Original Article

Nursing staff knowledge in relation to complications of diabetes *mellitus* in emergency services

Conhecimento da equipe de enfermagem nas complicações do diabetes *mellitus* em emergência

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Abstract

Objective: To investigate nursing staff knowledge in relation to acute complications of diabetes *mellitus* (DM) in emergency services.

Methods: A qualitative study conducted with 18 nursing staff members working in an adult emergency hospital service. Inclusion criteria were: 1) having worked for at least six months in the emergency service; 2) having no plans of being absent from the service. Semi-structured interviews were recorded and conducted individually. The thematic analysis was used for organizing and analyzing data.

Results: Four themes emerged: 1) recognizing the signs and symptoms associated to severity in diabetes; 2) determining the urgency of care for people with diabetes; 3) the sequence of nursing care for acute complications of diabetes; and 4) recognizing risks and complications during nursing care.

Conclusion: The nursing staff working in the studied adult emergency service displayed knowledge in relation to how to care for acute DM complications, however, there were limitations regarding routine care practices.

Resumo

Objetivo: Investigar o conhecimento da equipe de enfermagem sobre assistência nas complicações agudas do diabetes *mellitus* em serviço de emergência.

Métodos: Pesquisa qualitativa realizada com 18 profissionais da equipe de enfermagem de um serviço hospitalar de emergência para adultos. Critérios de inclusão: atuação no serviço de emergência há pelo menos seis meses; sem previsão de afastamento do serviço. As entrevistas gravadas foram realizadas individualmente, utilizando roteiro semi-estruturado. Para organização e análise dos dados, seguiram-se a Análise Temática.

Resultados: Emergiram quatro temas: reconhecimento dos sinais e sintomas associados à gravidade no diabetes; determinação da urgência nos atendimentos das pessoas com diabetes; sequência dos cuidados de enfermagem nas complicações agudas do diabetes; reconhecimento dos riscos e complicações durante o atendimento de enfermagem.

Conclusão: Os profissionais de enfermagem que atuam numa emergência adulto possuem conhecimento acerca do atendimento às complicações agudas do diabetes, porém há limitações referentes à prática rotineira dos cuidados.

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Introduction

Diabetes *mellitus* (DM) refers to a group of metabolic diseases characterized by high levels of blood glucose (hyperglycemia) due to defects in insulin secretion and/or action. In 2002, there were 173 million people diagnosed with diabetes throughout the world, and this number is estimated to reach 300 million by 2030.[1] This disease ranks among the most serious health problems due to its high rates of morbidity, disabilities, and premature death, as well as the public cost involved with its treatment and related complications.[2]

There are two main acute situations related to diabetes in the professional practice of adult emergency nursing: severe hypoglycemia and diabetic ketoacidosis. Professionals must immediately identify both conditions, as they can provoke altered level of consciousness leading to airway impairment, coma and even death.[1]

Considering the Brazilian context, in which hospital emergency services can be the entryway into the Brazilian Unified Health System (SUS, as per its acronym in Portuguese), it is essential that nursing staff master the management of such emergency situations. Diabetes-related emergency care must be organized in order to ensure patient embracement, and quality and decisive care, thus reducing acute DM morbimortality rates.[3,4]

Thus, the objective of this study was to investigate the nursing staff knowledge of care for acute DM complications in emergency services.

Methods

This was a qualitative study conducted with nursing professionals working in an adult emergency service in a teaching hospital in Santa Catarina, southern Brazil. The risk classification system adopted by the SUS was used to define the priority of patients' treatment: red (emergency), orange (very urgent), yellow (urgent), green (not very urgent), blue (not urgent) and white (procedures).

Eighteen professionals participated in the study, five of which were nurses and 13, nursing technicians. Sample size was guided by the principle of data saturation and staff members from all work shifts were included: morning, afternoon and night. Inclusion criteria were: 1) having worked for at least six months in the hospital's emergency service; 2) having no plans of being absent from the service for more than a month during data collection.

