УДК 616.379-008.64-07-035.7(048.8) Original research

REGISTRY OF TYPES, FACTORS, AND CONSEQUENCES OF MEDICAL ERRORS IN THE DIAGNOSIS OF DIABETES MELLITUS TYPES

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Key words: *diabetes mellitus, types, diagnosis, errors, registry.*

Bukovinian Medical Herald. 2024. V. 28, № 3 (111). P. 62-68.

DOI: *10.24061/2413-0737.28.3.111.2024.11*

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Resume. Aim*. To identify and systematize the types, factors, and consequences of medical errors in diagnosing types of diabetes mellitus (DM) and to create a registry for them.*

Materials and Methods*. A search, collection, evaluation, and synthesis of scientific data regarding the prevalence of diagnostic errors, their significance, types, causes (including general and diabetes-specific factors), and prevention methods were conducted using Google Scholar, Scopus, Web of Science, PubMed Medline, and Embase databases, as well as publications from open sources. The analysis included guidelines from leading medical societies and expert groups. Based on the systematization of literature data and the authors' clinical observations, a «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types» was created for the first time.*

Results. *General factors contributing to errors in the diagnosis of diabetes mellitus (DM) include limited access to quality healthcare, a shortage of specialists in diabetology, low levels of teamwork, lack of availability of diagnostic tests for determining DM types, ineffective communication, unsatisfactory care coordination, and follow-up, as well as cognitive biases. Diabetes-specific factors include the heterogeneity of DM, atypical disease progression, comorbidities, environmental factors, and technical errors in DM diagnosis. The most typical diagnostic discrepancies involve the misidentification of type 1, type 2, and other specific types of DM. Implementing the created «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types» in endocrinology departments has significantly reduced the number of diagnostic discrepancies for DM types. Additionally, incorporating this registry into the educational process at higher education institutions has improved the competence of students and medical professionals on this issue.*

Conclusions*. The «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types», created based on a synthesis of literature data and the results of clinical observations, contributes to improving the quality and accuracy of diagnosis, enhances the professional level of healthcare workers, and reduces the number of incorrect diagnoses and treatment prescriptions.*

РЕЄСТР ВИДІВ, ЧИННИКІВ ТА НАСЛІДКІВ ЛІКАРСЬКИХ ПОМИЛОК У ДІАГНОСТИЦІ ТИПІВ ЦУКРОВОГО ДІАБЕТУ

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Ключові слова: *цукровий діабет, типи, діагностика, помилки, реєстр.*

Буковинський медичний вісник. 2024. Т. 28, № 3 (111). С. 62-68.

Резюме. Мета роботи *– встановити та систематизувати види, чинники та наслідки лікарських помилок у діагностиці типів цукрового діабету (ЦД) із створенням їх реєстру.*

Матеріал і методи*. Проведено пошук, збір, оцінку і синтез наукових даних щодо поширеності діагностичних помилок, їх значущості, типів, причин, включаючи загальні і діабет-специфічні чинники, шляхів попередження у базах даних Google Scholar, Scopus, Web of Science, PubMed Medline та Embase, публікацій із відкритих джерел. До аналізу залучені настанови провідних лікарських товариств та експертних груп. На підставі*

систематизації даних літератури та власних клінічних спостережень вперше створений «Реєстр видів, чинників та наслідків лікарських помилок у діагностиці типів ЦД».

