

## SOCIAL ACCEPTANCE OF ARTIFICIAL INTELLIGENCE (AI) APPLICATION FOR IMPROVING MEDICAL SERVICE DIAGNOSTICS

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**Abstract:** *The aim of the conducted research was to assess the attitude of the Polish society towards the use of artificial intelligence in medical diagnostics. In the research process, we sought answers to three research questions: how trust in the use of AI for medical diagnostics can be measured; if societal openness to technology determines trust in the use of AI for medical diagnostics purposes; and if a higher level of trust in the use of AI for medical diagnostics influences the potential improvement in the quality of medical diagnostics as perceived by Poles. The authors' particular focus was on the following three constructs and the relationships between them: openness to new technologies (OP), willingness to trust AI in medical diagnostics (T), and perceived impact of AI application on the quality of medical diagnostic services (PI). A survey was conducted on a representative sample of 1063 Polish respondents to seek answers to the above questions. The survey was conducted using the CATI technique.*

**Keywords:** *artificial intelligence, medical diagnostics, trust to AI, medical diagnostics quality.*

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## INTRODUCTION

Global socio-economic development trends pose diverse and complex challenges for healthcare systems. One of the key global social trends is the aging of the population (Wolf et al., 2021), characterized by an increase in the number of elderly individuals. It is projected that the proportion of older people (aged 65 and older) in the overall EU population will increase from 21.1% (94.3 million) at the beginning of 2022 to 32.5% (136.1 million) in 2100. Around 2050, the number of people aged 65 and older will make up 25% of the population, surpassing the number of those under 25 (United Nations, 2019). With the decline in the overall EU population by 2100, this is the only age group with the potential to grow (both in relative and absolute terms), confirming the ongoing process of population aging (Eurostat, 2023).

Ongoing demographic changes have a significant impact on the economy and its various segments (Halicka, 2024). It is necessary to adapt infrastructure, services, healthcare, and social care to accommodate the shifting age structure of the population. The aging population will increase the demand for elderly care. Healthcare systems will need to adjust to this trend by offering high-quality geriatric care and long-term senior care. Social security systems, especially those based on a pay-as-you-go model, where pensions are paid from the current contributions of working individuals (as in Poland), may face destabilization. The rise in healthcare costs will also be driven by the need to address chronic and lifestyle-related diseases and the growing demand for preventive diagnostic tests.

Global pandemics like COVID-19 pose a significant challenge to modern healthcare and medicine. Significant changes are typical for human behaviour as well (Florek & Lewicki, 2022; Mishchuk et al., 2023). They underscore the need for rapid responses and increased capacity to control infectious diseases. Finally, rapid technological advancement and the increasing volume of medical data require the adaptation of medical practices, as well as the implementation of new regulations and procedures to ensure the security and privacy of data.

These challenges shape innovative processes and the way healthcare is delivered. To ensure better quality of care and health outcomes for patients, modern medicine focuses on leveraging advanced technologies, personalizing healthcare, and improving access to medical services.

One of the tools introducing revolutionary innovations in healthcare is artificial intelligence (AI) (Alberich-Bayarri, Pastor, González, & Castro, 2019; Doanh et al., 2023). It can offer convenient access to medical care, diagnostics, and monitoring outside of hospital settings (Lee & Yoon, 2021).

The literature review conducted for the purpose of this article has allowed for the identification of the main areas of AI applications in medicine and the research topics within them. The identified main research topics, along with sample publications and the research objectives described in these articles, are presented in Table 1.

**Table 1.** The area of AI applications in medicine [Source: Own study]

The area of AI applications in medicine	The role of AI	Publication	The research problem, objectives
Medical diagnosis	Recognition of diseases and interpretation of medical test results such as X-ray images, computer tomography (CT), and magnetic resonance imaging (MRI)	Parasher, Wong, & Rawat, 2020	A discussion on the role of AI in gastrointestinal endoscopy and future development opportunities
		Gulshan et. al., 2016	Applying deep learning to create an algorithm for automated detection of diabetic retinopathy and diabetic macular edema in retinal fundus photographs
		Hwang et. al., 2019	Developing a deep learning-based algorithm that can classify normal and abnormal results from chest radiographs with major thoracic diseases including pulmonary malignant neoplasm, active tuberculosis, pneumonia, and pneumothorax and validating the algorithm's performance using independent data sets
Prediction and risk assessment	Patient data analysis and assistance in predicting treatment outcomes and assessing disease risk, enabling better clinical decision-making	Navarro et. al., 2021	Assessing the methodological quality of studies on prediction models developed using machine learning techniques across all medical specialties
		Kanegae et. al., 2020	Using machine learning techniques to develop and validate a new risk prediction model for new-onset hypertension
		de Hond et. al., 2022	Identification of actionable guidance for those closely involved in AI-based prediction model (AIPM) development, evaluation and implementation including software engineers, data scientists, and healthcare professionals and to identify potential gaps in this guidance
Prediction of epidemics	Analysis of epidemiological data and assistance in predicting potential outbreaks of infectious diseases, which is crucial for public health	Kolozsvári et. al., 2021	Using the official epidemiological data to forecast the epidemic curves (daily new cases) of the COVID-19 using Artificial Intelligence (AI)-based Recurrent Neural Networks (RNNs), then comparing and validating the predicted models with the observed data
		Gruenwald, Jain, & Gropp, 2021	Detailed technical description of the role Artificial Intelligence plays in various stages of a disease outbreak, using COVID-19 as a case study
		MacIntyre et. al., 2023	The role of AI in epidemic surveillance and summary of several current epidemic intelligence systems including ProMED-mail, HealthMap, Epidemic Intelligence from Open Sources, BlueDot, Metabiota, the Global Biosurveillance Portal, Epiweetr and EPIWATCH
Personalized medicine	Providing a personalized approach to treatment, tailored to individual patient needs based on genetic analysis and other data	Schork, 2019	Analysis of contributions of AI in advancing personalized medicine, pointing out the limitations of many AI techniques in developing personalized medicines, presenting areas for further research
		Awwalu, Garba, Ghazvini, & Atuah, 2015	An overview of the application and ability of artificial neural network (ANN), support vector machines (SVM), Naïve Bayes, and fuzzy logic in solving personalized medicine problems
		Gifari, Samodro, & Kurniawan, 2021	Review of selected applications of AI tools in the development of personalized medicine in the context of their performance, interpretability and clinical relevance
Surgical support	Robotics and AI systems can assist surgeons during procedures, enabling precise surgeries and reducing recovery time	Hashimoto, Rosman, Rus, & Meireles, 2018	Summary of major topics related to artificial intelligence (AI), including their applications and limitations in surgery. Discussion of key capabilities of AI to help surgeons understand and critically evaluate new AI applications and contribute to new developments
		Hashimoto, Rosman, Meireles, 2021	A history, principles, and main subfields of artificial intelligence (AI), examples of current and near-future use cases for AI in surgery, followed by a discussion of the ethical implications of AI and its potential impact on health policy
		Zhou, Guo, Shen, & Yang, 2020	Review of the recent successful and influential applications of AI in surgery from preoperative planning and intraoperative guidance to its integration into surgical robots, summary of the current state, emerging

