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INFORMATIONAL ARTICLE

NURSING PERSPECTIVES AND THE ADVANCED TECHNOLOGIES IN DIABETES MANAGEMENT

PERSPECTIVAS PARA A ENFERMAGEM FACE AOS AVANÇOS TECNOLÓGICOS NO CONTROLE DO DIABETES

PERSPECTIVAS DE ENFERMERÍA FRENTE A LOS AVANCES TECNOLÓGICOS EN EL CONTROL DE LA DIABETES

Jaqueline Almeida Guimarães Barbosa[1], Marina Celly Martins Ribeiro de Souza[2]

ABSTRACT

Objective: to address the most relevant innovations currently available for the control and treatment of diabetes in a nursing perspective. ***Methods:*** descriptive study based on literature review. ***Results:*** The up-to-date market offers different resources for the treatment of the disease through more accurate insulin, with easier, less painful and safer routes of administration, such as injection pens. They are already available for monitoring glycemia's rates without frequent finger pricks and continuous infusion of insulin, also without the need for multiple subcutaneous injections aiming at a better adherence to treatment and glycemic control. These innovations are therefore conducive to the prevention of complications, not only long-term complications, which are so feared by the onset of disease, but also the acute ones, such as hypoglycemia, which can lead to death. ***Conclusion:*** Nurses need to be aware of different resources available for diabetes control, to better educate patients and use such resources when necessary. These great contributions can improve patients´ quality of life. ***Descritores*:** Diabetes Mellitus; Nursing Care; Diffuson of innovation; Selfcare; Health Education; Chronic Disease.

RESUMO

Objetivo: abordar as principais inovações disponíveis para o controle e tratamento do diabetes como perspectivas de trabalho e atuação do enfermeiro nesse cenário. ***Método***: estudo descritivo com base em uma revisão de literatura. ***Resultados***: o mercado oferece diferentes recursos para o tratamento da doença perpassando por insulinas de ação mais acurada, com formas de administração mais fáceis, menos dolorosas e mais seguras, como as canetas injetoras. Já se dispõe da possibilidade de monitoramento das taxas de glicemia sem a necessidade de picadas frequentes de dedo e, ainda, da infusão contínua de insulina também sem a necessidade de injeções múltiplas no subcutâneo visando a uma melhor adesão ao tratamento e controle glicêmico. Essas inovações se mostram, assim, favorecedoras da prevenção de complicações, não só aquelas de longo prazo, tão temidas com o avançar do tempo da doença, mas, também, aquelas agudas, como a hipoglicemia, que pode levar à morte. ***Conclusão***: a Enfermagem precisa estar atualizada quanto às diferentes possibilidades disponíveis no mercado para o controle do diabetes sabendo informar, orientar e operar, quando preciso, tais recursos que grandes contribuições podem agregar à qualidade de vida dos pacientes. ***Descritores*:** Diabetes Mellitus; Cuidados de Enfermagem; Difusão de Inovação; Autocuidado; Educação em Saúde; Doença Crônica.

RESUMEN

Objetivo: Abordar las principales innovaciones disponibles para el control y tratamiento de diabetes, como perspectivas de trabajo y actuación del enfermero. ***Metodología:*** estudio descriptivo con base en revisión de literatura. ***Resultados:*** el mercado ofrece diferentes recursos para el tratamiento de la enfermedad, pasando por insulina de acción más precisa, con formas de administración más fáciles, menos dolorosas y más seguras, como las plumas de insulina inyectores. Ya se dispone de la posibilidad de monitorar las tasas de glucosa, sin la necesidad de punzadas frecuentes del dedo y también de la infusión continua de insulina, sin la necesidad de inyecciones múltiples en el tejido subcutáneo, visando una mejor adhesión al tratamiento y control glucémico. Estas innovaciones se muestran favorables a la prevención de complicaciones, no solo de aquellas a largo plazo, tan temidas, conforme avanza el tiempo de la enfermedad; pero también de aquellas complicaciones agudas como la hipoglucemia, que puede llevar a la muerte. ***Conclusión*:** Los enfermeros necesitan estar actualizados sobre las diferentes posibilidades en el mercado, para el control de la diabetes; sabiendo informar y orientar, porque tales informaciones pueden agregar calidad de vida a los pacientes. ***Descritores*:** Diabetes mellitus; Atención de Enfermería, Difusión de Innovaciones, Autocuidfado, Educación en Salud, Enfermedad Crónica.