Результати. *Загальні фактори, що впливають на виникнення помилок у діагностиці ЦД, включають недостатній доступ до якісної медичної допомоги, дефіцит фахівців у галузі діабетології, низький рівень командної роботи, недоступність діагностичних тестів для визначення типів ЦД, неефективну комунікацію, незадовільну координацію догляду та подальшого спостереження, а також когнітивні упередження. Діабет-специфічними факторами є гетерогенність ЦД, атиповий перебіг, супутні захворювання, екологічні чинники і технічні помилки в діагностиці ЦД. Найбільш типовими варіантами розходження діагнозів є помилкова ідентифікація ЦД 1-го, 2-го та інших специфічних типів. Впровадження створеного «Реєстру видів, чинників та наслідків лікарських помилок у діагностиці типів ЦД» у практику відділень ендокринологічного профілю дозволило суттєво зменшити число розходжень діагнозів типів ЦД, а в навчальний процес закладу вищої освіти – покращити рівень компетентності студентів та медичних фахівців з цього питання.*

Висновки. *Створений на підставі узагальнення даних літератури та результатів власних клінічних спостережень «Реєстр видів, чинників та наслідків лікарсь-ких помилок у діагностиці типів ЦД», сприяє покращанню якості та точності діагностики, підвищенню професійного рівня медичних працівників, зменшує кількість неправильних діагнозів і призначень лікування.*

Introduction. Diagnostic competence is an integral part of a physician's practice. Establishing the correct diagnosis is crucial for providing appropriate treatment to patients. However, diagnostic errors, especially in diabetology, have become quite common and are considered a severe public health issue. Inaccurate or delayed diagnoses are among the most critical problems in modern healthcare, causing significant patient harm [1]. Statistics show a substantial prevalence of diagnostic errors: about 15% of adults experience them, with 5% occurring annually at the outpatient stage, and more than half of errors may lead to severe consequences [2].

Diabetes mellitus is a global issue, as the number of people affected by this disease continues to increase annually. It is characterized by either insufficient insulin production or insulin resistance, leading to hyperglycemia. According to estimates, by 2046, the global number of people with DM will rise to 783 million [3]. Since the disease often progresses without symptoms, improving diagnostic and treatment systems for effective management is crucial.

In turn, misdiagnosis of DM can have serious consequences for patients, including incorrect treatment, deterioration of health, development of complications, and increased risk of death. Additionally, an inaccurately established diagnosis can lead to financial difficulties for patients and the healthcare system, consume unnecessary time and resources to correct errors, and result in a loss of trust in medical institutions and professionals, ultimately threatening the quality of healthcare delivery.

This highlights the need for research on the types, causes, and consequences of diagnostic errors in DM and the development of effective measures to prevent them.

The **study aims** to identify and systematize the types, factors, and consequences of medical errors in the diagnosis of diabetes mellitus and create a registry for them.

Materials and Methods. A search, collection, evaluation, and synthesis of scientific data regarding the prevalence of diagnostic errors, their significance, types, and causes (including general and diabetes-specific factors, the role of cognitive biases, heterogeneity, and atypical disease progression), as well as prevention methods, were conducted using the databases Google Scholar, Scopus, Web of Science, PubMed Medline, and Embase, along with publications from other open sources. After data collection, sorting and filtering of materials were performed. The quality of the studies was assessed using the CASP (Critical Appraisal Skills Programme) scale, which helped evaluate the validity and reliability of the published works [4]. Guidelines from leading medical societies and expert groups, particularly in diabetology, were also included in the analysis.

The information was synthesized by combining results from various sources, allowing for a comprehensive overview of the researched topic and highlighting key trends, discrepancies, and gaps in the studies. Based on the literature data and the authors' clinical observations, the «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types» was created for the first time. This registry has been implemented in the practice of the endocrinology departments of the Regional Municipal Non-Comersial Enterprise «Chernivtsi Regional Clinical Hospital» and in the educational process of the Department of Clinical Immunology, Allergology, and Endocrinology at Bukovinian State Medical University.

Results of the Study and Discussion. The analysis of literature sources has shown that diagnostic errors are a serious issue in medical practice. They occur when

physicians incorrectly identify a disease or do so with a delay, which can lead to inappropriate treatment or deterioration of the patient's condition [1,5].

The causes of diagnostic errors in diabetology can be general and related to the specific characteristics of different types of diabetes mellitus [6].