Patient monitoring	AI can assist in real-time patient monitoring by analyzing data from medical equipment and wearable devices, enabling a quick response to changes in the patient's health	Shaik et. al., 2023	trends, and major challenges in the future development of AI in surgery
		Baig, GholamHosseini, Moqeem, Mirza, & Lindén, 2017	A comprehensive review of Remote Patient Monitoring (RPM) systems, including advanced technologies employed, the impact of AI on RPM, challenges, and trends in AI-enabled RPM. The analysis covers the benefits and challenges of patient-centric RPM architectures facilitated by IoT devices and sensors using cloud, fog, edge, and blockchain technologies
		Malche et. al., 2022	Investigating barriers and challenges of wearable patient monitoring (WPM) solutions adopted by clinicians in acute, as well as in community, care settings.
Medical Data Management	AI assists in the analysis of vast amounts of medical data, contributing to the improvement of medical data management, predicting trends, and identifying patterns	Wehbe, Al Zaabi, & Svetinovic, 2018	A proposal for an Intelligent Remote Patient Activity Tracking System that can monitor patient activities and vital signs during these activities based on attached sensors
		Mehta, Pandit, & Shukla, 2019	A proposal for a coupled AI-Blockchain EHR management system. The goal is to provide a platform that leverages blockchain and artificial intelligence (AI) for secure EHR management, efficient data integration, and reliable computer-aided diagnoses
		Hariri, Fredericks, & Bowers, 2019	Systematic mapping study to identify and analyze research on big data analytics and artificial intelligence in healthcare, in which 2421 articles between 2013 and February 2019 were evaluated. The results of this study will help understand the needs in application of these technologies in healthcare by identifying the areas that require additional research
Pharmacology	AI helps accelerate the drug discovery process, identify potential therapeutic targets, and design new drugs	Zhavoronkov, Vanhaelen, & Oprea, 2020	Presentation on Artificial Intelligence Techniques Applied to Large Data Sets. This article reviews previous work in big data analytics and presents a discussion of open challenges and future directions for recognizing and mitigating uncertainty in this domain
		Al Meslamani, 2023	Discuss on current trends in the use of AI/ML in health care and the impact of AI/ML context of the daily practice of clinical pharmacologists
		Rubinic et. al., 2023	The discussion of the potential of artificial intelligence in revolutionizing pharmacy practice is a promising exploration. It involves an examination of the current state of AI applications in pharmacy, identifying gaps and challenges, and suggesting potential strategies for integrating AI tools into daily practice. This integration has the potential to propel the pharmaceutical sector into a new era of healthcare, characterized by increased personalization and efficiency
Healthcare and Healthcare Company Management	AI systems can support healthcare organizations in optimizing processes, detecting abuses, and reducing care costs	Dicuonzo, Donofrio, Fusco, & Shini, 2023	Exploring the possibility of employing large language models (LLMs) – a type of artificial intelligence (AI) – in clinical pharmacology, with a focus on its possible misuse in bioweapon development
		Kulkov, 2021	Investigating how AI supports the effective and efficient management of the healthcare system by examining the Humber River Hospital in Toronto using the case study methodology
		Cubric, 2020	Identifying exactly how AI affects the key and supporting business processes of pharmaceutical companies
			Review of AI implementations in various business sectors (including healthcare)

The field of medical diagnostics is particularly sensitive to the emergence of issues resulting from the global trends of an aging society. There is an increasing demand for complex medical examinations and the monitoring of chronic diseases. The growing number of patients leads to challenges in accessing healthcare services, longer waiting times for medical appointments, and delays in diagnosis. A shortage of specialists, including radiologists and

technicians, also hinders access to medical tests. Elderly patients often require more advanced examinations due to their multiple health conditions, which increases healthcare costs. Complex monitoring of chronic diseases, privacy issues, and physical barriers in accessing medical facilities are further challenges in the context of an aging society.