Semi-structured interviews were recorded and conducted individually between May and July 2013. In order to ensure participants' anonymity, nurses were identified with a capital "N" and nursing technicians with "NT", and they were assigned a number according to the order in which they were interviewed.

The assumptions of the thematic analysis were observed for data organization and analysis: First, the speeches were organized, once the interviews had been fully transcribed and an exhaustive reading of the empirical material was conducted. Afterwards, speech excerpts were organized by selecting relevant ideas that formed units of meaning, which were then coded and organized into sub-themes related to the broader themes.

The development of this study complied with ethical guidelines for research involving human subjects.

Results

As characteristic signs of diabetes-related alterations, nurses and nursing technicians mentioned sweating, altered levels of consciousness, pallor, ketotic breath, thirst, labored breathing, tachypnea, general discomfort, nausea, apathy, polyuria, weakness, faintness, dizziness, abdominal pain, deterioration of general condition, altered visual perception and edemas.

Some nurses reported how the risk classification applied to patients in emergency care: *"[...] if there is hyperglycemia, the patient is classified as yellow*"; "[...] *if the patient condition is more severe, he/she is classified as orange*"; "*If the blood glucose test is altered, patients are classified with a higher color, or if there other alterations, they are orange or red, depending on*

the severity"; "If blood glucose is above 300mg/dl, I immediately classify patients as orange and pass them on to the doctor".

All nurses emphasized the importance of referring emergency patients directly to medical care: "[...] *if they wait outside the emergency room, their condition may worsen, so it's best to take them directly to a resuscitation or medication room* [...]," "[...] *if blood glucose is below 60mg/dl, I place them straight inside* [...]," "[...] *hypoglycemia or ketoacidosis characterizes priority patients and I generally accompany them all the way inside, I call the doctor and request immediate care. I place the patient inside the emergency service, inside the examining room or in the resuscitation room. But I don't leave them waiting outside the emergency service, they stay inside, practically in front of the doctor so that procedures can begin.*"

Within the sub-theme priority of care, extreme glycemic levels were mentioned as priority (hypoglycemia and hyperglycemia): "[...] *when blood glucose test indicates very altered results, either very high or very low, that is a priority*" "*Both diabetic ketoacidosis and hypoglycemia are priorities, emergency situations."*

Altered levels of consciousness were also mentioned as priority: "[...] *when the patient arrives unconscious and the family member reports that they have a history of diabetes,"* "[...] *fainting,*" "[...] *drowsiness.*"

Blood glucose testing was mentioned as a priority nursing care action and establishing venous access as the first nursing action in diabetic ketoacidosis and severe hypoglycemia situations. Other first and priority nursing actions reported by participants included identifying the situation, verifying respiratory pattern, assessing signs and symptoms, monitoring vital signs, conducting arterial blood gas analysis and providing supplementary oxygen.

Regarding general actions recommended for acute DM complications, all participants highlighted compliance with medical prescription; institutional routine in cases of hypoglycemia; patient stabilization and assisting medical procedures when a situation becomes worse. They also mentioned primary patient assessment according to the ABCDE approach (airways, breathing, circulation, disability, exposure), and monitoring hydroelectrolytic and acid-base balance.

Nursing care records in diabetic ketoacidosis and severe hypoglycemia situations were carried out on complementary nursing observation forms, vital sign forms (with slots for time of measurement and values of blood glucose tests and the presence or absence of respective correction insulin). All nurses mentioned keeping nursing assessment records, emphasizing that the nursing care methodology is only applied to patients in the resting unit.