As the study results indicate, general errors (see Table 1) in the diagnosis of DM can arise from a range of factors, such as limited access to quality healthcare, inadequate training of healthcare professionals, and poor coordination among specialists [7]. Furthermore, the lack of medical services or their insufficient quality in certain areas makes successful diagnosis and treatment inaccessible to a significant portion of the population.

Problems are also associated with the limited availability of diagnostic tests, which may be caused by financial difficulties or distance from healthcare facilities. In this context, prolonged waiting times, outdated diagnostic methods, and low-quality tests complicate the identification of diabetes types, including both classic types (Type 1 diabetes (T1DM) and Type 2 diabetes (T2DM)) and rarer, more specific forms (such as Latent Autoimmune Diabetes in Adults (LADA), Maturity Onset Diabetes of the Young (MODY), pancreatogenic diabetes (Type 3c), and diabetes associated with hypercortisolism, among others).

Table 1

Register of Common Errors in the Diagnosis of Diabetes Types

Problem in diagnosing the type of DM	Causes of diagnostic errors	Consequences
Access to quality primary healthcare	Financial difficulties: The inaccessibility of diagnostic tests for determining the type of diabetes mellitus (DM) can hinder accurate diagnosis and treatment, especially in regions with limited resources. Distance from medical facilities: Living far from healthcare centres can prevent individuals from undergoing necessary diagnostic tests for DM and receiving proper care. Low level of medical literacy: A lack of knowledge among healthcare professionals about modern diagnostic methods for DM can result in misdiagnosis and improper management of the condition. Transportation issues: Difficulties in reaching medical facilities can delay or prevent access to necessary care for diabetes patients. An insufficient number of medical facilities: A shortage of healthcare centres can result in long waiting times and inadequate attention to diabetes patients.	Incomplete examinations: Partial or absent diagnostic evaluations for patients suspected of having diabetes can lead to overlooked or untreated conditions. Misdiagnosis of diabetes: Errors or missed diagnoses can result in incorrect or delayed treatment.
Availability of healthcare professionals and diabetes specialists	A shortage of skilled practitioners in diabetology can negatively impact the quality of care and diagnosis for diabetes patients. Insufficient number of qualified healthcare professionals: A lack of endocrinologists/diabetologists in medical institutions can hinder proper diabetes care. Lack of training: Inadequate education for healthcare workers in diabetology can lead to diagnostic errors. Migration of medical personnel: The emigration of diabetes specialists to foreign countries or the private sector can deplete local expertise. Unfavourable working conditions: Low pay and poor working conditions can discourage healthcare professionals from remaining in the field.	Diagnostic errors: Incorrect interpretation of symptoms and test results can lead to misdiagnosis and improper diabetes treatment. Treatment errors in diabetes: Use of inadequate treatment methods or incorrect types of insulin therapy can compromise patient care.
Teamwork	Poor quality of teamwork: Lack of coordinated efforts among healthcare providers of different specialities during the diagnostic process for diabetes. Lack of training: Insufficient training and educational activities on modern approaches to diabetes diagnosis. Lack of feedback after errors: Misdiagnosis cases are not analyzed, preventing learning from mistakes.	Misinterpretation of Diabetes Symptoms: Symptoms of a certain type of diabetes can be confused with other variations of the disease. Incorrect Diabetes Diagnosis: Underestimation or overestimation of the risks of developing a particular type of diabetes in patients.

