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Nurses' Performance Regarding Caring Of Patient With Diabetic Ketoacidosis

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Abstract:

Diabetic ketoacidosis is an acute, major, life-threatening complication of diabetes, may be fatal if not treated quickly and appropriately. Nurses' knowledge and practice play important roles in provision of supportive care to decrease morbidity and mortality secondary to diabetic ketoacidosis.Aim of the study to assess nurses' performance regarding caring of patient with diabetic ketoacidosis. Study design: a descriptive exploratory design. Subjects and methods: Conveniencesample of 40 nurses were recruited from Medical Intensive Care Unit at Makkah Hospital within 6 months' duration. Tools: consisted of (1) Self-administered questionnaire to assessnurses' knowledge regarding caring of patients with diabetic ketoacidosis, (2) Nurses' practice observational checklists to assess nurses' practice regarding caring of patients with diabeticketoacidosis. The Results of this study revealed that, 75% of nurses had unsatisfactory level of knowledge as regards diabetic ketoacidosis and 85% of them had unsatisfactory level of practice. Conclusion This study concluded that, the majority of nurses had unsatisfactory level of knowledge and practice regarding caring of patients with di[1]abetic ketoacidosis. It was elicited that there was nostatistically relation between overall nurses' knowledge and practice and demographic characteristics, also there was no statistically relation between total nurses' knowledge and practice. Recommendations: this study recommended; the importance of conducting In-service training advancing educational program for nurses caring of patients with diabetic ketoacidosis for improving their performance & quality of care provided for such group of patients.

Key words: *Diabetic ketoacidosis, Performance.*

Introduction:

Diabetic ketoacidosis (DKA) is anacute, major, life-threatening metabolic complication of diabetes occurs mostly in type 1DM also it can occur in type II; it is characterized by

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hyperglycemia, ketonemia, ketonuria and metabolic acidosis **(Kishore, 2016).**

Diabetic ketoacidosis remains a significant source of morbidity among patients with diabetes. The presence ofDKA leads to a new diagnosis of diabetes in up to 20% of patients. Fortunately, mortality attributable to DKA is generallyless than 5% with appropriate treatment **(Lanken, Kohl, Hanson & Manaker, 2014).**

Signs and symptoms of DKA vary with severity and comorbid conditions. Polyuria with polydipsia is the mostcommon presenting symptoms weight loss, fatigue, dyspnea; vomiting, abdominal pain and polyphagia.

Dehydration causes tachycardia and orthostatic hypotension. The metabolic acidosis may lead to compensatory deep (Kussmaul) respirations; mental status canvary from somnolence to lethargy and coma. A detailed evaluation may reveal precipitating factors, especially infection and no adherence to medical regimens,which are common causes of DKA**(American Family Physician,2013).**

Successful treatment of DKAinvolves identification of the precipitatingfactors, frequent patient monitoring, alongwith correcting dehydration,hyperglycemia and electrolyteimbalances. Correction of dehydration is aimed at restoring fluid volume by initial fluid replacement based on vascular status. Administration of regular insulin by IV infusion is the treatment of choice for DKA. Follow-up fluid replacement depends on the state of dehydration,serum electrolyte levels and urine output to prevent hypokalemia **(Sanuth, Bidlencik &Volk, 2014).**

There are many ways to prevent DKA. One of the most important ways is proper management of diabetes to preventcomplications. Preventive measuresinclude; keep blood sugar levels withinnormal range by checking them severaltimes per day, never skipping insulin doses, developing an emergency or "sick- day" plan, testing urine for ketone levels during stress or illness, seeking medical care when blood sugar and ketone levels are higher than normal as early detection is essential **(Wint & Leonard, 2014).**

Once the patient diagnosed withDKA will need both dehydration and hyperglycemia managed. The nursesshould assessed airway, give oxygen,determine level of consciousness, assess blood sugar level and watch closely for signs of cerebral edema. Cardiac monitoring is used to assess for evidence of hyper or hypokalemia. Vital signs should be taken routinely; start intravenous (IV) fluids to restore circulatory volume and correct electrolytedeficits, also arterial blood gases and electrolyte levels are monitored closely.Also nurses must confirm the kidneys are functioning adequately with at least 30 mlof urine output/hour **(Beard, 2014).**

Fluid resuscitation is reserved for patients requiring restoration of circulation. The possibility of over- hydration should be monitored. Nurses should also monitor for complications related to fluid volume excess. Once the blood glucose level decreases to about 250 mg/dl., glucose is added to IV solutions to avoid hypoglycemia and cerebral edema **(Randall, Begovic & Hudson, 2011).**

Aim of the study:

This study aims to assess nurses' performance regarding caring of patient with diabetic ketoacidosis through thefollowing:

1- Assess nurses' knowledgeregarding caring of patient with diabetic ketoacidosis.

