

# ASSESSMENT OF KNOWLEDGE ABOUT INSULIN HANDLING AND ADMINISTRATION BY MEDICAL STUDENTS

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## ABSTRACT

Diabetes mellitus is a chronic endocrine-metabolic disease that is treated with medications that improve insulin production or action, or with exogenous insulin administration. Insulin must be stored and handled correctly in order to minimize application errors and ensure successful treatment and glucose control. With this in mind, the overall objective of this project is to assess the knowledge of medical students at the Evangelical University of Goiás regarding the handling and administration of insulin. The evaluation was carried out through a questionnaire, which aimed to assess errors and correct answers during patient guidance on insulin handling and administration. The results showed that the highest error rates were identified in sub-items related to the insulin application technique, the method of homogenization of NPH insulin, and possible application sites. On the other hand, the items with the highest accuracy were about contraindications for application in injured areas and the time to remove insulin from the refrigerator before application. The study revealed gaps in the students' knowledge about insulin therapy, indicating the need to improve medical training and conduct new studies to address these deficiencies and thus increase the safety and effectiveness of diabetes mellitus treatment.

**Keywords:** Health Education; Diabetes Mellitus; Insulin.

## INTRODUCTION

Diabetes mellitus (DM) represents a group of metabolic diseases with diverse etiologies, characterized by hyperglycemia, which results from deficient insulin secretion by pancreatic beta cells, peripheral resistance to insulin action, or both. Thus, diabetes mellitus is a chronic endocrine-metabolic disease with two main etiologies, namely type 1 diabetes mellitus (DM1), which accounts for 5% to 10% of cases, and type 2 diabetes mellitus (DM2), which accounts for 90% to 95% of cases (VILAR, 2020).

In addition, it is important to note that glycemic control is crucial for the prevention of micro- and macrovascular complications of diabetes mellitus. Thus, it is necessary to introduce pharmacological treatments aimed at achieving glycemic

control combined with lifestyle changes, one of the treatments being insulin therapy (BRUTSAERT, 2022).

The dynamics of insulin handling and preparation involve a complex process that must follow strict step-by-step instructions. During this process, it is necessary to store insulin correctly and choose individualized materials for each patient. This includes hand hygiene, inspection of the application site, rotation of application sites, separation of the material to be used, homogenization and asepsis of the bottle containing the medication, aspiration and injection of air in the corresponding dose of insulin followed by aspiration of insulin, removal of air bubbles, and finally application. In addition, it is recommended that when two types of insulin need to be prepared in the same syringe, the first to be aspirated should be the dose of regular insulin (BANCA, et al, 2022; ANDERS, et al, 2016).

According to Moreira et al (2018), in the evaluation of procedures not performed or performed incorrectly during the process of self-administration of insulin, the main errors were during hand washing, aspiration of air into the syringe and injection into the insulin vial, and disposal of sharps in an appropriate place. For the effective and safe management of people with diabetes mellitus, in order to minimize adverse events that prevent metabolic control, a multidisciplinary approach is necessary, consisting of doctors, nurses, pharmacists, physical therapists, psychologists, nutritionists, and other health professionals who provide care and are involved in the initial guidance of these patients. That said, the objective of this study was to assess the knowledge of medical students at the Evangelical University of Goiás on the handling and administration of insulin.

## **METHODS**

This is a quantitative, cross-sectional, methodological study approved by the Ethics and Research Committee of the Evangelical University of Goiás (CEP - UniEVANGÉLICA), with Certificate of Ethical Review number 77132123.3.0000.5076. The total estimated population was 400 medical students enrolled between the 5th and 8th semesters at UniEVANGÉLICA, with the sample defined by convenience.

In order to answer the objective established above, a printed questionnaire was applied to collect data on the level of education related to the handling and application of insulin by medical students. The questionnaire was administered in the classroom, 20 minutes before the start of classes, to students who agreed to participate and signed the Free and Informed Consent Form (TCLE). For data analysis, the quantitative results obtained were tabulated in relative frequency (%) and absolute frequency (n) in Microsoft Excel®, so that the frequencies between the groups surveyed could then be compared.

## RESULTS

A total of 249 questionnaires were answered in the study, with 67 responses from 5th-year medical students at UniEVANGÉLICA, 31 responses from 6th-year students, 71 responses from 7th-year students, and 80 responses from 8th-year students. Based on the responses analyzed, the number of correct answers in absolute frequency (n) and relative frequency (%) per period analyzed are described below (Table 01).

