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ARTIFICIAL INTELLIGENCE IN PRIMARY CARE - THREAT OR SUPPORT FOR THE GENERAL PRACTITIONER?

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ABSTRACT

Background: With the rapid development of information technology, artificial intelligence (AI) is finding more and more applications in medicine, including in primary care (PCP). The potential of AI in improving diagnosis, patient monitoring and practice management is presented, and the ethical and legal challenges of its use are highlighted.

Aim: The aim of this paper is to analyse the benefits and risks of implementing AI-based solutions in the daily practice of the family physician.

Materials and methods: The scientific literature documents a number of examples of successful use of AI in clinical practice, such as medical decision support systems, diagnostic image analysis, health risk prediction tools, patient telemonitoring or automation of administrative tasks. However, despite the high effectiveness of the technology, research points to a number of limitations: the lack of transparency of the algorithms, the risk of potential errors and biases in decision-making, risks to patient privacy and fears of over-automating the treatment process.

Results: Maintaining the doctor-patient relationship and ensuring doctors' decision-making autonomy in the context of AI-generated recommendations becomes particularly important.

Conclusions: AI can significantly support general practitioners (GPs) in their daily practice, but the implementation of such technologies must be thoughtful and responsible. Ethical aspects, patient trust, data security and legal liability are crucial. It seems reasonable to create uniform standards and guidelines governing the use of AI in PCPs, while developing digital competence among medical staff. Only then will technology become a real support and not a threat to the quality of healthcare.

KEYWORDS

Artificial Intelligence, Primary Health Care, Family Practice, Ethics, Diagnosis, Telemedicine

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Introduction

Artificial intelligence (AI) in medicine represents one of the most promising tools that has the potential to revolutionise healthcare. In the context of primary healthcare (PHC), AI can support GPs in the diagnostic process, monitoring patients, as well as managing daily medical duties, e.g.: admitting patients, maintaining appointment schedules, liaising with other specialists or professional development. The use of technologies such as machine learning-based systems, image recognition or data analytics can significantly improve the quality of patient care, as well as enabling doctors to make accurate clinical decisions more quickly [1][6][10]. Machine learning-based systems are a type of artificial intelligence that can learn from data, without the need for humans to program each value [8]. Algorithms analyse huge sets of information, i.e. test results, demographics, medical histories, and learn to recognise patterns that can be useful for diagnosis, predicting the course of a disease or recommending better treatment for a particular person [4][7]. By doing so, it can also identify a new patient at risk and suggest appropriate preventive measures, preventing deterioration of health.

Benefits of using AI in PCPs

The introduction of AI in PCPs can bring numerous benefits to both patients and GPs. First and foremost, AI has the potential to improve the quality of diagnoses [2][5]. By analysing vast amounts of patient data, algorithms can support doctors in identifying hidden patterns that might have escaped human eyes [8]. An example would be a decision support system that analyses patient data and, based on this, recommends further diagnostic or therapeutic steps, anticipating an infinite number of disease scenarios and possibilities for failure [3].

Another area where AI can support doctors is in the monitoring of patients with chronic diseases. The use of devices to continuously monitor parameters such as blood pressure, glucose levels or heart rate can keep

patients up-to-date [9][17]. AI algorithms can automatically analyse this data and alert doctors to possible health problems, allowing for a faster response and implementation of appropriate treatment and preventing unnecessary hospitalisations, thus not exposing the patient to more virulent pathogens.

In addition, AI can help to optimise daily work in the PCP by automating administrative tasks such as making appointments, analysing test results or issuing prescriptions [16][21]. This allows GPs to focus on more complex clinical tasks, increasing the efficiency of their work and the time spent with patients [25].

Opportunities for the use of AI in PCPs

AI-assisted diagnosis – AI-based systems, such as tools for analysing medical images (e.g. X-rays, CT scans, MRIs) and diagnostic algorithms, can help the doctor in the early detection of diseases such as cancer, heart disease or diabetes [4][6][18]. An example is the use of artificial intelligence in the analysis of imaging findings, where algorithms can detect subtle changes that may be missed during manual assessment.

