

FAILURES IN THE PRACTICES OF PREPARATION AND ADMINISTRATION OF INSULINS: SITUATIONAL DIAGNOSIS FOR PATIENT SAFETY

Tatiana Rebouças Moreira¹ 

Lucilane Maria Sales da Silva¹ 

Adriana Catarina de Souza Oliveira² 

Rhanna Emanuela Fontenele Lima de Carvalho¹ 

¹Universidade Estadual do Ceará, Programa de Pós-graduação Cuidados Clínicos em Enfermagem e Saúde. Fortaleza, Ceará, Brasil.

²Universidade Católica de Múrcia, Programa de Pós-graduação em Ciências Sócio Sanitárias. Murcia, Espanha.

ABSTRACT

Objective: to map failures related to insulin preparation and administration practices in healthcare settings, from the comparative perspective of frontline professionals and experts.

Method: a cross-sectional observational study conducted with 86 healthcare professionals, including frontline workers from a hospital in Fortaleza-Ceará and experts in the field, carried out between August 2023 and April 2024. A tool with 20 multiple-check items, divided into six domains, was used to identify the main errors and adverse events related to patient safety resulting from insulin preparation and administration practices in clinical care.

Results: the most frequently reported inconsistencies by healthcare professionals were: failure to rotate insulin injection sites; use of inappropriate abbreviations and symbols in insulin prescriptions; in-use vials without a label indicating the opening date; improper storage of insulins; incorrect timing between insulin administration and meals; and disposal of sharps related to treatment in inappropriate locations. The identification of the following aspects was significantly higher among expert professionals: "In-use insulin vials without a label indicating the opening date," "Storage of insulins and heparins near refrigerators, and "Administration of insulin using large needles with improper angulation or without creating a skinfold."

Conclusion: these findings are significant as they serve as indicators of patient safety, contributing to the re-planning of actions aimed at improving the quality of care provided to people with diabetes.

DESCRIPTORS: Health staff. Diabetes *mellitus*. Insulin Boas práticas de manipulação. Patient safety.

HOW CITED: Moreira TR, Silva LMS, Oliveira ACS, Carvalho REFL. Failures in the practices of preparation and administration of insulins: situational diagnosis for patient safety. Texto Contexto Enferm [Internet]. 2025 [cited YEAR MONTH DAY]; 34:e20240217. Available from: <https://doi.org/10.1590/1980-265X-TCE-2024-0217en>

FALHAS NAS PRÁTICAS DE PREPARO E ADMINISTRAÇÃO DE INSULINAS: DIAGNÓSTICO SITUACIONAL PARA SEGURANÇA DO PACIENTE

RESUMO

Objetivo: mapear as falhas relacionadas às práticas de preparo e administração de insulinas em ambientes de cuidados de saúde, sob a ótica comparativa de profissionais assistenciais e especialistas.

Método: estudo observacional transversal conduzido com 86 profissionais de saúde, incluindo assistenciais de um hospital em Fortaleza-Ceará e *experts* na área, realizado entre agosto de 2023 e abril de 2024. Utilizou-se um instrumento com 20 itens de múltipla checagem, divididos em seis domínios, para identificar os principais erros e eventos adversos relacionados à segurança do paciente decorrentes das atividades de preparo e administração de insulinas na prática assistencial.

Resultados: as inconsistências mais apontadas pelos profissionais de saúde foram: não realização de rodízios nos locais de aplicação das insulinas; uso de abreviaturas inadequadas e símbolos na prescrição de insulinas; frascos em uso sem registro (etiqueta) da data de abertura; acondicionamento inadequado das insulinas; intervalo incorreto entre a administração de insulina e a refeição; e descarte de material perfurocortante relacionado ao tratamento em local inapropriado. A identificação dos aspectos “Frascos de insulina em uso sem registro (etiqueta) da data de abertura”, “Armazenamento de insulinas e heparinas em setores próximos à geladeira” e “Administração de insulina com agulhas grandes, realizando angulação inadequada ou sem fazer a prega subcutânea” foi significativamente maior entre os profissionais *experts*.

Conclusão: tais achados são importantes, pois consistem em indicadores de segurança do paciente, contribuindo para o replanejamento de ações voltadas à melhoria da qualidade da assistência prestada à pessoa com diabetes.

