical to the management of type 2 diabetes. Despite evidence documenting the benefits of insulin therapy in achieving glycemic control and reducing risk of long-term diabetes complications, 1-4 insulin therapy remains underutilized, 5,6 with only 29% of adults with diabetes in the United States using insulin. This underuse reflects numerous barriers to treatment initiation as well as obstacles that hinder treatment adherence. Errors in insulin injection further curtail the ability of many patients to attain glycemic goals (6). Critically ill patients are highly vulnerable to medical errors, because they usually have both underlying comorbidities and acute organ dysfunctions. In addition, the life-sustaining treatments and highly technical routine care used in ICUs provide many opportunities for medical errors. Efforts have been made to develop standardized definitions of medical error. To be good-quality indicators, medical errors must be common, preventable, reproducible, easy to diagnose and to collect, associated with high morbidity and mortality, and easy to report without fear of punishment. In critical care, there is no generally accepted list of medical errors exhibiting these characteristics (9). In general, nurses are trained to care and be equipped with knowledge, skills and attitude to be the instrument of care. It is stated in the Professional Nursing Ethics that nurses should stay rooted and strictly adhere to the standards of nursing practice and any process must be done within the realm of standard procedure. As part of the nursing procedures, insulin and insulin administration should be taken for considerable (10). Currently, in intensive care units, the exposure of patients to situations in the clinical practice that affect their health condition has become a concern. The main aggravating factor for this exposure is the multiple drugs these patients receive, together with their physiological imbalance. Drug interactions, when they are not promptly prevented or treated, are among main

problems connected with the use of drugs intensive care units, and can cause irreparable harm to patients. Studies point out that is frequent in ICU patients with higher indexes compared to patients admitted to other units (11). From a professional stand point, the nursing team has a unique work in the prevention of drugs intervention, because it is responsible for scheduling, preparing, and administering and following-up drug effects. However, they must have knowledge and must know how to identify the possible drugs intervention so that patients are not exposed to unwanted situations. Medication errors involving insulin have been reported for many years, but despite this, their common occurrence continues (12). According to the most recent MEDMARXR report published by the United States Pharmacopeia , insulin, in all its dosage forms, has been the most commonly reported product involved in errors overall and the leading product involved in harmful errors. So, considering that the knowledge of diabetic is an important tool to optimize nursing care (13). So the present study was carried out to assess the knowledge, skill and attitudes toward insulin errors for diabetic critical ill patients of nurses working in intensive care units at Assiut university hospital.

AIM OF THE STUDY

The purpose of this study was to assess nurses, knowledge, skill and attitudes toward insulin error for diabetic critical ill patient at Assiut University Hospital.

PATIENT AND METHOD

Research design:

Descriptive research design was utilized to achieve the aim of this study.

Setting:

This study was conducted in three units (general intensive care unit, post-operative intensive care unit and traumatic intensive care unit) at Assiut university Hospital.

Sample:

A convenience sample included all available nursing staff working at the general intensive care unit (22nurses), postoperative intensive care units (20nurses), and traumatic intensive unit (38nurses) total number was (80 nurses).

Research questions:

What are Nurses, knowledge, skill and attitudes toward insulin error for diabetic critical ill patient?

Tools:

Three tools were used for collecting data in this study:

(A)Structured questionnaire sheet for assessment of nurse's knowledge:

It was developed by the investigator after reviewing of the related literature to assess the nurses, knowledge toward insulin therapy and it is error for diabetic critical ill patient (American Diabetes Association)¹⁴. It consisted four parts:

Part one: personal characteristics of nurses, name, age ,qualification, years of experience and duration in the current work place.

Part two: Nurses, knowledge regarding insulin therapy (16 items):

Definition of insulin ,indication, mechanism of action, which patients require insulin, ,lists prescription (type ,dosage ,timing of insulin injections Potential complication of insulin therapy) and Describes approximate time course of insulin action (identifies long and short acting insulin by

name, states approximate time delay until onset of insulin action, identifies need to delay food until 15-30 minutes after the injection, know that longer time delays are safe when blood glucose level is high, medication affect blood glucose level (steroids, dextrose IV, medication incompatible to insulin in the same IV line), TPN or enteral feeding monitoring and time delays may need to be shortened when blood glucose level is low.