2- Assess nurses' practice regardingcaring of patient with diabetic ketoacidosis.

Research Questions

To achieve the aim of this study the following research questions were formulated:

1- What is nurses' knowledge regarding caring of patient with diabetic ketoacidosis?

2- What is nurses' practice regardingcaring of patient with diabetic ketoacidosis?

Subjects and methodsResearch design
A descriptive exploratory design wasutilized to conduct this study.

Research Setting

The study was conducted in MedicalIntensive Care Unit (ICU) at Makkah Hospital.

Subjects

Convenience sample of 40 nurses were recruited from the previouslymentioned setting for those available nurses from different gender, age and different level of education, caring of patients with diabetic ketoacidosis and agreed to participate in this study

Tools for data collection
Two different tools were used to collect data:

I- Self-administered questionnaire

It was developed by the researcher based on the recent literatures **(Pellico,2013; Burke et al., 2014;Hinkle & Cheever, 2014 & Urden et al., 2014)**. It was used to assess nurses' knowledge regarding caring of patients with diabetic ketoacidosis. The questionnaire was constructed in the form of multiple choicequestions (MCQ) and the total number of questions was (35) questions, this questionnaire included two parts divided as follows:-

1st part: It represents demographic characteristics of nurses under study such as (gender, age, level of education andyears of experience, as well as attended any training course related to diabetic ketoacidosis).

2nd part: It concerned with the assessment of nurses' knowledge regarding diabetic ketoacidosis. It was consisted of (35) MCQ, which grouped to three subgroup as follows:

(A) : It included 11 questions related to nurses' knowledge regarding diabetic ketoacidosis disease.

(B) : It included 13 questions concerned with nurses' knowledge towardnursing care of patients with diabetic ketoacidosis.

(C) : It included 11 questions related to nurses' knowledge regarding instructions that must be given to patients with diabetic ketoacidosis to be followed after their discharge from

the hospital.

Scoring system:

The total score of questionnaire tool was 35 marks (100%).Zero mark was given for each incorrect answer and one mark for each correct answer.

Evaluation was considered asfollow:

- Satisfactory score for knowledge ≥70 % = (≥ 24.5 marks).
- Unsatisfactory score for knowledge <70 % = (< 24.5 marks).

II- Nurses' practice observational checklists for caring of patients with diabetic ketoacidosis.

The observational checklists were carried out to assess the level of nurses' practice regarding caring of patients with diabetic ketoacidosis; it was adapted from**(Basavanthappa, 2009; Joint British Diabetes Societies (JBDS), 2013& Lynn, 2015)** and consisted of (7) main items covering all procedures include:

Nurses' practice during; emergency care (on admission)blood glucose test procedure, urine ketone test strip procedure, intra- venous infusion therapy procedure, intravenous insulin infusion via a volume -control administration set procedure, arterial blood gases (ABGs) procedure and Nurses' practice after care of patients with DKA.

Scoring system as the following:

The total score of checklists 163 marks (100%). Each step in the observational checklists was checked asdone and not done. The responses were scored one mark for done step and zero for not done one.

Evaluation was considered asfollows:-

A subject with satisfactory score of practice ≥70 % (≥ 114.1 marks).

While unsatisfactory score ofpractice <70% (< 114.1 marks).

The preparatory phase:

It included extensive reviewing of the current, past and relevant related literature and theoretical knowledge of thevarious related aspects using books, articles, internet, periodical magazines, scientific journals and more recentnational and international literature reviews concerning nurses' performanceregarding caring of patients with diabetic ketoacidosis of the various aspects of this issue in order to develop the data collection tools

Pilot study

The pilot study was carried out on 10% of the nurses under the study (6 nurses) to test applicability of the developed tools, the clarity of the included questions as well as estimate the average time consuming needed tocomplete all questions, the results obtained were studied and analyzed. Nurses who shared in pilot study wereexcluded from the study sample.