DESCRITORES: Pessoal de saúde. Diabetes mellitus. Insulina. Boas práticas de manipulação. Segurança do paciente.

FALLAS EN LAS PRÁCTICAS DE PREPARACIÓN Y ADMINISTRACIÓN DE INSULINAS: DIAGNÓSTICO DE SITUACIÓN PARA SEGURIDAD DEL PACIENTE

RESUMEN

Objetivo: identificar las fallas relacionadas con las prácticas de preparación y administración de insulina en ambientes asistenciales, desde la perspectiva comparativa de profesionales de salud y expertos.

Método: estudio observacional transversal realizado con 86 profesionales de salud, entre auxiliares de un hospital de Fortaleza-Ceará y expertos en el área, entre agosto de 2023 y abril de 2024. Se utilizó un instrumento con 20 ítems de verificación múltiple, divididos en seis dominios, para identificar los principales errores y eventos adversos relacionados con la seguridad del paciente resultantes de las actividades de preparación y administración de insulina en la práctica asistencial.

Resultados: las inconsistencias más frecuentemente señaladas por los profesionales sanitarios fueron: no rotar los lugares de aplicación de la insulina; uso de abreviaturas y símbolos inapropiados en la prescripción de insulinas; viales en uso sin registro (etiqueta) de la fecha de apertura; envasado inadecuado de las insulinas; intervalo incorrecto entre la administración de insulina y una comida; y eliminación de los objetos punzantes relacionados con el tratamiento en un lugar inapropiado. La identificación de los aspectos «Viales de insulina en uso sin registro (etiqueta) de la fecha de apertura», «Almacenamiento de insulinas y heparinas en sectores próximos a la heladera» y «Administración de insulina con agujas grandes, realizando una angulación inadecuada o sin hacer el pliegue subcutáneo» fue significativamente mayor entre los profesionales expertos.

Conclusión: estos hallazgos son importantes por ser indicadores de la seguridad del paciente, contribuyendo a la replanificación de las acciones dirigidas a mejorar la calidad de la atención prestada a las personas con diabetes.

DESCRIPTORES: Personal sanitario. Diabetes *mellitus*. Insulina. Buenas prácticas de manipulación. Seguridad del paciente.

INTRODUCTION

Patient safety is a global public health issue that demands universal and effective safeguards within healthcare systems. Harm caused to patients due to unsafe practices and medication-related failures ranks among the leading causes of illness worldwide and is the primary source of preventable errors globally¹.

Understanding the processes involved in medication administration practices is essential for developing strategies to mitigate errors in healthcare settings². To this end, conducting a situational diagnosis is crucial to identifying process failures.

A situational diagnosis consists of the outcome of a data collection and analysis process conducted in a specific location, supporting the establishment of priorities based on institutional and population realities to identify problems. Thus, it becomes an important health management tool, particularly in research on conditions and risks affecting specific populations, aiding in strategic planning and action programming. It allows for an understanding of healthcare service organization by identifying and analyzing priority institutional needs, being essential for establishing demands that require adjustments to achieve more qualified care management².

Within the scope of care management for diabetes mellitus (DM), pharmacological management through insulin therapy stands out. According to the Institute for Safe Medication Practices, insulin is classified as a potentially dangerous medication (PDM) or high-alert drug. Medications in this category carry an increased risk of significant harm due to usage errors. Therefore, having trained and up-to-date healthcare professionals on the management of this medication is a priority to ensure effective care that prioritizes patient safety³.

Despite its recognized risk potential, insulins are medications used both in hospital and outpatient settings, making it essential for healthcare professionals to establish a continuous education process linked to surveillance and monitoring systems. The goal is to identify and prevent errors related to the use of these drugs. In this regard, medication error prevention programs should pay special attention to insulins⁴.

Errors in insulin preparation and administration are frequently identified by healthcare professionals, compromising patient safety. These errors include: inappropriate doses due to the use of abbreviations and symbols in prescriptions; mistakes in syringe calibration (mL instead of international units); incorrect administration of insulin type (rapid-acting instead of basal); inappropriate intervals between insulin administration and meals; lack of suspension homogenization for certain insulins; and issues with programming insulin pumps in inpatient units⁵.