Continuation of the table 1

Availability of Diagnostic Tests for Establishing Diabetes and Its Types	Limited Scope of Diagnostic Tests: Insufficient number of tests for blood glucose levels, glycosylated haemoglobin, and other specific tests to clarify the type of diabetes. Low Availability of Diagnostic Tests: Long waiting times for testing. Low Quality of Diagnostic Tests: Use of outdated or inaccurate diagnostic methods.	Complicated Accurate Diagnosis of Diabetes Type: Inability to determine the type of diabetes (Type 1, Type 2, MODY, LADA, and other forms).
Communication	Low level of medical information exchange between healthcare workers: lack of data exchange between primary care doctors and diabetes specialists Insufficient documentation: absence of detailed records about the patient's condition and examination results	Incomplete interpretation of data: incomplete analysis of medical history and examination results Incorrect interpretation of data: erroneous analysis of data specific to types of diabetes Complications in making the correct diabetes diagnosis: lack of interaction between doctors complicates diagnosis
Care coordination	Delays in consultations: prolonged waiting for an appointment with an endocrinologist/diabetologist Loss of test results: unreliable storage or transmission of examination results Absence of medical records: incomplete or missing medical history of the patient with diabetes	Barriers to timely diagnosis of the type of diabetes: delays in diagnosis and treatment Barriers to accurate diagnosis of the type of diabetes: lack of a complete picture of the patient's condition
Further observation	Limited observation of patients with diabetes: infrequent or formal doctor visits Absence of monitoring: insufficient monitoring of glucose levels and other indicators	Difficulties in adjusting the diagnosis: loss of the opportunity to timely change the diagnosis or type of diabetes and its treatment Reduced possibility of adequate diabetes treatment: ineffective diabetes control
Availability of Medical Assistance	Inaccessibility of Medical Assistance: Lack of necessary medical services in certain regions. Deficit of Basic Needs (Food, Housing): Absence of proper conditions to support the health of patients with diabetes.	Missed Diagnostic Opportunities: Lack of timely diagnosis and treatment of diabetes. Complications of Diabetes: Complications due to the absence of adequate medical care

Another serious problem is the shortage of qualified endocrinologists and diabetologists, especially in regions with limited access to adequate medical care. This may be related to the migration of healthcare workers abroad or the private sector and insufficient levels of their training. Diagnostic errors often occur due to a lack of skills among medical professionals, exacerbating the misinterpretation of symptoms.

The training of healthcare professionals in diabetology also leaves much to be desired. The insufficient number of training activities, workshops, and continuing education programs means that doctors need more modern knowledge and skills for accurate diagnosis and treatment of DM. The absence of certification and compliance with licensing standards creates additional barriers to quality diagnosis. As a result, some types of DM, such as LADA or MODY, may be misdiagnosed, complicating disease management.

Underestimating specific diagnostic criteria, including cognitive biases and behavioural factors [8], and overestimating or underestimating test results can also lead to incorrect diagnoses. At the same time, a significant portion of errors is diabetes-specific and depends on the characteristics of the progression of different types of diabetes mellitus (see Table 2).

The main reason is the increasing heterogeneity of DM, which has blurred the boundaries between its types. DM is increasingly presenting atypically, which reduces the diagnostic value of the most important criteria for distinguishing DM types—such as age, the presence of metabolic syndrome indicators, and insulin dependence—creating conditions conducive to diagnostic errors [9,10].

According to studies, about 40% of patients over 30 years old diagnosed with T1DM were mistakenly diagnosed with T2DM [11]. There is a stereotype that older individuals only suffer from T2DM, which leads to a significant number of diagnostic biases and errors.