Five nursing technicians reported not keeping any type of care record: "[...] *maybe the nurses write it down."* One nurse reported sometimes keeping records only on the patient's emergency form: "*If the patient does not have a chart yet, I end up keeping records right there on the emergency care form."*

Regarding diabetes-related complications, professionals mentioned rebound glycemic instability due to glucose or insulin treatment, which can lead to hypoglycemia or hyperglycemia, according to the situation: "[...] *it all happens very fast, the patient's blood glucose changes and can cause damage if it decreases or increases too quickly.*"

Professionals also mentioned diabetic coma as an important complication that can occur during patient care: "[...] *the patient can fall into a diabetic coma and have an arrest* [...]," "*If patients wait too long to receive care, they risk progressing to a hyperosmolar coma and presenting complications and needing more invasive care."* Cardiac arrest and even death were mentioned: "*With diabetic ketoacidosis, there is a risk of initiating insulin too prematurely and not monitoring hydroelectrolytic parameters, the patient can lose too much potassium and have an arrest."*

Other reported complications were patient falls, risk of seizures and multiple complications.

Discussion

This study presented limitations related to the routine practice of the care procedures mentioned by participants, such as the absence of record keeping by some nursing technicians and the poor use of the institution's hypoglycemia

protocol. Another limitation is one inherent to qualitative research, as it limits the degree to which results can be generalized.

Four themes emerged: 1) recognizing the signs and symptoms associated to severity in diabetes; 2) determining the urgency of care for persons with diabetes, 2) the sequence of nursing care for acute complications of diabetes and 4) recognizing risks and complications during nursing care.

Within the first theme, participants reported 17 diabetes-related signs and symptoms that indicate severity, with emphasis on sweating and pallor, frequently identified during initial assessments of hyperglycemic cases. According to the literature, altered levels of consciousness can occur both in hypoglycemia and in diabetic ketoacidosis.[1,5-11] Five nurses mentioned altered mental status as important, and of these, three emphasized it as a sign of severity.

Some of the signs and symptoms of hypoglycemia described in the literature were not mentioned, such as: tremors, anxiety, hunger, parasthesia, dysarthria, gait disorders and headaches. Similarly, participants did not report some severe symptoms of diabetic ketoacidosis, such as flushing, vomiting, dehydration and arterial hypotension, which can progress to hypovolemic shock.[1,7,10,12,13]

Ketotic breath and Kussmaul breathing, which are commonly cited in the literature as characteristic signs and indicators of severity in diabetic ketoacidosis, were mentioned by six interviewees. Ketotic breath is not always present or noticeable. However, altered breathing patterns are visible and manifested initially as tachypnea, followed by Kussmaul breathing, which can progress to shallow breathing in more severe cases.[1,2,7,12]

Within the second theme, determining the urgency of care for persons with diabetes, situations such as extreme blood sugar levels prevailed as requiring priority care. Severe hypoglycemia can provoke arrhythmia and increased myocardial demand for oxygen, favoring angina conditions, in which irreversible neurological damage can occur. Thus, it is essential that it be identified as early as possible.[8,12,14-16]

Considering the third theme, sequence of nursing care for acute complications of diabetes, professionals identified hypoglycemia as having higher priority over hyperglycemia. Regarding priority actions in cases of diabetes-related complications, nurses mentioned venipuncture and nursing technicians mentioned periodic verification and monitoring of blood glucose levels. According to protocol guidelines, measuring blood glucose levels systematically following a rigorous verification schedule is part of the duty of nursing professionals, as well as recording blood glucose levels and administered doses on an institutional form.[15,17] When treating diabetic ketoacidosis with intravenous insulin infusion, blood glucose must be verified on an hourly basis. After blood pH is normalized, verifications can occur every four hours.[2,11,14-16]

Establishing venous access for large-caliber catheters is required due to the need for vigorous hydration, continuous insulin infusion, and hydroelectrolytic and acid-base imbalance correction, in accordance with each case. One nurse reported only performing punctures on patients in the presence of a physician. The Brazilian Federal Nursing Council establishes that if there is a clinical protocol validated by the institution for cases of hypoglycemia, nursing staff can establish venous access in severe cases and carry out the initial treatment until the physician returns for reassessment and to continue medical management. However, this protocol is underused, probably because there is a physician present in the sector 24 hours a day.[11,18]