Field work

Interviewing with 40 nurses caringof patients with diabetic ketoacidosis in the previously mentioned setting, theresearcher introduced herself, the aim of the study and component of tools were explained at the beginning of data collection. The researcher assured that thedata collected would be treat confidentially and used only for the purpose of the research, the researcher took their approval (oral consent) to participate in the study prior to any data collection.

Data were collected in 6 months, from beginning of December 2022 to the end of May 2023; the researcher visited the Medical ICU at the research setting four days weekly (Saturday, Sunday,Monday and Tuesday) during morning shift from 9:00 am to 2:00 pm in the previously mentioned setting.

First; the researcher used the observational checklists prior to administering of questionnaire to ensure the maximal realistic observation of the nurses practice and minimize the possibility of bias, nurses' practice were assessed by the researcher while they were caring of patients with diabetic ketoacidosis. Each nurse was observed by the researcher during practice of any nursing procedure, it took about 35-45 minutes for every nurse personal to full-filled by the researcher.

Second; then self-administered questionnaire was distributed and full- filled by the nurses caring of patients withdiabetic ketoacidosis, it took about 20-30 minutes to be full-filled by the nurse; the answers were recorded by the nurses themselves. Only code numbers were used and no names appeared. Also thedata was collected by the researcher usingsimplified Arabic language.

Administrative design: An approval official letter obtained

Ethical consideration:
The ethical considerations of the study included the following:

The research approval obtainedbefore starting the study. Explaining the aim of the study to the director to take his permission to do the study. Nurses were informed that they are allowed to choose whether to participate or withdraw from the study at any time.

Statistical Design:
All data were collected, entry, organized, categorized and analyzedthrough computer using the statistical package for social science (SPSS) version tabulated and subjected to statistical analysis, also (p- value) testwere also used to test of significance (the relation between qualitative variable) and regarding significance of result, the observed difference and associations wereconsidered as follows:

$p>0.05$ not significant (NS)$p<0.05$ significant (S)
$p<0.01$ highly significant (S)

results:

As regards demographic characteristics of the nurses; Table 1 illustrates that 85% of nurses were female,40 % of them their ages less than 30 years old, 72.5% of them had diploma nursing, 25% of them had experience 10-15 years and 75% of them didn't have training course regarding diabetic ketoacidosis.

Demographic characteristics	**No**	**%**
Gender		
Male	6	15%
Female	34	85%
Age		
<30	16	40 %
30 – 40	13	32.5%
40+	11	27.5%
Mean 32.5SD± 7.1		
Level of Education		
Diploma nursing	29	72.5%
Technical institute.	7	17.5%
Bachelor degree	4	10 %
Years of Experience		
< 10	15	37.5%
10 – 15	10	25 %
15 +	15	37.5%
Mean 11.9SD± 6.9		
Training course regarding diabetic ketoacidosis		
Yes	10	25 %
No	30	75 %

Figure 1: shows that 75% of the nurses had unsatisfactory level of knowledge regarding caring of patients with DKA.