Good practices in insulin therapy can minimize or prevent errors associated with administration failures, enhancing its therapeutic effect, reducing pain, and improving metabolic control and quality of life for people with DM, especially those on regimens requiring multiple daily insulin injections⁶. In this context, promoting safe practices in insulin therapy is crucial, encompassing all related aspects⁶.

In pursuit of organizing diabetes care services, defining processes and monitoring mechanisms is essential. These should be organized practically for services and activities, documented in the form of procedural models. Protocols and indicators related to the care of individuals undergoing insulin therapy are scarce and should be utilized by relevant sectors as guidelines for executing work process stages in accordance with established criteria and assigned responsibilities⁷⁻⁸.

In this regard, aiming to obtain a situational diagnosis on the safety of patients with diabetes mellitus undergoing insulin therapy, this study sought to map failures related to insulin preparation and administration practices in healthcare environments, from the comparative perspective of frontline professionals and experts.

METHOD

This is a cross-sectional observational study, of the situational diagnostic type, conducted with 86 healthcare professionals: 40 frontline workers from a reference hospital in Fortaleza, Ceará, and 46 experts in the thematic area, between August 2023 and April 2024. The objective was to identify the main errors and adverse events related to patient safety resulting from insulin preparation and administration practices in clinical care.

A mapping approach was chosen that included both frontline professionals and experts in the field to assess whether increased technical knowledge acted as a contributing factor in identifying failures in care practices and, consequently, in enhancing the safety of patients with diabetes undergoing insulin therapy.

Experts were professionals trained in the field and with practical experience in caring for people with diabetes, selected from the five Brazilian regions according to criteria proposed by Jasper⁹. According to this author, an expert in a specific area must meet the following requirements: possess knowledge and skills acquired through experience; have specialized knowledge and competencies that make them an authority on the subject; demonstrate specific expertise in a particular type of study; pass a designated test to identify experts; and receive high ratings or titles attributed by an authority.

For this study, it was stipulated that participants (experts) should meet at least two of the above requirements to be considered specialists in the thematic area. Each requirement was achieved by summing related characteristics, verified through consultation of the participants' curricula on the Lattes Platform. Chart 1 details the requirements and adapted characteristics for defining a clinical expert.

Chart 1 – Requirements for defining a clinical expert, as proposed by Jasper (1994)⁹, according to respective specific characteristics, Fortaleza, CE, Brazil, 2024.

Requirements	Characteristics
Possess skills/knowledge acquired through experience.	Have professional experience providing care to people with diabetes or working in units that receive patients with diabetes. Have teaching experience in the field of diabetes. Have experience conducting individual and group activities in the field of diabetes. Participate in a health research project focused on diabetes.
Possess specialized skills/knowledge that make the professional an authority on the subject.	Have been an invited speaker at a national or international scientific event in the field of diabetes. Have supervised academic works at the undergraduate or graduate level in the field of diabetes. Possess specialization/residency in the field of diabetes. Hold a master's or doctoral degree with a dissertation or thesis in the field of diabetes.
Demonstrate special expertise in a specific type of study.	Have experience in developing research in the diabetes field and/or validation of technologies and instruments. Be an author of scientific article(s) on topics related to diabetes and/or validation of technologies and instruments, published in journals classified by CAPES. Participate on evaluation boards for graduate-level academic works (Master's and Doctorate) with methodological research in any field.
Pass a specific test to identify qualified judges.	Be a professional certified by the Brazilian Diabetes Society and/or other organizations focused on diabetes.
Receive high classification attributed by an authority.	Be recognized by a well-known scientific institution with an honor/mention as an authority in the diabetes field. Have award-winning papers at national or international scientific events, with content related to diabetes and/or validation of technologies and instruments.

Source: Adapted from Jasper⁹.

The instrument used to identify failures related to insulin preparation and administration practices was developed based on recommendations from relevant scientific societies^{6,10}. It contains 20 multiple-check items divided into six domains: risk behaviors related to failures in documentation records in healthcare environments; use of inappropriate instruments for insulin administration, causing imprecision in calibration and errors in the administered dose; failures in insulin storage; failures in insulin preparation; failures in insulin administration; and failures in the disposal of sharps related to diabetes treatment.