Table 2

Registry of Diabetes-Specific Diagnostic Errors for Types of Diabetes

Factors	Types and Causes of Errors in Diagnosing Types of Diabetes	Consequences
1. Heterogeneity of diabetes, caused by genetic and epigenetic factors		
Autoimmunity	Misdiagnosis of type 2 diabetes, other types instead of type 1 diabetes (LADA). Insufficient consideration of autoimmune diseases accompanying type 1 diabetes. Incorrect classification of autoimmune processes. Failure to detect islet cell antibodies	Lack of insulin therapy Risk of ketoacidosis Insufficient glycemic control
Beta Cells	Misdiagnosis of type 1 diabetes, LADA, MODY, type 3c diabetes. Failure to determine the degree of beta-cell dysfunction (C-peptide) and insufficient consideration of their role in the pathogenesis of diabetes.	Incorrect treatment Inadequate therapy effectiveness Risk of complications
Insulin Resistance	Incorrect differential diagnosis between type 1 and type 2 diabetes, LADA, and other types of diabetes. Underestimation of the degree of insulin resistance.	Incorrect treatment Inadequate therapy effectiveness Increased risk of complications
Defects in Insulin Secretion (Polygenic and Monogenic)	Inadequate diagnosis of polygenic and monogenic insulin secretion defects, particularly MODY. Misdiagnosis of other types of diabetes Inadequate consideration of polygenic defects of insulin secretion, insufficient testing for monogenic mutations	Incorrect treatment (e.g., use of insulin instead of oral drugs or vice versa) Inadequate therapy effectiveness Increased risk of complications
2. Atypical Course of Diabetes		
Type 1 Diabetes	*Manifestations*: Older age, excess body weight *Causes*: Insulin overdose, lifestyle impact, presence of comorbid diseases	Absence or late diagnosis Incorrect treatment of diabetes type Increased risk of complications
Type 2 Diabetes	*Manifestations*: Young age, absence of excess body weight, low C-peptide, need for insulin (beta-cell depletion) *Causes:* Lifestyle modifications leading to normalization of body weight, reduction of insulin resistance and manifestations of metabolic syndrome; beta-cell depletion, lifestyle impact, presence of comorbid diseases	
LADA	*Manifestations*: LADA 1 similar to type 1 diabetes, LADA 2 - to type 2 diabetes *Causes:* Heterogeneity of the disease caused by varying degrees of autoimmunity, beta-cell damage, and insulin resistance, lifestyle impact, presence of comorbid diseases	
MODY	*Manifestations:* Mild or moderate symptoms of hyperglycemia, often misdiagnosed as type 1 or type 2 diabetes *Causes:* Different degrees of clinical manifestations and laboratory changes, lifestyle impact, presence of comorbid diseases	
Pancreatogenic	*Manifestations:* Weak manifestations of pancreatic disease, no weight loss, normal or low-normal C-peptide *Causes:* Onset of pancreatic disease, mild course, lifestyle impact, presence of comorbidity	
Related to Hypercortisolism	*Manifestations:* Moderate or atypical manifestations of hypercortisolism *Causes:* Mild course, comorbid diseases, lifestyle impact	

Continuation of the table 1

3. Accompanying Diseases		
	Failure to consider accompanying diseases (pancreas, autoimmune, Cushing's syndrome, excess body weight, obesity, diseases enhancing catabolic processes). Incorrect diagnosis of rare diabetes subtypes	Delay in diagnosing the main disease, risk of complications Insufficient diabetes control Deterioration of patient's quality of life
4. Environmental Factors		
	Viruses Dietary characteristics Socioeconomic factors May contribute to the development of various diabetes manifestations through autoimmunity, inflammation, insulin resistance	Inadequate effectiveness of antidiabetic drugs Increased risk of complications Deterioration of quality of life
5. Technical Errors in Diabetes Diagnosis		
	Lack of clear protocols for diagnosing different types of diabetes Observer errors, analytical and stochastic errors Insufficient awareness of doctors about various diabetes subtypes, insufficient experience	Incorrect treatment Insufficient diabetes control Development of complications Deterioration of quality of life

Another critical factor is that T1DM, mainly its variant LADA, can occur after age 30 in individuals with excess body weight and other manifestations of metabolic syndrome, and it may not require insulin therapy. Meanwhile, T2DM has significantly become more prevalent among younger individuals, and in the presence of comorbid conditions or during beta-cell exhaustion, it may be accompanied by weight loss and ketosis. Active lifestyle modifications, especially among the population of European countries, reduce the significance of excess body weight in the diagnosis of T2DM. Furthermore, the diagnostic process for T1DM is more complex and prolonged than for T2DM, complicating the differentiation process. There is also insufficient diagnosis of other specific types of diabetes, particularly pancreatogenic diabetes. The situation is exacerbated by the low availability of diagnostic tests for clarifying the type of diabetes, such as determining islet autoantibodies and C-peptide levels. This contributes to errors in diagnosing diabetes types and inappropriate patient management strategies [9,12,13].