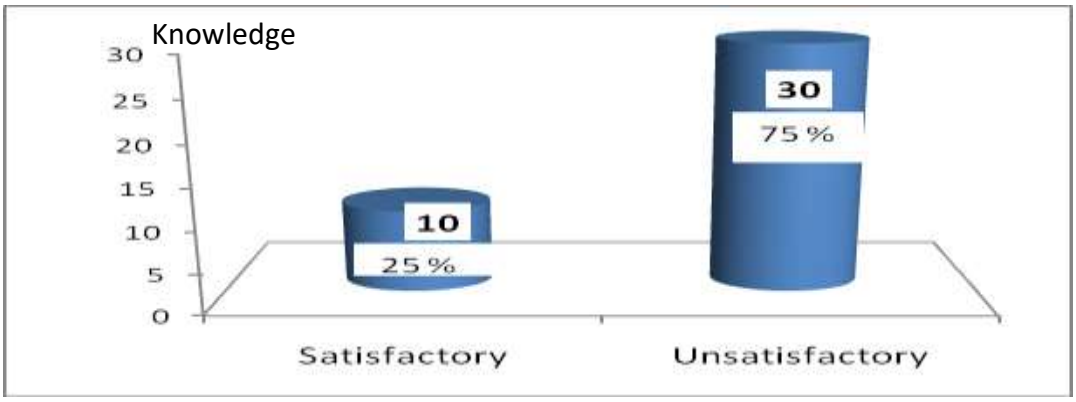

Table 2 Show that nurses had unsatisfactory level of knowledge regarding diabetic ketoacidosis disease and nursing care of patients with diabetic ketoacidosis (72.5% and 82.5%) respectively. Whereas 62.5% of them had satisfactory level of knowledge regarding instructions thatmust be given to patients with diabetic ketoacidosis to be followed after their discharge from hospital.

Knowledge (items)	**Satisfactory**		**Unsatisfactory**	
	No	**%**	**No**	**%**
1-Nurses' knowledge regarding diabetic ketoacidosis disease	11	27.5%	29	72.5%
2-Nurses' knowledge regarding nursing care of patients with diabetic ketoacidosis	7	17.5%	33	82.5%
Nurses' knowledge regarding instructions that must be given topatients with diabetic ketoacidosis to be followed after their discharge from hospital	25	62.5%	15	37.5%

Figure 2: shows that 85% of nurses had unsatisfactory level of practice toward caring of patients with DKA.

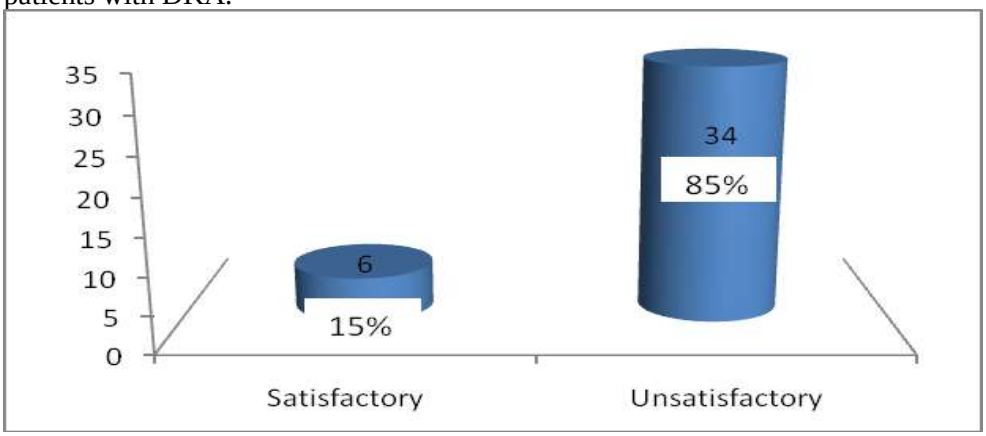

Table 3 Shows that 92.5% of nurses had satisfactory level of practice during urine ketone test strip procedure. Meanwhile the nurses had unsatisfactory level of practice during; emergency care on admission, blood glucose test procedure, intra- venous infusion therapy

procedure, intravenous insulin infusion via a volume control set procedure, arterial blood gases procedure and after care of patient with DKA (67.5%, 82.5%, 55%, 97.5%, 82.5% and 85%) respectively.

Practice	**Satisfactory**		**Unsatisfactory**	
	No	**%**	**No**	**%**
1- Nurse's level of practice during emergency care (on admission)	13	32.5%	27	67.5%
2- Nurse's level of practice during blood glucose test procedure.	7	17.5%	3	82.5%
3- Nurse's level of practice during urine ketone test strip procedure.	37	92.5%	3	7.5%
4- Nurse's level of practice during intra- venous infusion therapy procedure.	18	45%	22	55%
5-Nurse's level of practice during Intravenous insulin infusion via a volume control set procedure.	1	2.5%	39	97.5%
6- Nurse's level of practice during arterial blood gases procedure.	7	17.5%	33	82.5%
7- Nurse's level of practice after care	6	15%	34	85%

Regarding relation between total nurses' knowledge and their demographic characteristics Table 4 shows that, there was no statistically significant relation between total nurses' knowledge and gender, age, level of education, years of experience and training course regarding caring of patient with diabetic ketoacidosis (X2= 0.26, 2.62, 1.77, 4.62, 0.17 at p> 0.05 respectively).