Part three: assess nurses, knowledge concerning insulin therapy related practices; including; knowledge Regarding assessment, preparation, post care, maintenance, and documentation of amount, type of insulin, area of injection, time and undesirable effects from insulin.

Part four assesses nurses, knowledge regarding legal and ethical factors: related to the use of insulin therapy.

Tool (II) Nurses, Insulin therapy administration and errors observation checklist:-

This tool was adapted from Potter and Perry (10, 14, &15). It was used to assess nursing performance while applying and providing insulin therapy. It consists of three parts. **Part one:** includes type of the ICU, the shift (morning, evening or night) when the observation was taken, nurse and to patient ratio. **Part two:** involves patients characteristics, such as age, medical diagnosis, and past history. **Part three:** was used to observed nurses, practices while applying and maintaining insulin therapy. It contains **five main sections** covering the main steps of insulin therapy use and care, assessment, preparations, application, post care, maintenance and documentation. **First section** was for assessed before the application of insulin therapy, such as, induction of insulin therapy, physician's order, the site of injection and type of insulin. **Second section** is concerned with preparation for insulin medication

which involves preparation of equipment (insulin vial and syringes), patient, and environment. **Section three** was for the application of the insulin therapy including practices such as, draws up correct amount and type of insulin describes, sit rotation for injection with all anatomic areas to be used for subcutaneous injection or intravenous route and uses of syringe pump. **Section four** involves post care practices such as, washing hands and performing regular care while the insulin was maintained. Finally; **section five** was for documentation; which includes items such as ; amount, type ,area of injection, appearance of skin and undesirable effect from insulin. Finally 8 items to measure error consist of (wrong patient, wrong drug, wrong dose, wrong route, wrong time, procedural errors, charting errors and transcription errors.

Tool (III) Nurses, attitude related to insulin errors:

Diabetes attitudes, wishes, and needs instrument (DAWN) adopted by Peyrot et al (6) by structured interviews. It consists of 9 questions and used by researcher to assess nurses, attitudes toward insulin therapy errors.

METHODS

Permission was obtained from the hospital administrative authority to collect the necessary data. Confidentiality of the data was asserted. Explanation of the aim and methodology of the study was done to nurses by the investigator. The right to refuse to participate in the study was emphasized to the nurses. Validation of the study tools was assessed by presenting them to five experts from the critical care nursing and medical field and its result was 96%. Reliability was estimated by Alpha Cronbach's test for the tool and its result was $R=0.66$. A pilot study was conducted on 10% of nurses from three intensive care units at Assiut University Hospital to test the clarity and visibility of the tool for doing the needed modification. The researcher collected the needed data for

nurses, characteristics, their knowledge, performance and attitudes by applying tool (I, II& III).Data were collected during routine work of the units. Each nurse was interviewed individually for her knowledge, performance and attitudes towards insulin administration and error of hospitalized for diabetic critical ill patient .Time taken to fill the sheet from 30 to 45 minutes. The method of data collection for the tools, every nurse was met in the morning; afternoon and night shift to assess their knowledge, performance and attitudes .Data were collected during the period from the beginning of January 2010 to July 2010.

Scoring system:

- A)** Scoring system for data collection from knowledge questionnaire sheet:

It consists of 16 questions for nurses. A score of one was given for correct answer and a zero for incorrect answer. The grading of nurses according to their knowledge total score was done as follows:

Satisfactory =60% and more

Unsatisfactory less than 60%

- B)** Scoring system for data collection from observation performance checklist:

It consists of 15 points, in which; each practice performed completely and accurately is graded as one point. Incorrect, incomplete or not done practice is graded as zero. The maximum possible score for checklist is 15.

The grading of nurses according to their knowledge total score was done as follows:

Satisfactory =60% and more

Unsatisfactory less than 60%

C) Scoring system for data collection from Nurses, attitude related to insulin therapy &ITS ERROR: The responses were measured on a five point likert scale ranging from strongly agree to strongly disagree. Items were respectively scored 5, 4, 3,2and 1for the responses(strongly agree,agree,uncertain, disagree and strongly disagree). The scoring was reversed for negative items. The median score was14,nurses scored 14 and above were considered to have positive attitude while nurses scored less than 14 were considered to have negative attitude.