Thus, one of the key issues in misdiagnosis is the heterogeneity of DM, driven by genetic and epigenetic factors. Errors often arise from challenges in identifying autoimmune processes associated with T1DM, which can lead to misdiagnosis as T2DM or other forms, such as LADA. Incorrect assessment of the degree of beta-cell dysfunction and insulin resistance can also result in errors when selecting therapy, leading to complications, including ketoacidosis.

Atypical presentations of DM are another significant cause of diagnostic errors. For example, T1DM diagnosed in older individuals or those with excess body weight may be misidentified as T2DM. Conversely, young patients with T2DM, especially those with low C-peptide levels and a need for insulin, may be diagnosed as having T1DM. This can lead to inappropriate treatment and an increased risk of complications. Rare forms of diabetes mellitus, such as MODY, LADA, and pancreatogenic diabetes, pose a particular challenge as they often present with mild or atypical symptoms [14]. Environmental factors, including viral infections and socioeconomic factors, are common causes that can provoke autoimmunity and insulin resistance development and progression.

The absence of clear diagnostic protocols, physicians' analytical errors, and insufficient experience also contribute to diagnostic errors, which can lead to inappropriate treatment and decreased disease control [9].

Based on the literature analysis and our clinical experience, we conclude that the most common forms of misdiagnosis of DM types are the incorrect diagnoses of T1DM and T2DM in patients with other variants of diabetes.

The implementation of our «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types» in the practice of the endocrinology departments at the Regional Municipal Non-Commercial Enterprise «Chernivtsi Regional Clinical Hospital» has significantly reduced the number of diagnostic discrepancies regarding diabetes types. Additionally, it has improved the level of competence among students and medical professionals in this area within the educational process at Bukovinian State Medical University.

The «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types», created based on the synthesis of literature data and our clinical observations, contributes to improving the quality and accuracy of diagnosis, enhancing the professional level of healthcare workers, and reducing the number of incorrect diagnoses and treatment prescriptions. This will also contribute to better treatment outcomes and a reduced risk of complications in patients with various types of DM. Such an approach will enhance the

effectiveness of medical practice and improve the standards of diabetes diagnosis and treatment, benefiting both patients and the medical community.

Conclusions

General factors influencing the occurrence of errors in the diagnosis of diabetes mellitus include inadequate access to quality medical care, a shortage of specialists in diabetology, low levels of teamwork, inaccessibility of diagnostic tests for determining diabetes types, ineffective communication, unsatisfactory coordination of care and follow-up, as well as cognitive biases. Diabetes-specific factors include the heterogeneity of diabetes caused by genetic and epigenetic factors, atypical presentations, comorbid conditions, environmental influences, and technical errors in the diagnosis of diabetes mellitus. The most common diagnostic discrepancies involve misidentifying Type 1 diabetes, Type 2 diabetes, and other specific types.

The «Registry of Types, Factors, and Consequences of Medical Errors in the Diagnosis of Diabetes Mellitus Types», created based on the synthesis of literature data and our clinical observations, contributes to improving the quality and accuracy of diagnosis, enhances the professional level of healthcare workers, and reduces the number of incorrect diagnoses and treatment prescriptions.

The prospects for further research involve developing effective measures to prevent diagnostic medical errors in diabetology.

References

1. Diagnostic Errors: Technical Series on Safer Primary Care. Geneva: World Health Organization; 2016. Licence: CC BY-NC-SA 3.0 IGO.