Still regarding sequence of care, participants mentioned the issue of nursing care records. Five nursing technicians stated not keeping any record of the care provided in cases of severe hypoglycemia and diabetic ketoacidosis. It is the responsibility and duty of nursing professionals to record professional actions in the patient's chart and in other appropriate documents, electronic or non-electronic. Nursing records document the work done by the team and are indicators of quality care; whereas their incorrect completion and lack of periodicity are factors that hamper assessment, certification and the creation of indicators, and also hinders the action of

inquiries and investigations that can provide professionals and institutions with legal support.[17]

All nurses mentioned keeping care records on complementary observation and nursing assessment forms. They also emphasized the difference between routine care in the Internal Emergency Service and in Resting. Nursing care is only systematized in the Resting sector, where all patients have gone through admissions, which includes nursing assessment and prescriptions. According to legislation, these actions are mandatory in all environments, whether public or private, in which professional nursing care takes place.[19] It is a tool that allows nurses to apply their technical and scientific knowledge and document patient care; actions which characterize nursing professional practice and help define the role of nurses in a multiprofessional health team.[19]

Regarding the fourth theme, risks and complications that can occur while caring for cases of hypoglycemia and diabetic ketoacidosis, most professionals mentioned rebound glycemic instability due to insulin or glucose treatment, with oscillations to lower or higher extremes of blood glycemic levels, according to the situation. Glycemic variation is an important factor in the rise of mortality by inducing cellular oxidative stress.[14] Iatrogenic hypoglycemia affects up to 90% of individuals treated with insulin.[9]

The most common complications to diabetic ketoacidosis are hypoglycemia as a result of inappropriate insulin use, hypocalcemia due to inadequate doses of insulin and/or sodium bicarbonate and hyperglycemia secondary to the interruption of insulin infusion without the correct compensation with subcutaneous insulin, hypoxemia, and acute pulmonary edema and hyperchloremia due to excessive fluid infusion. Cerebral edema is a rare complication among adults, but can progress to a seizure and even a coma and cardiopulmonary arrest, complications mentioned by a great portion of those interviewed. Severe hypocalcemia offers the risk of complications such as cardiac arrhythmia with cardiopulmonary arrest or respiratory muscle weakness, which can potentially progress to acute respiratory failure.[12,17,20,21] Risk of falls is also present, especially if there is mental confusion and agitation.

Investigating nursing staff knowledge with respect to treating diabetic patients who seek out emergency services, allows us to identify the gaps and strengths of nursing care. Considering that emergency services are frequently an entryway to the health system, careful assessment and efficient care can avoid complications and even death among diabetics.

Further studies in this line of research need to be carried out to identify and prepare for possible training needs for nursing professionals who work in adult emergency services. It is important to mention that, despite this study being local, it presents important themes that must be highlighted globally: nursing staff knowledge of diabetes; protocols for treating diabetic patients in emergency services; urgent and emergency care actions that can be conducted by nursing professionals; professional training on the topic of urgencies and emergencies when caring for diabetic patients, and preventing complications when caring for such patients in emergency services.

Conclusion

The nursing professionals working in the studied adult emergency service displayed knowledge regarding the clinical presentation of acute DM complications. Severe hypoglycemia was more frequently mentioned than diabetic ketoacidosis. They were able to recognize signs and symptoms associated with the severity of diabetes; determining urgency of care for individuals with diabetes; sequence of nursing care and acute complications of diabetes, and recognizing risks and complications during nursing care.

Collaborations

Oliveira DM contributed with the project conception, data analysis and interpretation, drafting of the article and content review. Schoeller SD and Hammerschmidt KSA collaborated with the project conception, data analysis and interpretation,

drafting of the article, critical review of its relevant intellectual content and final approval of the version for publication. Vargas MAO and Girondi JBR contributed with the critical review of its relevant intellectual content and the final approval of the version for publication.

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