Statistical analysis of data:

Data entry was done using compatible personal computer. The statistically analysis was done using SPSS-16 statistical software package. The content of each tool was analyzed, categorized and then coded. Data were presented using descriptive statistics in the form of frequencies and percentage for qualitative variables. ANOVA test was used to compare means of among groups. Statistical significance was used at P. value <0.05.

RESULTS

All staff present accepted to participate, the response rate consequently becoming 100% total of 80 participated in our study.

Table (1): presents personal characteristics of the studied nurses:

Characteristics	Nurses (n=80)	
	No.	%
Place of work		
• General ICU	22	27.5
• Postoperative ICU	20	25.0
• Trauma ICU	38	47.5
Age: (Years):		
• < 20	20	25.0
• 20 – 30	25	31.25
• ≥ 30	35	43.75
Mean ± SD	29.72 ± 6.14	
Qualification		
• B. Sc Nurses	16	20.0

• Technical Institute of Nursing	18	22.5
• Diploma secondary nursing school	46	57.5
Years of experience:		0.0
• < 5	48	60.0
• 5 – 10	25	31.25
• ≥ 10	7	8.75
Duration in the current work place:		
• < 6 months	20	25.0
• 6 months < 1 year	20	25.0
• ≥ 1 year	40	50.0
Training course:		
• Yes	0	0.0
• No	80	100.0
Total	80	100.0

It is found that (16%) of the nurses have a bachelor degree, (18%) are graduated from the technical nursing institute, and (46%) nearly to half are graduated from the secondary nursing school.

As for nurses' years of experience at the intensive care Units (general, postoperative, and Trauma ICU), about two thirds of the nurses (66.0%) have an experience of less than 5 years. Regarding nurses age, it is found that 25% are aged below 20 years, and 31.25% are between 20 – 30 years.

Table (2): shows characteristics of diabetic critical ill patients:

Characteristics	No. (n=80)	%
Age:		
• 15 – 44	7	8.75
• 45 – 65	60	75.0
• > 65	13	16.25
Mean ± SD (Range)	52.13 ± 13.44 (16 – 70)	
Gender:		
• Male	55	68.75
• Female	25	31.25
Diagnosis:		
• CABG	15	18.75
• Trauma	20	25.0
• Metabolic disorder	10	12.5
• Endocrine disorder	8	10.0
• Renal disorder	6	7.5
• Respiratory disorder	16	20.0
• Neurological disorder	5	6.25
Total	80	100.0

C.A.B.G = coronary arteries bypass graft.

It is found that patients' ages are ranged between 16 and 70 years old; most of than 45 years old (60%), with a mean of (52.13±13.44) years. The study includes 55 males (68.75%) and 25 females (31.25%). Regarding the medical diagnosis, 20 (25%) patients has trauma and 16 (20%) had respiratory disorder.