Telemedicine and remote diagnostics – AI-assisted telemedicine allows a doctor to remotely monitor the health of patients [19]. For example, patients with chronic heart disease can use devices to monitor vital signs, and this data is sent to the AI system, which analyses it in real time and sends alerts to the doctor if the parameters are out of normal [9][17]. Similarly, when a patient is treated for diabetes and uses daily blood glucose monitoring systems, any hypo- or hyperglycaemia or other abnormalities are signalled as alerts on the phone app.

Medical data management – AI can help organise and analyse patients' medical data, enabling the doctor to quickly adjust the treatment plan [20][28]. An example would be a system that recommends the best possible personalised therapies based on a patient's health history and genetic data.

Optimising the management of the doctor's office – by automating organisational processes such as making appointments, verifying health insurance or analysing test results, doctors can save time and focus on treating patients [21]. An example of this is a system that automatically adjusts the doctor's schedule depending on the urgency of the appointments [18]. This represents a considerable relief for doctors and increases the availability of services for more patients.

Threats and limitations

Despite the many potential benefits, the implementation of AI in PCPs comes with a number of challenges. First of all, the responsibility for decisions made with the help of AI still lies with the doctor [5][22]. For example, if the system recommends the wrong treatment for a hypertensive patient due to incomplete input data, the doctor suffers the consequences, even if he or she blindly trusted the algorithm. It is therefore necessary to maintain a healthy scepticism and be able to verify the recommendations generated by the technology.

There is also a risk of over-reliance on algorithms and a limitation of the individual patient approach [12][13][14]. For example, an algorithm may fail to recognise important psychosocial factors affecting a patient's health, such as work-related stress or domestic violence, because these are not directly represented in the medical data. This can lead to simplistic, overly schematic therapeutic decisions that do not take into account the context of the patient's life.

Data privacy issues are also of concern, e.g. when data collected by a mobile blood glucose monitoring app is transferred to external parties without the patient's knowledge [23][27]. Transparency in the operation of algorithms also remains a challenge: many AI-based solutions are so-called 'black boxes' whose logic of operation is unclear to both doctors and patients [11][12]. Added to this is the lack of clear legal liability regulations for data processing by commercial applications, where users may not have access from the patient account itself.

An additional problem is the potential biases arising from the quality of the learning data [2]. If an algorithm has been trained mainly on data from one ethnic or age group, it may misinterpret symptoms in patients outside that group, e.g.: the system may have lower performance in detecting skin diseases in people with darker skin colour if it has been trained mainly on images of Caucasian patients. Such errors may lead to inequalities in access to care and quality of treatment.

Ethics and trust

Trust is the foundation of the doctor-patient relationship, and preserving it is one of the biggest challenges in the context of implementing AI in primary care [13][15]. While technology can improve the quality of care, its unreflective introduction can upset the delicate balance between the doctor's clinical competence and the patient's autonomy [1][30]. For example, if a patient receives an algorithm-generated diagnosis or treatment recommendation and does not understand the basis on which it was made, this could undermine their confidence in the entire treatment process.

A key ethical issue remains: who is responsible for decisions made with AI – the doctor, the programmer, the medical institution or perhaps the software manufacturer [5][12][14]? In a situation where an AI system recommends against further diagnosis in a patient with non-specific symptoms (e.g. chronic fatigue), and subsequent testing reveals cancer, there may be a legal and ethical dilemma regarding the source of the error.

Key ethical questions include:

- How to protect patient autonomy?
- How do we integrate humanistic values into technology?

The literature emphasises the importance of interdisciplinary collaboration and the need to codify ethical standards for AI in medicine [13][14][15].

Another issue is the transparency of how algorithms work [11][14][36]. Patients and physicians should understand how an algorithm arrives at a particular diagnostic or therapeutic conclusion. So-called 'black box' algorithms' can raise legitimate concerns, especially when their operation is not fully explainable or controllable. The lack of transparency makes it difficult not only to assess the reliability of a recommendation, but also the possibility of challenging an algorithm's decision, which can introduce additional anxiety among patients.

Conclusions

Artificial intelligence offers great potential in improving the quality of healthcare in PCPs. However, its implementation must be preceded by ethical reflection, ensuring transparency and accountability for clinical decisions [12][15]. Collaboration between physicians and health informaticians is crucial for the full and safe use of AI in the daily practice of the GP [17][25]. The demand for 'ethical AI' should become an integral part of health policies and regulations [13][31]. Technological developments must be compatible with the values of family medicine: holism, relationality and concern for the whole person.

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