With age, the risk of various health conditions such as heart disease, cancer, and neurodegenerative disorders increases, leading to changes in diagnostic needs. Diagnostic systems must adapt to these specific requirements, which may call for innovative technologies and more advanced tests. All of these factors create challenges that medical diagnostic systems need to address to ensure effective care for elderly patients. It appears that modern technologies, including AI, have the potential to contribute to the improvement of healthcare and serve as effective tools for contemporary and future medicine to meet the challenges posed by current developmental trends. They have the potential to save time and money while promoting patient engagement in using technologically supported systems offered by healthcare institutions (Lee & Yoon, 2021).

Artificial intelligence (AI) has already demonstrated significant potential in the field of medical diagnostics. Deep learning algorithms, especially convolutional neural networks, have become a popular choice for analyzing medical images (Litjens et al., 2017; Shen, Wu, & Suk, 2017). These machine learning algorithms have been applied in various tasks related to medical images, including image classification, object detection, segmentation, and registration (Litjens et al., 2017).

AI tools can be utilized throughout the entire radiological process, starting from image quality in acquisition, automated image classification, quantitative image analysis, up to reporting and management. They achieve results similar to human capabilities and should be viewed as a supplementary rather than a replacement for radiologists (Alberich-Bayarri et al., 2019). These tools can expedite the diagnostic process, enhance diagnostic quality, facilitate early disease detection, and contribute to improving diagnostic service accessibility (Rigby, 2019; Lee & Lee, 2020; Saleh et al., 2022; Morgan et al., 2021; Dreyer & Allen, 2018).

The use of AI in the analysis of medical images has been explored in various fields, including neurology (Giannos, 2023); retinal studies (Saleh et al., 2022), pulmonology (Yanagawa et al., 2021), digital pathology (Bizzego et al., 2019); breast imaging (Erickson, Korfiatis, Akkus, & Kline, 2017; Sidey-Gibbons & Sidey-Gibbons, 2019; Zhou et al. 2021), cardiology (Sengupta & Chandrashekar, 2021), abdominal imaging (Park, Cho, & Kim, 2023), musculoskeletal imaging (Litjens et al., 2017), dermatology (Esteva et al., 2017), ophthalmology (Afifi-Sabet, 2018); gynecology (Sone et al., 2021), surgery (Lewicki et al., 2021). AI has the potential to enhance diagnostic accuracy, improve efficiency, and support healthcare professionals in decision-making processes (Harada, Katsukura, Kawamura, & Shimizu, 2021; Erickson et al., 2017, Jiang et al., 2017). The most common diagnostic applications of AI are in oncology, neurology, and cardiology (Jiang et al., 2017). Currently, diseases in these areas are major causes of death, making early diagnosis crucial to prevent the deterioration of patients' health.

Support for diagnosticians can also involve providing the most up-to-date medical knowledge from various sources (journals, textbooks, clinical practice) (Sitthipon et al., 2022). AI has a high potential for analyzing large and complex datasets to create predictive models that personalize and improve diagnosis, prognosis, monitoring, and therapy administration for the enhancement of individual health outcomes. The predictive models developed are useful in

assessing health risk and support clinical decision-making (Collins & Moons, 2019). Summarizing, AI, especially deep learning algorithms, has shown promise in the field of medical diagnostics. Nevertheless, there are still challenges and directions for future research in this field.

One of the solutions needed is how to effectively utilize the vast amount of available healthcare data in computer systems, which raises questions about data security and patient privacy. It turns out that the assessment of data quality and data curation (including medical images) in the context of AI and DL can take up to 80% of data specialists' time. This can make proper implementation challenging and may even lead to incorrect data processing or erroneous conclusions (van Ooijen, 2019).

The need for AI in diagnostics is also linked to the high number of errors made in human diagnoses. Taylor (2019) stated that 60% of all medical errors and an estimated 40,000-80,000 deaths annually in U.S. hospitals are due to diagnostic errors. AI systems can help reduce diagnostic and therapeutic errors (Lee & Yoon, 2021; Uziakko, 2019).

The broader applications of artificial intelligence offer numerous possibilities, but on the other hand, they can raise societal concerns (Ikkatai, Hartwig, Takanashi, Yokoyama, 2022; Kieslich, Lünich, & Došenović, 2023; Wach et al., 2023). The dark side of). These concerns stem from the need to ensure the safety of patient data and privacy (Murdoch, 2021), uncertainties regarding outcomes (arising from machine learning), and the high costs of implementing AI-based solutions for medical institutions (Ahmad, Rahim, Zubair, & Abdul-Ghafar, 2021).

Concerns related to the use of artificial intelligence in medical diagnosis extend to both doctors and diagnostic experts, as well as patients who traditionally relied solely on human knowledge - specialist doctors. Raising public awareness about the increasing use of AI in medicine, its advantages, and disadvantages will contribute to more informed decision-making and greater openness to these solutions in the future. Many researchers emphasize the need for ongoing education for both doctors, diagnostic experts, and patients (Lee & Yoon, 2021).

The aim of the conducted research was to assess the attitude of the Polish society towards the use of artificial intelligence for medical diagnostics.