Through remote communication via email, professionals were informed about the study and invited to participate. Those who agreed signed the Free and Informed Consent Form (FICF). Each professional was free to list, without a maximum limit, all failures related to insulin preparation and administration practices experienced in their work process, enabling the identification of key problems in diabetes care. This formed the basis for constructing a situational diagnosis for the planning and strategic programming of actions aimed at improving the quality and safety of care for people with diabetes mellitus.

The data obtained through the mapping of failures were processed and analyzed using the Statistical Package for the Social Sciences version 29.0. Measures of central tendency and dispersion were evaluated and presented in tables with absolute and relative frequencies.

The study adhered to the ethical requirements established in national and international regulations governing research involving human subjects and was approved by the Research Ethics Committees.

RESULTS

Among the professionals who participated in the research on failures related to insulin preparation and administration practices, there was a predominance of women, with an average age of 33.5 ± 8 years. The most prevalent professional category was nurses (45; 52%). The average length of professional experience (13.7 ± 10.3 years) and experience in the diabetes field (8.8 ± 6.9 years) was significantly higher in the expert group compared to frontline professionals.

Regarding academic qualifications, a significantly higher prevalence of master's degree holders (25; 54%) and doctoral degree holders (11; 24%) was observed in the expert group, in contrast to frontline professionals (Table 1).

The most frequently reported errors by healthcare professionals were: lack of rotation of insulin injection sites; use of inappropriate abbreviations and symbols in insulin prescriptions; in-use insulin vials without a label indicating the opening date; improper storage of insulins; inappropriate timing between insulin administration and meals; and disposal of sharps related to diabetes treatment in inappropriate locations.

Additionally, expert professionals identified the following aspects with greater frequency: "In-use insulin vials without a label indicating the opening date," "Storage of insulins and heparins near refrigerators," and "Administration of insulin with large needles, improper angulation, or without creating a skinfold" (Table 2).

Table 1 – Characterization of frontline healthcare professionals and experts. Fortaleza, CE, Brazil, 2024. (n=86).

Characterization of frontline healthcare professionals and experts.	Total (%)	Assistance n=40 ¹	Expert n=46 ¹	p-value ²
Age	33.5 ± 8	28 ± 4	38 ± 12	<0001
Years of professional experience	8.9 ± 6.8	3.5 ± 3.2	13.7 ± 10.3	<0001
Years of experience in the field.	5.7 ± 4.9	2.1 ± 2.9	8.8 ± 6.9	<0001
Gender				0.31
Female	74 (86)	32 (37)	42 (49)	
Male	12 (14)	8 (9)	4 (5)	
Rating				0.6447
Nursing	45 (52)	19 (47.5)	26 (57)	
Nutrition	15 (17)	8 (20)	7 (15)	
Physiotherapy	10 (12)	4 (10)	6 (13)	
Medicine	15 (17)	9 (22.5)	6 (13)	
Psychology	1 (2)	0	1 (2)	
Degree				
Rating	15 (17.4)	15 (37.5)	0	
Specialization	41 (47.6)	24 (60)	17 (37)	<0001
Master's degree	30 (34.8)	5 (12.5)	25 (54)	
PhD	11 (12.7)	0	11 (24)	

¹Mean ± Standard Deviation; n (%). ²Wilcoxon rank-sum test; Chi-square test of independence; Fisher's exact test.

Table 2 – Prevalence of errors and adverse events related to patient safety resulting from insulin preparation and administration practices. Fortaleza, CE, Brazil, 2024. (n=86).