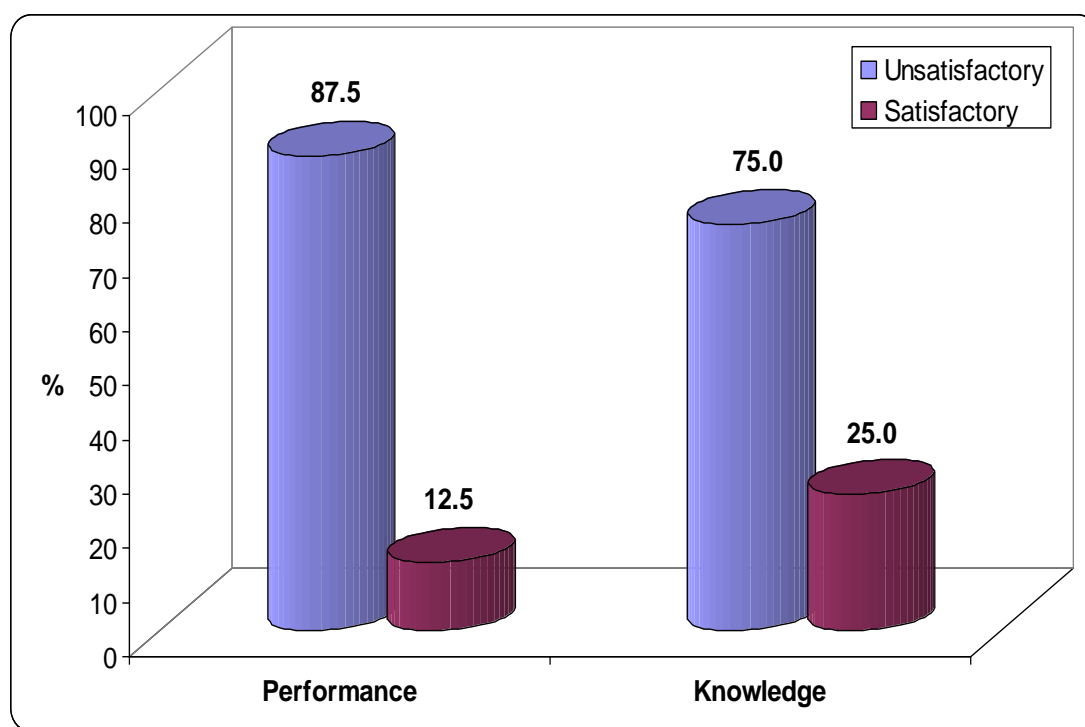


Figure (1): represents nurses' performance and knowledge regarding insulin therapy:

Regarding nurses performance, it is found that 10 (12.5%) nurses have satisfactory and 70 (87.5%) of them have unsatisfactory. Concerning their knowledge, it is found that 20 (25%) of nurses had satisfactory knowledge, while 60 (75%) of them had good knowledge.

Table (3): demonstrates nurses' knowledge concerning insulin therapy performance and their observed performance score:

Insulin therapy practice	Years of experience				P-value
	< 5 (n= 15)	5-10 (n= 37)	≥10 (n= 28)	Total (n= 80)	
Assessment	3.89±0.404	4.00±0.000	4.00±0.000	3.92±0.340	0.563

Preparation	2.43±0.558	2.60±0.516	2.60±0.548	2.48±0.544	0.603
Procedure	4.83±0.382	4.90±0.316	5.00±0.000	4.86±0.350	0.556
Post care	8.91±1.738	9.80±1.160	10.20±1.095	9.20±1.629	0.142
Documentation	0.00±0.000	0.00±0.000	0.00±0.000	0.00±0.000	--
Total	20.14±2.522	21.70±1.494	22.80±1.789	20.72±2.441	0.024*

ANOVA test

* Statistical significant difference (P < 0.05)

Regarding the assessment of insulin therapy, it was found that, 80 nurses (100%) know how to assess the need for insulin therapy and they do it. In relation to checking Physician's order, 80 (100%) perform and recognize that they have to do. Regarding the identifies information on label 34 (42.5%) nurses performed, 25 (31.25%) know. Regarding checked appearance of insulin 30 (37.5%) performed and knows.

Regarding identified where to purchase and store insulin 35 (43.75%) performed and know, according to describes approximate time course of insulin action, no one 0 (0.00%) perform, 10 (12.5%) know. In relation to identified concentration and size of syringe 10 (12.5%) performed and 20 (25%) recognize that they have to do. Regarding medication affect blood glucose level 20(25%) performed and 28 (35%) know. Regarding the procedure, half of nurses 40 (50%) who draw up correct amount and type of insulin and know how to draws up insulin therapy. Regarding properly mixes two insulin's 15 (18.75%) nurses performed and 25 (31.25%) nurses know. It was noticed that more half 70 (87.5%) nurses performed inserts needle and injected insulin's and know who to do that. In relation to describe sit rotation 50 (62.5%) nurses performed and know it and 50 (62.5%) performed and 60 (75%) know how apply aseptic technique. Regarding post care, assessment and observe for any allergic reaction no one 0 (0.00%) perform. 20 (25%) of them know. In relation to documentation (amount, type of insulin, date and time) all of them 80 (100%) performed and know but all of them 80 (100%) do not perform area of injection, appearance of skin and any undesirable effect from insulin and not know it.