Items	**Knowledge**				**X2 test**		
	Satisfactory		**Unsatisfactory**				
	No	**%**	**No**	**%**	**X2**	**P**	**SIG**
Gender							
Male	1	2.5%	5	12.5%	0.26	> 0.05	NS
Female	9	22.5%	25	62.5%			
Age							
< 30	2	5 %	14	35 %	2.62	> 0.05	NS
30-40	5	12.5%	8	20 %			
40+	3	7.5%	8	20 %			
Level of Education							
Diploma nursing	7	17.5%	22	55.0%	1.77	> 0.05	NS
Technical institute	1	2.5%	6	15.0%			
Bachelor degree	2	5.0%	2	5.0%			
Years of Experience							

< 10	1	2.5%	14	35 %	4.62	> 0.05	NS
10 – 15	3	7.5%	7	17.5%			
15 +	6	15 %	9	22.5%			
Training course regardingDKA							
Yes	3	7.5%	7	17.5%	0.17	> 0.05	NS
No	7	17.5%	23	57.5%			

Concerning the relation between total nurses' practice and their demographic characteristics; Table 5 shows that, there was no statistically significant relation between total nurses' practice and gender, age, level of education, years of experience and training course regarding caring of patient with diabetic ketoacidosis (X2 = 0.01, 0.16, 2.7, 0.52, & 0.26 at p> 0.05 respectively).

Items	**Practice**				**X2 test**		
	Satisfactory		**Unsatisfactory**				
	No	**%**	**No**	**%**	**X2**	**P**	**SIG**
Gender							
Male	1	2.5%	5	12.5%	0.01	> 0.05	NS
Female	5	12.5%	29	72.5%			
Age							
< 30	2	5 %	14	35 %	0.16	> 0.05	NS
30-40	2	5 %	11	27.5%			
40+	2	5 %	9	22.5%			
Level of Education							
Diploma nursing	6	15.0%	23	57.5%	2.7	> 0.05	NS
Technical institute	0	0 %	7	17.5%			
Bachelor degree	0	0 %	4	10 %			
Years of Experience							
< 5	2	5 %	13	32.5%	0.52	> 0.05	NS
10 – 15	1	2.5%	9	22.5%			
15 +	3	7.5%	12	30 %			
Training course regarding DKA							
Yes	2	5 %	8	20 %	0.26	> 0.05	NS
No	4	10 %	26	65 %			

Concerning the relation between total nurses' knowledge and practice regarding caring of patients with diabetic ketoacidosis; Table 6 shows that there was no statistically significant relation between overall nurses' knowledge and practice regarding caring of patients with diabetic ketoacidosis (X2=2.4 at p > 0.05 respectively).

Knowledge	Practice				X2 test			R
	Satisfactory		Unsatisfactory					
	No	%	No	%	X2	P	SIG	
Satisfactory	3	7.5%	7	17.5%	2.4	> 0.05	NS	0.24
Unsatisfactory	3	7.5%	27	67.5%				

Discussion:

Diabetic ketoacidosis (DKA) may befatal if not treated quickly and appropriately. Patients with DKA are at risk for complications due to the complexity of the disease, potential forerror in fluid, electrolyte, insulin administration and adverse effects of treatment. The emergency nurse has animportant role in the monitoring and treatment of the DKA patients. Although DKA represents a complex metabolic imbalance, a systematic approach to fluid resuscitation, insulin administration, electrolyte repletion and monitoring is advantageous to emergency nurses in providing excellent patient care **(Donahey& Folse, 2012).**

Regarding the study of demographic characteristics; the result of the presentstudy revealed that more three quarters of nurses were females. From the researcher point of view; this might be due to elevated number of females working inthe nursing field more than males and a reflection of preponderance of women in nursing. Females continue to dominate theprofession and men are still a minorityamong those who practice nursing. This finding is in confirmity with **Mogre, Ansah, Marfo, & Garti (2015)** who were studied assessing nurses' knowledge levels in the nutritional management ofdiabetes and reported that, the most ofnurses' participant are females.

As regards the age;the finding of thisstudy revealed that two fifth of nurses were less than thirty years old. The finding of this study is consistent with **Heshmat, Varaei, Salsali, Cheraghi & Tehrani (2013)** who werestudied education and implementingevidence-based nursing practice for diabetic patients and found that, most of the studied group ages were less than thirty years. On the other hand, this finding is contradicted with **Teixeira (2011)** who conducted a study about validation of nursing interventions inpeople with DM and stated that, most of the nurses were more than thirty years.