Errors and adverse events	Total n (%)	Assistance n =40	Expert n =46	p-value ¹
Domain 1: Risk behaviors related to documentation record failures in the healthcare environment				
Use of inappropriate abbreviations and symbols in insulin prescriptions, such as “U” and “UI” instead of the word “units,” which may lead to improper dose interpretation.	68 (79)	34 (85)	34 (74)	0.207
In-use insulin vials without a label indicating the opening date, posing the risk of using insulin beyond its expiration date	48 (56)	15 (38)	33 (72)	0.001
The professional administered the prescribed insulin without checking the prescription, resulting in re-administration by another professional, which caused hypoglycemia in the patient	18 (21)	5 (13)	13 (28)	0.073
Failure to suspend prandial insulin (rapid or ultra-rapid action) in patients on a zero diet (e.g., Administration of regular insulin in a patient on a zero diet for exams, resulting in hypoglycemia).	36 (42)	17 (43)	19 (41)	0.911
Domain 2: Use of inappropriate instruments for insulin administration, leading to risks in calibration precision and errors in the administered dose.				
Use of syringes calibrated in milliliters (ml) instead of international units.	28 (33)	9 (23)	19 (41)	0,063
Use of syringes with detached needles.	45 (52)	17 (43)	28 (61)	0.089
Reuse of insulin needles and syringes.	57 (66)	26 (65)	31 (67)	0.815
Use of the content of a prefilled pen in another device (syringe). Example: Due to a lack of knowledge about the different presentations and concentrations of insulin, a syringe was used to aspirate Toujeo insulin (glargine U300) from a prefilled pen, resulting in an overdose and late hypoglycemia.	13 (15)	4 (10)	9 (20)	0.217
Domain 3: Failures in the insulin storage process.				
Storage of insulins in inappropriate locations, such as on the refrigerator door, in the freezer, or outside the refrigerator in areas with high temperatures (above 30°C) or direct sunlight exposure.	64 (74)	30 (75)	34 (74)	0.908
Storage of insulins and heparins near refrigerator sections.	19 (22)	4 (10)	15 (33)	0.012
Storage of insulins and vaccines in the same refrigerator section.	15 (17)	6 (15)	9 (20)	0.578

Table 2 – Cont.

Errors and adverse events	Total n (%)	Assistance n =40	Expert n =46	p-value ¹
Domain 4: Failures in the insulin preparation process.				
Failure to homogenize suspension insulins (e.g., NPH) before aspiration.	50 (58)	24 (60)	26 (57)	0.744
Combining human insulins in the same syringe without respecting the proper aspiration order (correct order: regular followed by NPH).	43 (50)	19 (48)	24 (52)	0.665
Combined use in the same administration device of basal insulin analogs (glargine-100, detemir, degludec, glargine-300) with regular insulin or prandial analogs (aspart, glulisine, lispro, or fiasp).	7 (8)	3 (7.5)	4 (8.7)	>0.999
Domain 5: Failures in the insulin administration process.				
Failure to rotate insulin injection sites.	73 (84)	33 (83)	40 (87)	0.565
Administration of insulin with large needles ($\geq 8\text{mm}$), using improper angulation (90°) or without creating a skinfold, increasing the risk of intramuscular injection.	38 (44)	12 (30)	26 (57)	0.014
Confusion between different types and doses of insulin prescribed at the same time, leading to administration errors (e.g., A patient started a regimen consisting of 35 units of insulin glargine (long-acting) and 6 units of insulin aspart (rapid-acting). Accidentally, a healthcare professional administered 35 units of aspart, resulting in hypoglycemia).	37 (43)	16 (40)	21 (46)	0.597
Inappropriate timing between insulin administration and meals (e.g., regular insulin was prescribed 30 minutes before lunch but was administered 1 hour prior, resulting in hypoglycemia).	63 (73)	32 (80)	31 (67)	0.188
Domain 6: Failures in the disposal of sharps related to diabetes treatment.				
Leaving the pen needle attached after use, increasing the risk of sharps-related accidents, as well as the possibility of air entering the pen cartridge and insulin leakage.	42 (49)	18 (45)	24 (52)	0.507
Disposal of sharps related to diabetes treatment in inappropriate locations (e.g., disposal of needles, syringes, or lancets in regular trash).	62 (72)	31 (78)	31 (67)	0.297

¹Wilcoxon rank-sum test; Chi-square test of independence; Fisher's exact test.

DISCUSSION

The situational diagnosis, developed based on the mapping of the main failures in insulin preparation and administration practices, allowed for the identification of the most significant weaknesses in insulin therapy care for people with diabetes.

Among the most frequently mentioned failures by healthcare professionals are: lack of rotation of insulin injection sites; improper storage of insulins; use of inappropriate abbreviations and symbols in prescriptions; and absence of labeling indicating the opening date on in-use insulin vials.

Regarding the rotation of injection sites, the literature reinforces the risks associated with non-compliance with this practice. Repeated injections in specific areas can increase the risk of adverse events, such as lipodystrophy. It is essential that rotation be performed systematically, considering the identification of injection sites and maintaining a minimum distance of 1.5 cm between injections, avoiding the reuse of the same site for at least 20 days. This effective practice helps reduce glycemic variability and prevent local complications, while also improving metabolic control^{6,11}.