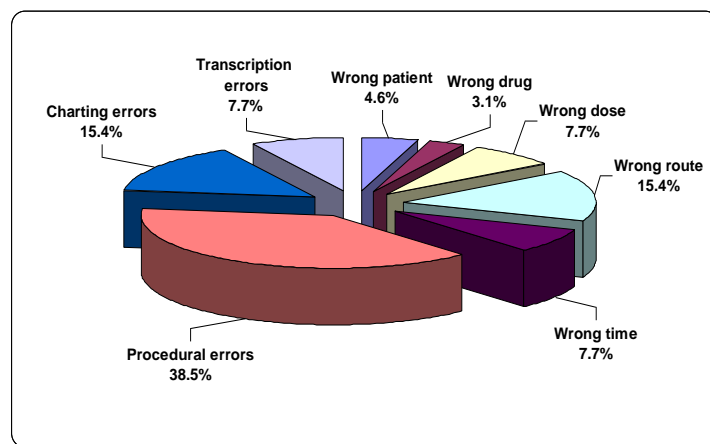


Figure (2): illustrates types of insulin errors in critical care units:

It was found that the most of studied nurses 25 (31.25%) had making procedural errors, while 10(12.5%) demonstrated wrong route and charting errors.

Table (4): shows the relationship between nurses' performance and their years of experience about insulin therapy:

Selected nurses' practice	Nurse who performed n=80		Nurses who know n=80	
	No	%	No	%
Assessment of insulin therapy				
• Assess the need for insulin therapy	80	100%	80	100%
• Check physician's order	80	100%	80	100%
• Identifies information on label of insulin bottle (type, species, manufacturer, concentration, expiration date)	34	42.5%	25	31.25%
• Checks appearance of insulin: - Clear of milky white. - Checks for flocculation.	30	42.5%	30	42.5%
• Identifies where to purchase and store insulin.	35	43.75%	35	43.75%
• Describes approximate time course of insulin action.	0	0.00%	10	12.5%
• Identifies concentration and size of syringe (U - 100)	10	12.5%	20	25%
• Identifies medication affect blood glucose level.	20	25%	28	35%
Procedures:				
• Draws up correct amount and type of insulin.	40	50%	40	50%
• Properly mixes two insulin if necessary.	15	18.75%	25	31.25%

<ul style="list-style-type: none"> • Inserts needle & injects insulin. • Describes site rotation. • Maintain aseptic technique. 	70	87.5%	70	87.5%
	50	62.5%	50	62.5%
	50	62.5%	60	75%
Post care				
<ul style="list-style-type: none"> • Assess & observe for any allergic reaction. 	0	0.0%	20	25%
Documentation				
<ul style="list-style-type: none"> • Amount, type of insulin, date, time. • Area of injection and appearance of skin. • Any undesirable effect from insulin. 	80	100%	80	100%
	0	0.0%	0	0.00%
	0	0.0%	0	0.00%

Regarding total score there is statistically significant relationship between nurse's performance and their years of experience, in which increasing years of experience is associated with an improvement with nurses performance, where (F=4.045, P=0.024) .

Table (5): Illustrates nurses' attitudes toward insulin therapy:

Items	Strongly disagree		Disagree		Uncertain		Agree		Strongly agree	
	No.	%	No.	%	No.	%	No.	%	No.	%
1- Documentation insulin errors decrease punishment.	20	25%	17	21.25%	9	11.25%	19	23.75%	15	18.75%
2- It is important that nurses to attend trainings and seminars for professional advancement.	5	6.25%	6	7.5%	4	5%	30	37.5%	28	35%
3- The nurses must be updating their knowledge about new medication in the market.	0	0	2	2.5%	10	12.5%	30	37.5%	38	47.5%
4- Insulin assignment reduces insulin errors.	10	12.5%	20	25%	15	18.75%	20	25%	15	18.75%
5-Identify the main types of diabetes and recommendation for treatment.	1	1.25%	2	2.5%	17	21.25%	28	35%	32	40%
6-When the nurse workload become excessive, her performance is impaired.	2	2.5%	3	3.75%	20	25%	30	37.5%	25	31.25%
7-Fatigue impairs performance during emergency situation.	1	1.25%	2	2.5%	29	36.25%	28	35%	20	25%
8-Ensure the final dose is accurate.	1	1.25%	2	2.5%	20	25%	28	35%	29	36.25%
9-Check blood glucose regularly.	1	1.25%	3	3.75%	10	12.5%	20	25%	46	57.5%

Positive attitudes were found toward the important that nurses update their knowledge about new medication in the market (85%) and attend trainings and seminars for professional advancement (72.5%) . Most nurses' correctly believed about check blood glucose regularly (82.5%) ,ensure that final dose is accurate (71.25%) and identify the main types of diabetes and recommendation for treatment (75%) .