The remaining part of the article has the following structure. In the next section, the results of the literature review in the context of the relationships between the three studied constructs were presented, allowing for the formulation of research hypotheses and a theoretical model. Next, in the section Research methodology, the research process was described, along with the methods and research tools employed. Additionally, the research sample was characterized, taking into account its demographic features. Subsequently, the results of the research were presented, allowing for the statistical verification of the research hypotheses. The authors' research findings were discussed in the context of previous research results by other authors. In the Conclusions section, the main methodological and practical conclusions were presented, limitations of the research were indicated, and future research directions were suggested.

## **LITERATURE REVIEW AND THEORETICAL MODEL**

Acceptance and understanding of AI by patients are essential for the implementation of artificial intelligence in medical diagnostics. Society's attitude towards the application of

artificial intelligence (AI) in medical diagnostics is dependent, among other factors, on the level of trust in AI systems, the public's awareness of the benefits and risks associated with AI in medicine, and the ability to handle technology.

Patients generally exhibit a positive attitude towards using artificial intelligence-based systems for health purposes (Esmaeilzadeh, Mirzaei, & Dharanikota, 2021). In their opinion, diagnoses made by AI are perceived to be more accurate than those made by doctors (Stai et al., 2020). They view clinical applications of AI as beneficial to their healthcare needs and believe that AI can help them understand diagnosis outcomes (Richardson et al., 2021). Patients recognize the benefits in terms of improving the quality of medical diagnostics (Ayad et al., 2023) and reducing human errors.

However, they express concerns regarding safety, privacy, and the potential increase in healthcare costs associated with the use of medical diagnoses based on artificial intelligence (Chernobrivtseva & Misyurin, 2022). Some of them are skeptical about AI's ability to accurately assess their health (Gaczek, Pozharliev, Leszczyński, & Zieliński, 2023).

The lack of trust stems from the fear of machine errors and the need for human knowledge in decision-making (Poon & Sung, 2021; Boiko et al., 2021) and the lack of AI regulation (Kerasidou, Kerasidou, Buscher, & Wilkinson, 2022).

Identifying and addressing these concerns (Hanhui, 2019) is crucial for the acceptance of AI by its users (medical staff and patients) (Zhang et al., 2020). Previous studies on medical personnel suggest that not everyone is willing to accept the use of medical AI devices (Lai, Brian, & Mamzer, 2020; Turja, Aaltonen, Taipale, & Oksanen, 2020). Patient attitudes towards AI are not well understood (Young, Amara, Bhattacharya, & Wei, 2021). There is still limited knowledge about the readiness of the general population to undergo medical procedures involving artificial intelligence. Few studies have focused on assessing consumer perspectives on the use of AI in medicine, including understanding the process of building patient trust in medical AI applications. Recent research has emphasized the importance of system explainability in increasing user trust and reliance on medical artificial intelligence in diagnostic support (Rong, Castner, Bozkir, & Kasneci, 2022). Gips and Bahramisharif (2022) highlight that trust in AI applications can increase by demonstrating that AI technologies can improve clinical outcomes and engaging clinicians in the decision-making process.

The successful implementation of artificial intelligence-based systems requires a thorough examination of users' attitudes and perceptions towards artificial intelligence (Romero-Brufau et al., 2020; Bilan et al., 2023). It necessitates a profound understanding of the factors influencing the acceptance of AI-based services by potential users. As noted by Czemieli-Grzybowska (2022), any kind of innovation implementation process depends on openness to new technology and solutions (Czemieli-Grzybowska, 2022). Many authors emphasize the urgent and continuous need for research on the societal and ethical aspects of AI technology applications (Robinson, 2020).

In shaping trust in the application of artificial intelligence in medical diagnostics, openness to new technologies plays a crucial role. Both doctors and patients hesitate to fully trust and adopt AI-based technologies in medicine due to the "black box" effect, where the internal workings of algorithms are not fully understandable (Nolan, 2023). There is still a need to improve trust in AI models (Sushma, Goud, Nikhil, & Reddy, 2021). The adoption and usage of artificial intelligence systems may be contingent upon the trustworthiness and acceptance levels attributed to these tools (Sohn, Kwon, 2020). Also, Pishnyak and Khalina (2021), when

studying the determinants shaping innovation openness, considered trust as one of the elements. Considering the importance of openness to new technologies and its role in building trust in technology, the following hypothesis has been formulated:

H1: Openness to new technologies statistically significantly influences a higher level of trust in the application of AI in medical diagnostics.

Trust in artificial intelligence in medical diagnostics is the subject of research (Juravle, Boudouraki, Terziyska, & Rezlescu, 2020), especially from the perspective of medical staff (Tucci, Saary, & Doyle, 2022; Asan, Bayrak, & Choudhury, 2020). The willingness to trust the application of artificial intelligence in medical diagnostics refers to the inclination or readiness of individuals (both medical staff and patients) to trust and rely on artificial intelligence technologies for diagnostic purposes. It encompasses the psychological and attitudinal aspects of using artificial intelligence as a valuable tool in medical diagnostics. It plays a crucial role in the successful integration and acceptance of AI technologies in healthcare. A high level of willingness indicates an open approach to AI-based medical diagnostics, while lower willingness follows from concerns about this form of diagnostics. Determinants of readiness to implement artificial intelligence in medical diagnostics include (Hsieh, 2023; Tran et al., 2021): perceived effectiveness of artificial intelligence in terms of diagnostic accuracy, level of trust in artificial intelligence systems, ethical considerations, and understanding of potential benefits and risks associated with the implementation of artificial intelligence in medical diagnostics.