Concerning level of education; theresult of the current study indicated that; about three quarter of nurses had diploma in nursing. This finding is in accordance with **El Sayed (2012)**who conducted a study about assessment of nurses' performance caring of patient withdiabetic foot in Makkah hospitalsand revealed that the majority of the studied samples were diploma nurses.

Concerning experience of the nurses, the current study indicated that more than one-quarter of the studied sample had experience between ten to fifteen years. This could be explained as the nature of intensive care units, which necessitates nurses' experience for better quality of care. This result is contradicted with **Alwan & Alhusuny (2014)** who reported that 53.0% of nurses had more than 15 years of experience.

In relation to the previous training course, the current study demonstrated that three quarters of the studied nurses didn't have previous training courses regarding DKA. This might be due to lackof in- service educational training program in the hospital. This result is

disagreement with **Uğur, Demir& Akbal(2015)** who carried out a study about postgraduate education needs of nurses who are caregivers for patients with diabetes and found that more than two thirds of studied sample had education course in DM after graduation.

Concerning total nurses' knowledge about all aspects of DKA. The current study revealed that three quarters of the nurses had unsatisfactory level of knowledge regarding caring of patients with DKA. This might be as a result of; shortage of staff nurse, a few training courses about DKA that didn't include all nurses. These findings are in conformity with **Oliveira, Schoeller,Hammerschmidt, Vargas & Girondi (2014)** who studied nursing staff knowledge in relation to complications of DM in emergency services and reported that nurses staff working in the studied adult emergency services should improve their knowledge in relation to how to care of acute complications of DM. On the other hand; these findings is contradicted with**Trepp, Wille, Wieland & Reinhart (2010)** who conducted a study about diabetes-related knowledge amongmedical and nursing house staff andreported that nurses have a high level of knowledge about DM.

Concerning total nurses' practice regarding caring of patients with DKA,the present study elicited that more than three quarters of the nurses had unsatisfactory level of practice toward caring of patients with DKA. The reasons for low practice level in the current study might be due to increased number of patients and work load, lack of: in-servicetraining programs, nurses' knowledge which reflects negatively on their practice. This result is in agreement with the study's findings was that of **Maina, Ndegwa, Njenga & Muchemi(2011)** who were studiedknowledge, attitude andpractice related to diabetes among community members in four provinces in Kenyaand reported poor practice of nurses towards diabetes.

As Regard relation between total nurses' knowledge and their demographic characteristics the present study illustratesthat there was no statistically significant relation between total nurses' knowledge and their demographic characteristics. This study goes in same line with **El Sayed, Youssef, Alshekhepy & Elfeky (2014)**who were found that there was no statistically significant relation between total nurses' knowledge and their demographic characteristics

The result of this study showed that there was no statistically significant relation between total nurses' practice and their demographic characteristics. This study in accordance with **El Sayedet al. (2014)**who found that there was no statistically significant relation between total nurses' practice and theirdemographic characteristics.

Concerning relation between total nurses' knowledge and practice this study demonstrated that there was no significantrelation between nurses' knowledge andpractice; this might be due to lack of supervision, equipment and practice training.This result is in accordance with **El Auoty (2013**) who reported that there were lack of linkage between nurses' knowledge and clinical practice. On other hand, this result is conflict with **Mohamed (2014)** found high statistically significant relation between nurses' knowledge and practice.

Conclusion:

Based on the findings of the current study, it can be concluded that, themajority of nurses had unsatisfactory level of knowledge and practice regarding caring of patients with diabetic ketoacidosis. Additionally, the currentstudy revealed that there was no statistically significant relation between nurses' demographic characteristics and total nurses' knowledge & practice. Also, there was no statistically significant relation between total nurses' knowledge and practice

Recommendations:

1- Continuous evaluation of nurses' knowledge and practice is essential to identify nurses' needs and factors affecting their performance in critical care units.

2- Close supervision and teaching on spot during work is needed to ensure that quality of care is provided by nursing care of patients with DKA.

3- Developing continuous educational programs including evidence based guidelines based on needs' assessment for nurses to improve their performance and quality of care regarding caring of patients with DKA.

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