**Table 01.** Absolute (n) and Relative (%) Frequencies of Correct Answers to the Questionnaire

Item evaluated by the questionnaire	5th period n	6th period n	7th period n	8th period n
Q1. Storage location	34	32	45	45 (56.3)
Q2. Conduct for frozen insulin	44 (65.7)	47 (66.2)	56	56 (70.0)
Q3. Time between removing from refrigerator and application	28 (41.8)	25	25	25 (31.3)
Q4. Method of homogenizing NPH insulin	25	22	26	26
Q5. Aseptic handling of vials	54 (80.6)	42	61	61 (76.3)
Q6a. Use of aseptic technique at the application site	45 (67.2)	34	49	49
Q6b. Skin fold	62	49 (69.0)	62 (87.3)	62 (77.5)
Q6c. Needle insertion movement	15	17	25	26
Q6d. Speed of administration	22	20	25	25
Q6e. Needle retention time in tissue	55	28	33	33
Q6f. Needle removal method	55	42	55	55
Q6g. Conduct if bleeding occurs after injection	45 (67.2)	29	57	57 (71.3)
Q7a. Asepsis of NPH bottles + Regular	37	33	46	46 (57.5)
Q7b. Method of aspirating NPH insulin	32	43	44	44
Q7c. Method of drawing up Regular insulin	35	37	44	44 (55.0)
Q7d. Order of aspiration of NPH + Regular	37	42	41	41 (51.3)
Q7e. Total NPH + Regular insulin	50 (74.6)	37 (52.1)	54 (76.1)	54 (67.5)

Q7f. Removal of needle from insulin vial	53 (79.1)	23	46	46
Q7g. Conduct in case of incorrect aspiration dose	39	33	40	40
Q8. Asepsis at the application site	57 (85.1)	50	63	63
Q9. Need to wait for 70% alcohol to dry	52 (77.6)	42	40	40
Q10. Method of performing the skin fold test	47 (70.1)	30	55	43
Q11. Repeated use of the same syringe and needle	56 (83.6)	53	57	57 (71.3)
Q12. Administration in areas with scars	65	58	70	72 (90.0)
Q13a. Application site on the arm	50	38	52	52
Q13b. Application site on the buttocks	35	30	30	30
Q13c. Application site on the thighs	45	33	48	48
Q13d. Application site on the abdomen	63	57	70	70 (87.5)

**Source:** The authors themselves (2024).

Given the data presented, it can be seen that sub-items Q6c and Q6d were the two sub-items with the highest error rate for the 5th and 6th periods. These sub-items refer to the technique of insulin administration, so there is a greater chance of providing incorrect guidance to insulin-dependent patients, as the correct way to insert the needle is with a single, quick, firm, and light movement and to administer the insulin continuously, but not too quickly. In the 7th period, the question with the highest error rate was Q4, referring to how NPH insulin should be homogenized, which should be done with 20 gentle movements (rolling between the palms of the hands or in a pendulum motion) so that the insulin crystals enter into suspension. Finally, in the eighth period, the highest error rate was found in subitem Q13b, regarding the appropriate site of application in the buttocks (upper outer quadrant).

Furthermore, with regard to the highest accuracy rates, there was extensive knowledge in the 5th and 6th periods for item Q12 concerning the contraindication of application in areas with scars, wounds, and lipohypertrophy. In the 7th period, the method of homogenizing insulin and, in the 8th period, item Q3, referring to the time insulin should be removed from the refrigerator before application to reduce pain and local inflammation, were the items with the highest frequency of correct answers.

## CONCLUSION

The results of this study reveal significant deficiencies in the knowledge of many students about the handling and administration of insulin. These gaps can lead to inadequate guidance for patients, compromising glycemic control and increasing the risk of complications associated with diabetes mellitus. Despite this, some aspects, such as the contraindication of application to injured areas and the preparation of

insulin before application, proved to be areas of consolidated knowledge among students.

The relevance of these findings points to the need to reinforce the theoretical and practical training of future physicians regarding insulin therapy, with a focus on patient safety and treatment efficacy. In addition, it is important to highlight the limitation of the study, since the absence of some students on the day of data collection may have impacted the representativeness of the results. Thus, further studies are needed to identify and fill gaps in medical education, contributing to the development of more effective educational strategies tailored to students' needs.

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