Areas such as reliance on AI, trust in it, and willingness to use it have not been fully explored within the patient population. Knowledge in this regard is crucial because implementing solutions based on artificial intelligence without considering the beliefs of potential users (medical staff, as well as patients) and their readiness to accept AI-based devices can lead to the waste of resources. This is especially important in healthcare, as patient engagement is a significant determinant of healthcare quality. If patients do not perceive the use of medical AI devices as beneficial, they may have a negative view of the entire process of receiving medical services using AI. Therefore, the following hypothesis has been formulated:

H2: Willingness to trust the application of AI in medical diagnostics determines the perceived impact of AI application on the quality of medical diagnostic services improvement.

Research on technology acceptance confirms that demographic characteristics (age, gender, and education) determine attitudes towards technology. Older adults, men, and individuals with higher education generally tend to have more positive attitudes towards technology (Lee et al., 2019).

According to some researchers (Lee, 2010), the influence of demographic factors on the acceptance of information technology is diminishing; respondents exhibit a positive attitude towards the benefits of technology and its adoption regardless of gender, age, education, and income levels.

The following hypotheses were formulated to investigate the relationship between attitudes towards the application of AI in medical diagnostics and socio-demographic characteristics:

H3.1. The age determines the openness to new technologies (OP)

H3.2. The gender determines the openness to new technologies (OP)

- H3.3. The education level determines the openness to new technologies (OP)  
 H4.1. The age determines the willingness to trust AI in medical diagnostics (T)  
 H4.2. The gender determines the willingness to trust AI in medical diagnostics (T)  
 H4.3. The education level determines the willingness to trust AI in medical diagnostics (T)  
 H5.1. The age determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)  
 H5.2. The gender determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)  
 H5.3. The education level determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)

## RESEARCH METHODOLOGY

### Research sample

The survey was conducted in June 2023, on a representative sample of 1063 Polish adults. A random sample selection method was employed. For data collection, the CATI (Computer-Assisted Telephone Interviewing) technique was used. The obtained sample size (1063), with an assumed margin of error of 3% and a confidence level of 95% ensured the sample's representativeness.

The structure of respondents varied based on demographic characteristics: gender, age, and education. The sample size and its demographic structure are presented in Table 2.

**Table 2.** Respondents' demographic structure based on gender, age, and education [Source: Own study]

	Frequency	Percentage
<b>Gender</b>		
Female	554	52.1
Male	508	47.8
Other	1	0.1
<b>Age</b>		
18-25 years old	148	13.9
26-40 years old	319	30.0
41-60 years old	366	34.4
over 60 years old	230	21.6
<b>Education level</b>		
Primary or lower secondary education	28	2,6
Basic vocational education	115	10,8
Secondary (high school/ post-secondary)	468	44,0
Higher education (University level)	452	42,5
<b>Declined health status</b>		
Very good	92	8,7
Good	476	44,8
Average	363	34,1
Rather poor	83	7,8
Poor	36	3,4
Hard to say	13	1,2

## Research measurements

Considering that the studied constructs are not directly measurable and represent unobservable constructs, one of the research objectives was to develop measurement scales for the three measurement constructs: openness to new technologies (OP), willingness to trust AI in medical diagnostics (T), and perceived impact of AI application on the quality of medical diagnostic services improvement (PI). The proposed measurement variables within the constructs OP and T were assessed by respondents using a 5-point Likert scale, where: 1 - indicated "strongly disagree," and 5 - indicated "strongly agree." In the case of assessing the impact of AI on the quality of medical services, a 5-point Likert scale was also used, where: 1 – indicated significant deterioration, 5 indicated significant improvement.

Subsequently, the obtained results were subjected to confirmatory factor analysis (CFA) to verify the proposed measurement scales. Variable reduction was conducted taking into account regression coefficient value and absolute values of the covariances for standardized residuals. From the initial set of observable variables, variables were excluded if their regression coefficient value was below 0.6, and if the absolute values of the standardized residual covariances exceeded 2 (as shown in Table 3).

The reliability of the adopted measurement scales was assessed using two measures: Cronbach's alpha coefficient ( $\alpha$ -Cronbach) and Composite Reliability (CR). For both measures, an acceptable level should exceed 0.7. Validity was evaluated in terms of convergent validity using the Average Variance Extracted (AVE). The AVE value should exceed 0.5. A Cronbach's alpha value above 0.7 confirms high reliability of the scales and their suitability for measuring the studied constructs. The Cronbach's alpha coefficients for the constructs are as follows: OP = 0.765, T = 0.847, PF = 0.854 (Table 4).