[1]PhD, Department of Basic Nursing, Universidade Federal de Minas Gerais/UFMG. Belo Horizonte (MG), Brazil. E-mail: jaqueline@task.com.br ORCID-iD: https://orcid.org/0000-0002-9175-0055; [2]PhD, Department of Public Health, The College of New Jersey/TCNJ. Ewing (NJ)-USA. E-mail: desouzam@tcnj.edu ORCID-iD: https://orcid.org/0000-0002-3503-4038

INTRODUCTION

At the present, Diabetes Mellitus (DM) is one of the most important chronic emergency syndromes that affects the population. With increasing prevalence, DM is a huge public health issue due to its high morbidity and mortality.[1] The worldwide prevalence of DM in the adult population was estimated at 4% (135 million people) in 1995 and 5.9 % (246 million) in 2007.[2] It is estimated that there are currently about 415 million people with diabetes, and additionally, 318 million adults have impaired glucose tolerance and 193 million people are still undiagnosed.

In 2040, it is estimated that the number of people with diabetes will reach 642 million worldwide.3 For Central and South America, the estimation is of 29.6 million people and 48.8 million new cases in 2040. In Brazil, 14.2 million cases are yearly estimated.[2]

In 2015, diabetes was responsible for five million deaths of people aged 20 to 80 years old worldwide, which represents one death every six seconds, accounting for 11.6% of total adult health expenditure: one estimated cost of 673 billion dollars.[3] In Brazil, this disease accounted for 5.3% of deaths in 2011, with a mortality rate of 33.7 deaths per 100,000 population, despite a reduction of 1.7% per year, from 2000 to 20114. The mortality due to diabetes´ acute complications showed a rate of 2.45 deaths per 100 thousand inhabitants in 2010, with 0.29 per 100 thousand inhabitants among those under 40 years of age.[5]

Data from the Vigitel, a Surveillance Study of Risk and Protective Factors for Chronic Diseases by Telephone Survey, conducted annually since 2006 in Brazilian capitals, confirmed the growing trend in the prevalence of diabetes, with a 35% increase from 2006 to 2015.[6] Thus, the number of people with diabetes is increasing due to population growth and aging, greater urbanization, the average prevalence of obesity and sedentary life, and the longer life expectancy of patients with DM.

At the same time that disease´s cases increase, new technologies are also emerging as an option to better control and monitor glycemic levels and consequently prevent complications. Several resources have been designed for health professionals and patients every day in clinics, hospitals, and specialized outpatient clinics, which gradually have been implemented through public health policies in Brazil. As a result, training regarding equipment operation requires constant nurses' update.

However, it is observed that several health professionals are unaware of the resources available to be used by patients, especially in smaller cities. This may be due not only to the high costs of such supplies but also to the lack of nurses' knowledge. For this reason, this article aims to support nurses to update themselves, discussing the latest innovations available for diabetes' control.

OBJECTIVE

- To address the most relevant innovations currently available for the control and treatment of diabetes in a nursing perspective.

RESULTS

♦ Innovations available in the market for diabetes control

It is known that DM is a disease that has no cure, but it is possible to have control over it to avoid its complications, which can affect kidneys, eyes, brain, heart and feet. The treatment offered in the public healthcare system in Brazil has remained the same since 1980, consisting of oral hypoglycemic agents (metformin and sulphonylureas), and regular insulin and NPH (short and intermediate action).