When performed randomly, site rotation can cause variations in insulin absorption. Thus, proper planning should consider the number of daily injections, dosing times, physical activity levels, and other factors that may affect insulin absorption rates⁶.

Another inconsistency highlighted in this study, consistent with the literature⁸, is the improper storage of insulins. Examples include storing them on the refrigerator door, in the freezer, or in locations exposed to high temperatures or direct sunlight. As a safe practice, it is recommended that sealed vials, cartridges, and disposable pens be kept refrigerated between 2 and 8°C until their expiration date. In-use insulins, however, can be stored at room temperature (up to 30°C) for the period specified by the manufacturer. If frozen, insulin must be discarded, as extreme temperatures compromise its potency and action¹².

Risk behaviors related to documentation failures in diabetes care settings emerged as another significant weakness in this study, particularly regarding the use of inappropriate abbreviations and symbols in insulin prescriptions, such as “U” and “IU” instead of the word “units.” This practice can lead to misinterpretations of prescribed doses. Additionally, the absence of labeling indicating the opening date on in-use insulin vials poses a risk of using insulin beyond its recommended expiration period.

These results align with the literature, which identifies recording and communication failures—including the use of abbreviations, transcription errors, inadequate verification and calculations, as well as prescription mistakes as contributing factors to errors in the insulin administration process¹³.

Another critical issue identified was the lack of labeling on in-use insulin vials, which may result in administering insulin beyond the recommended timeframe, typically ranging from 28 to 56 days after opening, as specified in pharmacological and manufacturer guidelines^{6,14}.

In this context, the importance of secure documentation for effective record management becomes evident. The challenge lies not only in ensuring quick and clear access to information but also in guaranteeing the integrity, reliability, and confidentiality of data provided by healthcare system users¹⁵.

Records document the care provided, enabling a continuous flow of information and facilitating safe communication among healthcare team members. Moreover, they are essential for care planning, promoting knowledge and health education, and serving as evaluative criteria for the quality, efficiency, and effectiveness of care¹⁶.

To achieve these objectives, records must be detailed, complete, and clearly written. The use of abbreviations, acronyms, and erasures should be avoided, prioritizing legibility and computerized documentation whenever possible. Records should include information such as the date, time, and identification of the responsible professional, ensuring a quality standard that contributes to patient safety¹⁵.

These findings underscore the importance of systematizing ongoing educational actions in healthcare services to raise awareness among professionals about the relevance of proper documentation for the safety of people with diabetes. This can minimize risky behaviors related to documentation failures in care settings, such as errors in prescription interpretation or the use of insulin past its expiration date due to the lack of labels indicating the opening date of in-use insulin vials.

Another point reinforcing the importance of ongoing education for adherence to safe insulin preparation and administration practices is that, in this study, the identification of aspects such as “In-use insulin vials without labeling of the opening date,” “Storage of insulins and heparins near refrigerator sections,” and “Administration of insulin with large needles, improper angulation, or without creating a skinfold” was significantly higher among diabetes expert professionals. This highlights the importance of increased professional knowledge as a collaborative factor for patient safety.

An investigation analyzing the relationship between education and adherence to diabetes self-care practices showed that compliance with insulin therapy improved after diabetes education interventions, demonstrating the effectiveness of such measures in promoting safe insulin therapy⁸. Thus, ongoing education for both healthcare teams and patients is directly linked to error identification and the establishment of strategies to improve the quality of care for people with diabetes¹⁷.

As limitations of the study, it is important to note that data collection from frontline professionals was conducted in only one institution. Additionally, the mapping was based solely on healthcare professionals’ perceptions, which may involve weaknesses and subjectivity, such as forgetfulness or lack of attention to capturing information across all stages of the safe insulin preparation and administration process.

In terms of contributions to clinical practice and improving the safety of people with diabetes, this study enabled the creation of a situational diagnosis by identifying the main failures in insulin preparation and administration practices. Therefore, it is suggested to implement an ongoing education plan based on validated protocols, focusing on the safe storage and administration of insulin, as well as improving documentation quality in care settings. These findings support the planning of actions aimed at enhancing clinical care and patient safety.