**Table 3.** Standardized regression weights before and after CFA [Source: Own study]

Constructs and items	Standardized regression weights before and after CFA		Variable symbol
	Before	After	
<b>Openness to new technologies (OP)</b>			
I enjoy using new technologies	0.780		Removed
When I hear about new technology, I look for ways and opportunities to try it out	0.797		Removed
Among my peers/friends/family, I am usually the first person to try new technologies	0.692		Removed
I enjoy experimenting with new technologies	0.786	0.549	OP1
Thanks to science and technology, the world is a better place	0.686		Removed
Science and technology make our lives easier and more comfortable	0.799	0.857	OP2
Science and technology create more opportunities for the development of society	0.751	0.831	OP3
<b>Willingness to trust AI in medical diagnostics (T)</b>			
The development of artificial intelligence is essential for the advancement of our economy	0.734		Removed
The use of AI in medicine may raise moral dilemmas and doubts about entrusting the health and life of a human to artificial intelligence (reverse scale)	0.248		Removed
I would be willing to trust AI for diagnosis or treatment	0.741		Removed

When undergoing examinations, I would prefer artificial intelligence (AI) to be used in imaging studies (e.g., ultrasound, computer tomography, magnetic resonance, X-ray)	0.851	0.867	T1
I would feel comfortable if my doctor used AI-based tools for diagnosing diseases and selecting treatment methods	0.794	0.797	T2
Artificial intelligence (AI) could diagnose various conditions more accurately than humans	0.749	0.781	T3
<b>Perceived impact of AI application on the quality of medical diagnostic services improvement (PI)</b>			
<b>The application of AI in medical diagnostics will improve the quality of services in the areas of:</b>			
Quality of diagnoses (accuracy)	0.847	0.867	PF1
Number of medical errors	0.753	0.744	PF2
Patient-physician relationships	0.679		Removed
Security of patients' private medical data	0.648		Removed
Accuracy and validity of selected treatment methods	0.844	0.841	PF3
Speed of diagnosis and treatment	0.793		Removed
Access to healthcare services	0.690		Removed

\* Variable removed due to regression coefficient value was less than 0.6 and if the absolute values of the covariances for standardized residuals were greater than 2.

**Table 4.** Descriptive statistics, Cronbach's  $\alpha$ , Average Variance Extracted and Composite Reliability for all constructs [Source: Own study]

Constructs and items	Mean (M)	Factor Loading	Cronbach's $\alpha$	Composite Reliability (CR)	Average Variance Extracted (AVE)
<b>Openness to new technologies (OP)</b>					
OP1. I enjoy experimenting with new technologies	3.33	0.549			
OP2. Science and technology make our lives easier and more comfortable	3.89	0.857	0.765	0.797	0.575
OP3. Science and technology create more opportunities for the development of society	3.91	0.831			
<b>Willingness to trust AI in medical diagnostics (T)</b>					
T1. When undergoing examinations, I would prefer artificial intelligence (AI) to be used in imaging studies (e.g., ultrasound, computer tomography, magnetic resonance, X-ray)	3.65	0.867			
T2. I would feel comfortable if my doctor used AI-based tools for diagnosing diseases and selecting treatment methods	3.42	0.797	0.847	0.856	0.666
T.3 Artificial intelligence (AI) could diagnose various conditions more accurately than humans	3.63	0.781			
<b>Perceived impact of AI application on the quality of medical diagnostic services improvement (PI)</b>					
PF1. Quality of diagnoses (accuracy)	3.51	0.867			
PF.2 Less number of medical errors	3.28	0.744	0.854	0.859	0.671
PF3. Accuracy and validity of selected treatment methods	3.52	0.841			

## RESEARCH RESULTS

At the beginning of the survey, respondents were asked if they had ever heard of artificial intelligence (AI). A significant majority of respondents, as many as 96.0% (1020 individuals), answered that they had heard of AI, while only 4.0% (4 individuals) provided a negative response. In response to the question: Have you heard about the use of solutions employing artificial intelligence in the medical sector? fewer people answered affirmatively, with 60.6% (644 individuals) responding positively. The remaining 39.4% (419 individuals) provided a negative response.

However, since a significant portion of the respondents had not heard about the potential use of AI in medical services, a brief explanation of potential areas of AI application in medical diagnostics was provided at the beginning of the survey questionnaire: *The use of artificial intelligence methods in medical diagnostics involves the application of AI techniques (neural networks, genetic algorithms, expert systems) in the automated analysis of medical images to assist in medical diagnostics of pathological tissue conditions (such as tumors and inflammations). Artificial intelligence can analyze medical images, including computer tomography (CT), magnetic resonance imaging (MRI), ultrasound (USG), or X-rays, to detect pathological changes. Through machine learning, algorithms can recognize anatomical structures and identify signs of diseases, such as tumors and other conditions (e.g., psoriasis, acne). Artificial intelligence can also analyze the results of laboratory tests, such as blood morphology or biochemical tests, to detect abnormalities and provide accurate diagnoses. Algorithms can help identify patterns that indicate specific diseases and predict the risk of complications.*

To evaluate the research hypotheses Structural Equation Modelling (SEM) was utilized, enabling the examination of causal connections among variables. AMOS software was used for Structural Equation Modeling. Generalized least squares (GLS) approach to estimating fit and coefficients was adopted. The validation of the two hypotheses was carried out using the structural path coefficients. Figure 1 illustrates the estimated structural paths between constructs and variables.