Positive attitudes also found toward the nurse workload become excessive, her performance is impaired (68.75%) and fatigue impairs performance during emergency situations (82.5%) .

Negative attitudes were found toward documentation insulin therapy errors decrease punishment (42.45%). negative attitudes were reflected in disbelief that insulin assignment systems reduce insulin errors (43.75%).

DISCUSSION

The nursing profession is advancing with high standards and specialized knowledge through research and evidence-based practices. Knowledge changes the attitude and develops confidence for practice. In order to achieve recommended glycemic goals, many patients require the use of intravenous insulin therapy in the critical care setting. So the critical care nurse is responsible for monitoring the rate of plasma glucose decline in response to insulin (16). Because nurses care for their patients around the clock in hospitals, they see themselves as primarily responsible for their patient, well-being and the main role they play in health care team is to serve as key guardian of patient safety. However, injuries in health care today are all too frequent. Safety is defined as the freedom from accidental injury. Many injuries occur as the result of errors. Patients receiving continuous infusions of Insulin require close monitoring, which may increase workload for intensive care unit staff (17).

Although intensive care units (ICUs) were created for patients with life-threatening illnesses, the ICU environment generates a high risk of iatrogenic event (18). Therefore; this study was conducted to assess Nurses knowledge, skill and attitude toward insulin error for diabetic critical ill patient. Regarding patients' characteristics, it was found that most of the diabetic patients were aged between 45-65 years old, and the mean age was 59 years old. This is similar to Shawky & Al-Den, (4) finding in their research about the epidemiology of diabetes mellitus in Egypt. They found out that reported the total prevalence of diagnosed and undiagnosed diabetes in the Egyptian population above 20 years of age to be 9.3% (3). For the medical diagnosis, this study showed that about 25% of the diabetic critical ill patient had trauma, 20% respiratory disorders, 15% coronary arteries bypass graft type 2 diabetic patients on medication are using insulin because critically ill patients with trauma, respiratory, metabolic, endocrine, renal, neurological disorder and coronary arteries bypass graft surgery that are always need for monitoring and supportive care. This finding is supported by Wilson, Weinreb, and Soo Hoo (19), who found that the ideal insulin infusion protocol should achieve glycemic control in a reasonable timeframe, with minimal hypoglycemia, low operator error rate and minimal nursing time required and must take the type of patient into account. Regarding nurses' characteristics, this section will present a description of the nurses' characteristics working as factors affecting insulin therapy errors including; nurses' age, years of experience, qualification, results of this study reveal that the number of diabetic critical ill patients increased with the decrease in the number of nurses, and this usually occurs in the evening and night shifts more than the morning shift. This may be interpreted as there is a shortage of nursing staff in the evening and night shifts which increase nurses' work overload, consequently advance them to use restraint. The present study finding is in line with Phillipov and Phillips (20). In relation to nurses' qualification, the present

study found that nurses' performance in applying and maintaining insulin therapy increases with the increase in nurses' qualification. This can be explained by the fact that B.Sc. nurses received some training on insulin therapy administration while they were undergraduates as a procedure included in the nursing fundamental course. Nurses graduated from the technical institute of nursing received also training on insulin therapy administration and it is said effect, although it is brief. While, nurses graduated from the secondary nursing school did not receive any classes or clinical training on insulin therapy errors. In relation to nurses' experience, it was found that there is a significant relationship between nurses' performance and nurses' experience. This study showed that nurses with a higher experience are performing the procedure of insulin therapy administration better than others. These findings are congruent with Garrouste-Orgeas, Timsit, Vesin, et al(21) who are graduated that day to day activities enhance nurses' experience and improve their performance while applying and maintaining insulin therapy. The present study demonstrated that nurses' general knowledge regarding the practices of applying and maintaining insulin therapy as well as their performance were moderate. This could be explained by the lack of training for nurses on insulin therapy administration, the lack of written policies and procedures in ICUs guiding insulin therapy administration and inadequate supervision and guidance by the nurse supervisors. These results are supported by Peyrot and Associates (6) who indicated that the nursing staff knowledge and attitude regarding the use of insulin therapy and its errors were strongly associated with their use in practice.