CONCLUSION

The study mapped the main failures in insulin preparation and administration practices as identified by frontline professionals and experts. The most prevalent failures were: failure to rotate insulin injection sites; documentation-related issues; improper storage; inappropriate timing between insulin administration and meals; and improper disposal of sharps.

These findings are highly relevant as they enabled the development of a situational diagnosis through patient safety indicators, contributing to the replanning of actions aimed at improving the quality of care for people with diabetes. Furthermore, they highlight the importance of ongoing education for healthcare professionals as a strategy to promote safe and efficient practices in patient care.

REFERENCES

1. Oyibo K, Gonzalez PA, Ejaz S, Naheyan T, Beaton C, O'Donnell D, et al. Exploring the Use of Persuasive System Design Principles to Enhance Medication Incident Reporting and Learning Systems: Scoping Reviews and Persuasive Design Assessment. *J Med Internet Research Hum Factors* [Internet]. 2024 [cited 2024 Jul 24];11:e41557. Available from: <https://doi.org/10.2196/41557>
2. Maia ARB, Andrade CND, Nascimento GB, Rodrigues GT, Fernandes JM, Oliveira KL, et al. Relação teórico-prática da administração em enfermagem vivenciada em uma unidade de saúde: relato de experiência. *Glob Acad Nurs J* [Internet]. 2021 [cited 2024 Jul 24];2(1):1-6. Available from: <https://doi.org/10.5935/2675-5602.20200077>
3. Instituto para Práticas Seguras no uso de Medicamentos (ISMP Brasil). Medicamentos potencialmente perigosos de uso ambulatorial e para instituições de longa permanência - Listas atualizadas 2022 [Internet]. Belo Horizonte: ISMP Brasil; 2022 [cited 2024 Jul 24]. Available from: <https://www.ismp-brasil.org/site/wp-content/uploads/2022/09/MEDICAMENTOS-POTENCIALMENTE-PERIGOSOS-LISTAS-ATUALIZADAS-2022.pdf>
4. Schepel L, Lehtonen L, Airaksinen M, Lapatto-Reiniluoto O. How to Identify Organizational High-Alert Medications. *J Patient Saf* [Internet]. 2021 [cited 2024 Jul 24];17(8):e1358-63. Available from: <https://doi.org/10.1097/pts.0000000000000512>
5. Silva MAA, Moreira TR, Negreiros FDS, Araújo ST, Donato IM. Adesão às recomendações de boas práticas em insulinoterapia: relação com o controle glicêmico. *Rev Enferm Cent-Oeste Min* [Internet]. 2023 [cited 2024 Jul 24];13:4993. Available from: <https://doi.org/10.19175/recom.v13i0.4993>
6. Sociedade Brasileira de Diabetes (SBD). Diretrizes da Sociedade Brasileira de Diabetes [Internet]. São Paulo: SBD; 2023 [cited 2024 Jul 24]. Available from: <https://diretriz.diabetes.org.br/>
7. Moreira TR, Silva LMS, Torres RAM, Silva MRF, Oliveira ACS. Outcome indicators of multi-professional diabetes care in a reference service. *Texto Contexto Enferm* [Internet]. 2021 [cited 2024 Jul 24];30:e20190052. Available from: <https://doi.org/10.1590/1980-265X-TCE-2019-0052>
8. Silva DES, Moreira TR, Negreiros FDS, Araújo ST, Silva LMS, Moreira TMM. The effect of nursing consultation on the promotion of safe practices in insulin therapy: A retrospective study. *Online Braz J Nurs* [Internet]. 2023 [cited 2024 Jul 24];22:e20236601. Available from: <https://doi.org/10.17665/1676-4285.20236601>
9. Jasper MA. Expert: A discussion of the implications of the concept as used in nursing. *J Adv Nurs* [Internet]. 1994 [cited 2024 Jul 24];20(4):769-76. Available from: <https://doi.org/10.1046/j.1365-2648.1994.20040769.x>
10. Instituto para Práticas Seguras no uso de Medicamentos (ISMP Brasil). Insulinas glargina e asparte: Erros de medicação, riscos e práticas seguras na utilização [Internet]. Belo Horizonte: ISMP Brasil; 2021 [cited 2024 Jul 24]. Available from: https://www.ismp-brasil.org/site/wp-content/uploads/2021/06/boletim_ismp_INSULINAS-GLARGINA-E-ASPARTE.pdf
11. Barros DG, Santos KF, Lima JOR, Malaquias SG, Sousa ALL, Silveira EA, et al. Management of insulin available by sus: Support to control diabetes mellitus. *Ciênc Cuid Saúde* [Internet]. 2021 [cited 2024 Jul 24];20:e50524. Available from: <https://doi.org/10.4025/ciencuidsaude.v20i0.50524>
12. FIT Recommendations. Best Practices in Injection Technique [Internet]. Montréal: Diabetes Quebec; 2021 [cited 2024 Jul 24]. Available from: <https://www.diabete.qc.ca/en/living-with-diabetes/care-and-treatment/drugs-and-insulin/all-about-injections/>
13. Tulsan SK, Laila R, Patel H, Dave V, Mary RM, Sham S, Anjali F, Jaladi S, Kumar SK, Singhanian P, Podder V, Rahman MF, Agarwala I. Errors in diabetic insulin therapy and the vitality of proper precautions in Bangladesh: Real-life insights from the developing world. *J Fam Med Prim Care* [Internet]. 2024 [cited 2024 Dec 05]. Available from: https://journals.lww.com/jfmpc/fulltext/2024/13010/errors_in_diabetic_insulin_therapy_and_the.45.aspx