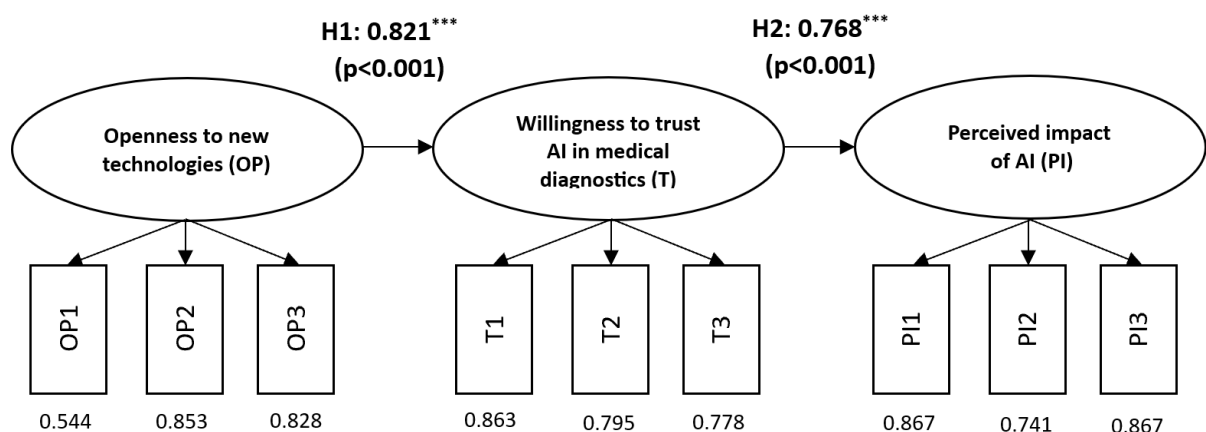


Figure 2. Measurement model [Source: Own study]

The examination of factor loadings on pathways and the p-value demonstrates the confirmation of two hypotheses (as shown in Table 5).

**Table 5.** The results of hypothesis statistical verification [Source: Own study]

Relationship between Constructs	Estimate	Standard Error	Capability Ratio	p	Hypothesis Testing
H1: OP→T	0.821	0.049	16.872	***	Support
H2: T→PI	0.678	0.029	23.507	***	Support

$\chi^2 = 74,40$ ; degrees of freedom (df) = 25;  $\chi^2/df = 2,976$ ;  $p < 0.001$ ; RMSEA = 0.043; GFI = 0.984; CFI=0.945L AGFI=0.972; \*\*\* the adopted level of statistical significance was 0.001

Table 6 displays the selected indices used to evaluate the goodness of fit for the SEM model, along with the target values for each. The model fit indices acquired validate that the model fits appropriately.

**Table 6.** SEM fit indices [Source: based on literature review]

Model fit indices	Level of acceptance	Sources
Chi-square/Degrees of freedom ( $\chi^2/df$ )	desire < 3, acceptable < 5	Hu, Bentler, 1999;
Comparative fit index (CFI)	0.9 acceptable	Hwang, Kim, 2007;
Root mean square error of approximation (RMSEA)	0.95 desire	Choudhury, Karahanna, 2008; Iacobucci, 2010;
GFI - The goodness-of-fit index	0.05 (0.08)	Konarski, 2023; Kline 2015;
AGFI - The adjusted goodness-of-fit index	>0.9	
	>0.9	

One of the research objectives was to determine to what extent the demographic characteristics of respondents influence their:

- openness to new technologies (OP);
- willingness to trust AI in medical diagnostics (T);
- perceived impact of AI application on the quality of medical diagnostic services improvement (PI).

The following research hypotheses were subjected to statistical verification:

- H3.1. The age determines the openness to new technologies (OP)  
 H3.2. The gender determines the openness to new technologies (OP)  
 H3.3. The education level determines the openness to new technologies (OP)  
 H4.1. The age determines the willingness to trust AI in medical diagnostics (T)  
 H4.2. The gender determines the willingness to trust AI in medical diagnostics (T)  
 H4.3. The education level determines the willingness to trust AI in medical diagnostics (T)  
 H5.1. The age determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)  
 H5.2. The gender determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)  
 H5.3. The education level determines the perceived impact of AI application on the quality of medical diagnostic services improvement (PI)

For the statistical verification of hypotheses H3.2, H4.2, and H5.2, a non-parametric Mann-Whitney test was applied. To verify the remaining hypotheses, a non-parametric Kruskal-Wallis test was used (Table 7).

**Table 7.** Kruskal-Wallis test results [Source: Own study]

Hypotheses		Z value	p-value	Hypothesis testing
H3.2.	OP→Gender	-2,397	0.017	Support
H4.2.	T→Gender	-2,757	0.006	Support
H5.2.	PI→Gender	-2,793	0.005	Support

The obtained results confirmed that there are statistically significant differences in the assessment of these constructs between men and women. The average rank values affirmed that men are more open to new technologies than women, men exhibit a higher willingness to trust the application of AI in medical diagnostics, and men rate the potential impact of AI in medical diagnostics on the improvement of healthcare services more highly.

**Table 8.** Mann-Whitney test results [Source: Own study]

Hypotheses		p-value	Hypothesis testing
H3.1.	OP→Age	0.214 ( $p > 0.05$ )	Reject
H4.1.	T→Age	0.001 ( $p < 0.05$ )	Support
H5.1.	PI→Age	0.020 ( $p < 0.05$ )	Support
H3.3.	OP→Education	0.001 ( $p < 0.05$ )	Support
H4.4.	T→ Education	0.001 ( $p < 0.05$ )	Support
H5.4.	PI→ Education	0.079 ( $p > 0.05$ )	Reject

The age of respondents does not have a statistically significant impact on openness to new technologies (H3.1 was rejected;  $p=0.214$ ). The age of respondents, however, determines willingness to trust AI in medical diagnostics (T) and the perceived impact of AI application on the quality of medical diagnostic services improvement (PI).

