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APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE DIAGNOSIS OF GYNECOLOGICAL DISEASES

Эгамкулов З. Т.
Кандидат медицинских наук

Abstract
Human-Centered Artificial Intelligence (HCAI) is an approach that creates support systems that can act as intelligent companions of experts, reflecting their thinking and decision-making process in solving real-world problems. This makes it an effective tool for improving the quality of medical services and reducing the burden on doctors. In our study, we focused on evaluating the accuracy and effectiveness of GAID in supporting the work of a gynecologist in clinical practice.

Keywords: artificial intelligence, gynecology, diagnostics, management, explainable diagnostics.

Introduction

Healthcare consists of medical and surgical decisions based on scientific evidence [1]. Medical research thrives, as does the knowledge we gain from it. Inevitably, we reach a stage where knowledge grows significantly, at levels that go beyond human capacity to remember and apply in general [2]. For this reason, we form specialized training pathways and highly specialized experts [3]. Obstetrics and Gynecology is a field that cares for patients with a variety of other primary conditions or comorbidities, often outside the doctor's area of expertise and experience. At the same time, it is a specialty that cares for patients of all ages, including pediatric and geriatric patients [4,5]. Inevitably, it involves a vast area of expertise that progresses at a rate far beyond what a specialist doctor can easily follow. This can present more problems for non-specialist healthcare professionals and frustrates those in training. At the same time, the number of patients increases and the time of admission decreases, while demands and expectations increase, and resources become more expensive or run out [6].

With the advancement of technology, we have begun to see its application in the daily life and decision-making of the physician, as well as in the surgeon's practical approach to management. In particular, artificial intelligence (AI) is being implemented at various stages of the healthcare path: diagnosis, research, and treatment [7,8]. It can play a role in assisting the healthcare professional in decision-making, in forecasting, and in ensuring safety for both the patient and the physician [9].

In obstetrics and gynecology, the application of AI is numerous and can be as specialized and unique as the branch of specialization in which AI is applied. Until now, AI has been used as a tool to interpret fetal cardiotocography and heart rate, to help identify pregnancy complications such as gestational diabetes and preterm birth, and to analyze discrepancies in its interpretation in order to reduce maternal and child morbidity and mortality [10,11,12,13,14,15]. In addition, in the

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field of gynecological surgery, the use of augmented reality helps surgeons detect vital structures, thereby reducing complications, reducing surgery time, and assisting surgeons in learning to practice in realistic conditions [16].

Human-Centric Artificial Intelligence (HCAI) is a modern take on AI that guides us to create systems that resemble an expert in a particular field, mimicking their way of thinking and making decisions to solve real-world problems. In the field of medical diagnostics, HCAI systems are designed to help physicians feel more confident in their decision-making by providing a more complete picture of differential diagnoses both within and outside their specialization, while ensuring that common diseases are overdiagnosed and emergencies are not missed.

Research materials and methods: The development of the GAID system was strictly guided by two central principles [17]. These are (a) the human in the cycle and (b) the sustained acquisition of knowledge. The first principle requires that the system does not seek to replace or surpass the human expert, but rather to empower the individual. In practice, this means that GAID is designed to provide a range of the most possible diagnoses, rather than one best diagnosis, each of which is accompanied by a comprehensive explanation. This allows a human expert to independently analyze differential diagnostic capabilities in accordance with the clinical picture and immediate needs of the patient [18]. In addition, following this human-in-cycle principle, GAID provides guidance on additional relevant information that the physician should gather during the patient's visit, which will help focus on the patient's possible diagnosis. The second principle of HCAI sustainable knowledge acquisition requires that the development of an AI system be designed as a continuous process that can easily obtain relevant knowledge either directly from experts or through an automated learning process.

There are three main methods for evaluating an AI-based decision support system. The first method is a general assessment of the system through a review of the relevant literature. This is done by gathering knowledge and understanding of how the system should respond and perform based on the given parameters and metrics. The second method is a specific assessment of the system using expert focus groups. This means that the decisions and performance of the system are compared to the decisions and performance doctor to resolve any questions regarding the correctness, validity and meaningfulness of the results of the system, as well as the level of discrepancy between two decisions for the same case (doctor versus system) [19,20]. In this method, the physician is the judge of the results and is responsible for communicating the level at which the system is correct, the level at which it has helped them perform their tasks, and whether their decision has changed due to discrepancies between their original decision and that of the system [19,20]. The third method is to use real patients to evaluate the performance of the system. Their pathologies and patient information can be used to assess the accuracy and correctness of the system [21], while their critical opinion can be used to assess how satisfactory the explanations provided by the diagnostic decision support system are compared to those of the human physician in order to assess their level of trust and transparency [22].

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Study Results:

By analyzing seven subcategories of gynecological cases—bleeding, endocrine disorders, oncology, pelvic pain, urogynecology, sexually transmitted infections, and vulvar pathologies in fifty patients—GAID demonstrates an average accuracy of 0.87. Because the system provides reasoned explanations to confirm the diagnosis compared to other possible diagnoses, this approach further aids system learning and improvement of the diagnostic process [23].

Conclusions:

GAID achieves an average accuracy of 0.87 when compared to the senior consultant's diagnoses. In addition, the system offers detailed explanations of its findings, allowing physicians to develop greater confidence in its recommendations. It also provides a practical database that can be used as an auxiliary tool for history collection and record keeping, which helps improve diagnostic accuracy through a complete set of differential diagnoses. Design system contributes to its continuous improvement and allows it to be easily adapted to new information. Larger studies are needed to further assess GAID and clarify its boundaries.

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