In many Brazilian cities, it is possible to obtain test strips for capillary glycaemia in the Primary Healthcare Units, in order to monitor glycemic rates, avoiding acute complications such as hypoglycemia, which can lead to death. The patient, as long as registered, can also receive a glucometer and lancets to fingerpick in order to obtain the blood sample necessary for the examination.

Currently, the health market offers safe lancets, which reduce the risk of accidents with perforating and cutting material and facilitate the obtaining of the drop of blood when compared to the way this procedure was performed in the past, using a needle, which caused greater fear to patients. Safe lancets are easier to use than the traditional ones, which require lancing. However, it is known that in many places, including in hospitals, the needle is still the most used resource to obtain gout for capillary glycemia, offering the greater risk of lacerations in patients[7] and also accidents involving health professionals.

Insulin NHP and Regular are known to be effective. It should be noted, however, that the market already offers other resources that can not only facilitate adherence to treatment but also avoid complications, especially in more complex settings such as those with

more difficult glycemic control. These devices will be further discussed in this article.

♦ Ultra-rapid and prolonged-acting insulin

At present, ultra rapid insulin with an onset of less than 15 minutes, and long-acting action, up to 24 hours in duration, with no peak of action, are found to avoid nocturnal hypoglycemia, one of the most severe complications in the treatment of diabetes. In addition, some of these insulin may be safer because they do not contribute to increased cardiovascular risk, which is the leading cause of death from diabetes.[8] DEVOTE, a study conducted comparing two basal insulin, Degludeca and Glargina, over two years in 7,637 adult patients with type 2 diabetes, showed that Degludeca (ultra-deep-acting insulin) reduced the severe hypoglycemia rate by 40% and nocturnal hypoglycemia by 53%. They are both high cost medicines, but offer significant gains for people who depend on them to guarantee their life daily.

♦ Insulin Pens

The insulin can be self-administered through injection pens, making them more practical and easier to use, including when patients are away from home, working or studying. The pens, besides being aesthetically less impacting in the face of the repulsion observed with the syringes, are an important resource for people who have visual and motor limitations, since their handling is much easier, with just a twist to prepare the prescribed dose. There are also pens with sound features to show the amount of insulin prepared, aiding in the safe administration of this medicine, considered potentially dangerous. They are a possibility for people with visual acuity impairment with and/or with less manual dexterity, skills necessary to prepare insulin using needle syringes since the use of the pen does not require aspiration of the medication.

Injection pens do not need to be stored in a refrigerator, some of them are rechargeable with insulin cartridges that can be easily replaced or discarded. They allow administration of more precise doses and with much finer and disposable needles, decreasing the administration's discomfort and collaborating to the adherence to the treatment.[9]

♦ Continuous Glucose Monitor

It is not uncommon to find patients using continuous glucose monitors to measure their blood glucose without having to perform multiple fingerpicks throughout the day. A sensor (rounded, portable, lightweight device measuring about four centimeters in diameter) is installed in the patient's subcutaneous tissue through a cannula, usually in the back of the arm, which can remain for up to 15 days. The monitor is a resource that also avoids damages resulting from frequent punctures, such as infection at the fingertips, which can, in more severe cases, cause amputation. In addition, it avoids pain and provides greater adhesion and control of glycemic rates, which is essential to prevent complications.

Once the sensor is installed, it is enough to pass the portable electronic device on the same one, when the serum rate of glucose is captured, presented electronically in a display. This information is shown instantly and can be obtained as often as needed, helping to improve diabetes control with minimal discomfort.