14. American Diabetes Association – ADA. Standards of care in diabetes [Internet]. Arlington: ADA; 2024 [cited 2024 Aug 22]. Available from: <https://professional.diabetes.org/standards-of-care>
15. Conselho Regional de Enfermagem de São Paulo (COREN-SP). Segurança do paciente: guia para a prática [Internet]. São Paulo: Coren-SP; 2022 [cited 2024 Jul 24]. Available from: <https://portal.coren-sp.gov.br/wp-content/uploads/2022/05/Seguranca-do-Paciente-WEB.pdf>
16. Oliveira NB, Peres HHC. Quality of the documentation of the Nursing process in clinical decision support system. *Rev Latino-Am Enfermagem* [Internet]. 2021 [cited 2024 Jul 24];29:e3426. Available from: <https://doi.org/10.1590/1518-8345.4510.3426>
17. Pais C, Liu J, Voigt R, Gupta V, Wade E, Bayati M. Large language models for preventing medication direction errors in online pharmacies. *Nat Med* [Internet]. 2024 [cited 2024 Dec 05]. Available from: <https://doi.org/10.1038/s41591-024-02933-8>

NOTES

ORIGIN OF THE ARTICLE

Extracted from the thesis – *Protocol on Safe Practices for Insulin Preparation and Administration: A Potentially Dangerous Medication*, presented to the Graduate Program in Clinical Nursing and Health Care at the State University of Ceará, 2024.

CONTRIBUTION OF AUTHORITY

Study design: Moreira TR.

Data collection: Moreira TR.

Data analysis and interpretation: Moreira TR. Silva LMS.

Discussion of the results: Moreira, TR. Silva, LMS.

Writing and/or critical review of the content: Moreira TR. Silva LMS; Carvalho REFL; Oliveira ACS.

Review and final approval of the final version: Moreira TR. Silva LMS; Carvalho REFL; Oliveira, ACS.

APPROVAL OF ETHICS COMMITTEE IN RESEARCH

Approved by the Ethics Committee in Research of the *Universidade Estadual do Ceará* and the *Hospital Universitário Walter Cantídio*, under opinions no.5,373,194 and no.5,409,529, Ethical Appreciation Presentation Certificates 56785422.2.0000.5534 and 56785422.2.3001.5045.

CONFLICT OF INTEREST

There is no conflict of interest.

EDITORS

Associated Editors: Carla Sílvia Fernandes, Ana Izabel Jatobá de Souza

Editor-in-chief: Elisiane Lorenzini.

TRANSLATED BY

Agência Latintrad – Leonardo Parachú

HISTORICAL

Received: August 22, 2024.

Approved: February 24, 2025.

CORRESPONDING AUTHOR

Tatiana Rebouças Moreira.

tatirmoreira@hotmail.com

DATA AVAILABILITY

The entire dataset supporting the results of this study is available upon request to the corresponding author Tatiana Rebouças Moreira. The dataset is not publicly available because it is part of a doctoral thesis, for which a portion of the data remains to be published.