2. Singh H, Schiff GD, Graber ML, Onakpoya I, Thompson MJ. The global burden of diagnostic errors in primary care. BMJ Qual Saf. 2017;26(6):484-94. DOI: 10.1136/bmjqs-2016-005401.

3. Sun H, Saeedi P, Karuranga S, Pinkepank M, Ogurtsova K, Duncan BB, et al. IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. Diabetes Res Clin Pract. 2022 Jan;183:109119. DOI: 10.1016/j.diabres.2021.109119.

4. Galdas P, Darwin Z, Fell J, Kidd L, Bower P, Blickem C, et al. A systematic review and metaethnography to identify how effective, cost-effective, accessible and acceptable self-management support interventions are for men with long-term conditions (SELF-MAN). Southampton (UK): NIHR Journals Library; 2015 Aug. (Health Services and Delivery Research, No. 3.34.) Appendix 6, Critical Appraisal Skills Programme criteria. Available from: https://www.ncbi.nlm.nih.gov/books/NBK311069/.

5. Zwaan L, Smith KM, Giardina TD, Hooftman J, Singh H. Patient generated research priorities to improve diagnostic safety: A systematic prioritization exercise. Patient Educ Couns. 2023 May;110:107650. DOI: 10.1016/j.pec.2023.107650.

6. Gerush K, Pashkovska N, Ukrainets O. Errors in the diagnosis of types of diabetes mellitus: causes and prevention strategies (literature review and own research results). Int J Endocrinol (Ukraine). 2024;20(4):307-15. DOI: 10.22141/2224-0721.20.4.2024.1410.

7. Frey J, Braun LT, Handgriff L, Kendziora B, Fischer MR, Reincke M, et al. Insights into diagnostic errors in endocrinology: a prospective, case-based, international study. BMC Med Educ. 2023 Dec 8;23(1):934. DOI: 10.1186/s12909-023-04927-5.

8. Graber ML. Progress understanding diagnosis and diagnostic errors: thoughts at year 10. Diagnosis (Berl). 2020 Aug 27;7(3):151-59. DOI: 10.1515/dx-2020-0055.

9. Redondo MJ, Hagopian WA, Oram R, Steck AK, Vehik K, Weedon M, et al. The clinical consequences of heterogeneity within and between different diabetes types. Diabetologia. 2020 Oct;63(10):2040-48. DOI: 10.1007/s00125-020-05211-7.

10. Chung WK, Erion K, Florez JC, Hattersley AT, Hivert MF, Lee CG, et al. Precision Medicine in Diabetes: A Consensus Report From the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care. 2020 Jul;43(7):1617-35. DOI: 10.2337/dci20-0022.

11. The Lancet Regional Health-Europe. Misdiagnosis of type 1 and type 2 diabetes in adults. Lancet Reg Health Eur. 2023 Jun 2;29:100661. DOI: 10.1016/j.lanepe.2023.100661.

12. Wasserfall C, Nead K, Mathews C, Atkinson MA. The threshold hypothesis: solving the equation of nurture vs nature in type 1 diabetes. Diabetologia. 2011 Sep;54(9):2232-6. DOI: 10.1007/s00125-011-2244-z.

13. Hamman RF, Bell RA, Dabelea D, D'Agostino RB Jr, Dolan L, Imperatore G, et al. The SEARCH for Diabetes in Youth study: rationale, findings, and future directions. Diabetes Care. 2014 Dec;37(12):3336-44. DOI: 10.2337/dc14-0574.

14. Harada Y, Kawamura R, Yokose M, Shimizu T, Singh H. Definitions and Measurements for Atypical Presentations at Risk for Diagnostic Errors in Internal Medicine: Protocol for a Scoping Review. JMIR Res Protoc. 2024 Mar 25;13. DOI: 10.2196/56933.

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Надійшла до редакції 02.08.24

Рецензент – проф. Федів О.І.