♦ Continuous Subcutaneous Insulin Infusion Pump

Patients who use the continuous glucose monitor also tend to use insulin infusion pumps, which are small, portable, battery-operated devices that deliver ultra-fast insulin in microdoses continuously. They need to be programmed in an individualized way to simulate the daily dose of basal insulin and are currently known as a kind of "artificial pancreas". Upon feeding, the patients inform the equipment how much carbohydrate they have ingested by means of a specific count, and the pump automatically calculates and ejects the bolus dose of insulin as needed. Thus, the pump keeps blood glucose stable between meals and during sleep. The pumps have an alarm system for worrying blood glucose levels, signaling the need for intervention, avoiding acute complications, as well as offering glycemic trend data throughout the day.[9]

The pump should be fitted to the waistband of the pants and remains attached to the body by means of a flexible cannula and a catheter inserted into the subcutaneous tissue, allowing the infusion of the insulin. For its operation, there is an insulin reservoir and the refill can easily be changed when necessary, which is informed by the equipment itself. Insulin pumps have sensors that send messages every five minutes indicating adjustments in insulin dosage, if needed.

In Brazil, insulin pumps from two different companies are available to be purchased. The infusion set, as well as the insulin reservoir, need to be changed every three days, and the rotation site should be rotated in order to

avoid lipodystrophies[10]. To use this feature, users need to develop skills for proper handling of the device, which must be done by a qualified professional. Given this need, this field has opened up opportunities for nurses to work in their educational roles in addition to deliver patient care, whether at home, in a clinic or in specialized clinics.

The use of the pump prevents frequent injections of insulin and is almost painless. Studies with adults have shown that insulin infusion pump therapy can achieve better glucose control than conventional multiple daily insulin regimens for people with type 1 diabetes[11]. In addition, insulin infusion pump therapy enables the greater probability of achieving better glycemic control with less hypoglycemia, asymptomatic hypoglycemia and better quality of life[12].

An integrative literature review about the use of the insulin pump[13] has identified that in six out of sixteen papers, the other authors did not identify the professional category. They pointed out, however, that they were linked to pediatrics, endocrinology, and diabetes, highlighting the gap in the nursing scientific contributions on this subject. None of these articles was published in a nursing journal. In the study mentioned above, the insulin pump proved to be beneficial and safe, and the greatest advantage for its use was the flexibility and the high level of acceptance among patients.

The insulin pump and continuous glucose monitoring system's prescriptions should be made by the healthcare provider, and the patients are required to be followed up with a multi-professional team. This healthcare team will be able to provide support regarding the use of these resources and, at the same time, to ensure the performance of the most diverse activities of daily living, work, socialization and study, essential for people with type 1 diabetes, who have theirs beginning even in childhood or adolescence.

It should be noted that not only health professionals who work in specialized facilities for people with diabetes should be aware of innovations. Patients using these resources may require emergency, educational or elective care at any level of the health care system, such as in hospitals and primary care. Therefore, all nurses need to improve patients' safety, who may be children, adolescents, adults or the elderly.

In this sense, nurses and Nursing students need to have contact with these technological innovations during education, allowing for the frequent updating and improvement of techniques and the development of skills and abilities to be able to care for people with DM. It is also necessary to develop studies about these innovations, since they are quite scarce in the literature, which has been configured as a limiting of the approach presented here.

It is important to highlight, however, that all these resources alone are not sufficient for good control of the disease. Yet, if they are associated with healthy eating and physical exercise, they can contribute to complications' prevention and costs' reduction due to DM.

CONCLUSION

The use of technological innovations can greatly contribute to treatment's adherence and complications' prevention. Thus, the importance of being knowledgeable and mastered by all nurses, regardless of the health system level and the age group of the population served, should be emphasized, since diabetes can affect people of all ages and requires health care at all levels.

Some of the innovations in this area, such as the insulin pump and the continuous glucose monitoring system, still require more scientific studies, and therefore constitute a stimulus for the professional nurses to research and publish more on the subject. All innovations that add comfort and safety to people with diabetes should be considered, such as insulin pens and safe lancets, as well as ultra-fast or long-acting insulin, since they are of chronic disease, each improvement translates into important gains for improving the quality of life of these people

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Corresponding Address

Jaqueline Almeida Guimarães Barbosa
Av. Alfredo Balena, 190
Bairro Santa Efigênia
CEP: 30130100 – Belo Horizonte (MG), Brazil