In addition, nurses' performance and knowledge specifically, concerning this performance score are generally moderate and inadequate. It is clear that such low standard of performance in insulin therapy administration practice, is due to a combination of factors, some are related to the hospital and its system, patients

and the others are related to nurses themselves. For example, there is no physician order; the nurse can follow which is one of the important legal aspects. This finding may be attributed to lack of cooperation between nurse and physician regarding their role in participating in the decision of documentation for area of injection and appearance of skin and any undesirable effect from insulin. . Also there was no explanation for the patient when applying insulin therapy about undesirable effect from insulin. What is obvious as well was that the absence of any nursing documentations related to this may be attributed to their belief that during procedure is not ethically accepted, so, they do not document any data related to this errors during procedure. Moreover, they may not consider as an important insulin therapy errors during procedure that requires documentation. Current study is in line with study Espin S, & et al (22), which showed that nurse's records in a patient's chart rarely, mentioned the insulin therapy error which happens.

Another objective of the study was to determine the attitude of nurses on insulin therapy errors. 9 questions were answered which contained either positive attitude dimensions or negative attitude dimensions. More than (85%) of nurses strongly agreed with the fact that they needed to new medication in the market and attend trainings and seminars for professional advancement (72.5%). Most nurses' correctly believed about check blood glucose regularly (82.5%) ,ensure that final dose is accurate (71.25%) and identify the main types of diabetes and recommendation for treatment (75%) . More than 68.75% indicated that the nurse workload become excessive, her performance is impaired and fatigue impairs performance during emergency situations (82.5%) .

Negative attitudes were found toward documentation insulin therapy errors decrease punishment (42.45%). negative attitudes were reflected in disbelief that insulin assignment systems reduce insulin errors (43.75%). Current study is

in line with study Stathi & Crisp (23&24) and Garrouste and et al., (25) mentioned that Clinical nurse specialists, specialized in diabetes and trained to understand the behavioral aspects of living with chronic illness, are especially well positioned to provide the patient education and coaching necessary to promote diabetes self-management. National Coordinating Council for Medication Error Reporting (26, 27&28), Advance Collaborative Group (29) Bode et al., (30) and mentioned that Organizations should strive to identify system-based causes of errors with the use of both insulin vials and insulin pen devices and implement effective types of error reduction strategies. Error reduction strategies such as constraints and standardization, which are more powerful because they focus on systems, will be more effective than education alone, which relies on individual performance and will likely be ineffective when used alone. Constraints Organizations should use strategies that lessen the Many strategies that could prevent harm with the use of insulin could be addressed by simplifying and Organizations must determine the safest way to receive, document, communicate Employ strategies to distinguish or make insulin products different in appearance

CONCLUSION

Based on the findings of the present study, it can be included that personal characteristics of the studied nurses found that (16%) of the nurses have a bachelor degree, (18%) are graduated from the technical nursing institute, and (46%) nearly to half are graduated from the secondary nursing school. According to nurses' performance and knowledge regarding insulin therapy. It was observed that 10 (12.5%) nurses have satisfactory performance and 70 (87.5%) of them have unsatisfactory performance. Concerning their knowledge, it is found that 20 (25%) of nurses had satisfactory knowledge, while 60 (75%) of them had unsatisfactory knowledge. It was observed that the relationship

between nurses' performance and their years of experience about insulin therapy there is statistically significant relationship between nurse's performance and their years of experience, in which increasing years of experience is associated with an improvement with nurses performance, where ($F=4.045$, $P=0.024$) . Our study observed that the most of studied nurses 25 (31.25%) had making procedural errors, while 10(12.5%) demonstrated wrong route and charting errors. It was observed that nurse' positive attitudes toward insulin therapy, nurses update their knowledge about new medication in the market (85%) and attend trainings and seminars for professional advancement (72.5%). Negative attitudes were found toward documentation insulin therapy errors decrease punishment (42.45%) and disbelief that insulin assignment systems reduce insulin errors (43.75%).

RECOMMENDATIONS

Based on the findings of the present study, the following recommendations are suggested:

- Develop a plan for education that includes critical information and core competencies, differentiates between “must know” and “nice to know” information and evaluates learning outcomes
- Develop an educational program that includes employee orientation, medication- knowledge tests, preceptor guidelines and curriculum, annual competency
- Testing, continuing education, resource or remedial support and, where applicable, a School of Nursing curriculum review and strong graduate student preceptorships.

- Use creative and innovative approaches for continuing education on the basics of diabetes management, special-population needs, research and advanced practice across the continuum of care.

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