Pairwise comparisons of age groups revealed statistically significant differences in the level of trust propensity between respondents representing the groups: 18-25 years old and 41-60 years old; between 18-25 years old and over 60 years old; between 26-40 years old and 41-60 years old, between 26-40 years old and over 60 years old. However, there is no statistically significant difference in the assessment of construct T between respondents 18-25 years old and 26-40 years old as well between 41-60 years old over 60 years old. The average rank values confirm that, generally, older people exhibit a higher level of willingness to trust AI in medical diagnostics (T).

Pairwise comparisons of age groups revealed statistically significant differences in the level of perceived impact of AI application on the quality of medical diagnostic services improvement (PI) between respondents representing the groups: between 26-40 years old and over 60 years old; between 18-25 years old and over 60 years old. The average rank values

confirm that, generally, older people exhibit a higher level of perceived impact of AI application on the quality of medical diagnostic (PI).

The level of education of respondents determines their openness to new technologies (OP) and propensity for trust (T). Pairwise comparisons of respondents belonging to different educational level groups revealed that willingness to trust AI in medical diagnostics (T) is closely correlated with the level of education. There are statistically significant differences in the assessment of Constructs OP and T between respondents with primary, vocational, and secondary education and respondents with higher education. The latter group exhibits a higher level of willingness to trust AI in medical diagnostics (T) and higher level of openness to new technologies (OP).

The perceived impact of AI application on the quality of medical diagnostic services improvement (PI) is not statistically different within the education groups.

## DISCUSSION

The obtained results are consistent with findings from other authors working on the issue of awareness and perception of AI application in medical diagnostics (Ibba, et al., 2023). Generally, respondents indicated a positive attitude (trust) towards the use of AI in medical diagnostics. The average results of variable measurements confirm the positive outlook of the respondents (T1 – 3.65, T2 – 3.42, T3 – 3.63). Similar results were obtained by the team of Ibba, et al. according to which 74% of respondents would feel comfortable if their doctor used AI (Ibba, et al., 2023).

Results regarding the impact of the demographic variable, such as age, on the perceived trust in the use of AI in medical diagnosis, have shown that older people exhibit a higher level of willingness to trust AI in medical diagnostics (T). These results are in contradiction with the findings obtained by Ibb et al., who demonstrated that with age, there is a decrease in positive attitudes towards AI applications (Ibba, et al., 2023). The observed relationship between the level of education and the perceived tendency to trust AI in medicine was also confirmed in studies conducted by Ibba, et al. (2023).

Results related to the perceived trust in AI by both genders of respondents were not confirmed by other researchers. The conducted studies confirmed that men are more inclined to trust AI applications than women. Also, studies conducted by Bahakeem et al. (2023) confirmed that men exhibit a higher level of positive attitude towards AI. For the opposing view, in the studies conducted by Ibba et al., such a relationship was not confirmed. A statistically significant correlation between trust and the level of education among respondents has also been confirmed by other researchers such as Ongen et al. (2020)

The perceived impact of AI application in medical diagnostics was examined by respondents in the context of improving the accuracy of diagnoses, reducing errors, and enhancing the precision and validity of selected treatment methods. Respondents indicate that the application of AI will have a modest but still positive impact on the analyzed indicators of improving the quality of diagnostic services. Research conducted by Ongen et al. (2020) also confirmed that the surveyed individuals believe that AI can be more efficient and effective in providing accurate diagnoses. The examined relationships between the gender of respondents and the perceived impact on the quality of diagnostics confirmed statistically significant

dependencies, which was not consistent with the results of Ongena et. al., 2020. The obtained results from the sample of Polish respondents diverge significantly from the findings of other authors regarding the relationship between the age of respondents and the perceived impact of AI on improving the quality of diagnostics. Polish respondents are more optimistic with age. Generally, older people exhibit a higher level of perceived impact of AI application on the quality of medical diagnostic. According to the results obtained by Ongena et. al., (2020) indicators related to the efficiency of AI application in diagnostics were weakly negatively correlated with the age of respondents.

## CONCLUSIONS

Building societal trust in the use of AI in medical diagnostics and the ability to use technology effectively in the long run will contribute to the broader adoption of solutions that can be used in everyday life, even without the need for a doctor's visit.

The authors' focus was particularly on examining the relationships among three variables: openness to new technologies in general, trust in AI in medical diagnostics, and the perceived impact of AI applications on the improvement of the quality of medical services, along with demographic variables (age, gender, and education level).

The gender of respondents is among the demographic variables that differentiate the opinions of respondents regarding three analyzed constructs: openness, trust, and perceived impact of AI application on the quality of diagnostic services. Men exhibit a higher level of openness to new technologies, thus a higher level of trust in AI applications and a higher perception of the positive impact of AI on the quality of diagnostic services. Although other researchers often do not confirm statistically significant dependencies of this kind in Polish conditions, it seems to be a cultural factor, also associated with more traditional roles attributed to each gender, particularly in rural contexts.

The level of education also has a decisive impact on the perceived trust of respondents in the applications of AI in diagnostics and the perception of the positive impact of AI applications on the quality of medical diagnostic services, which confirms the need for ongoing educational initiatives.

The surprising results concerning the Polish society are associated with the demonstrated statistically significant relationship between two variables: trust in AI and the perceived impact on improving diagnostic services and the age of respondents. Contrary to expectations, older respondents exhibit a higher level of trust in AI and a higher perception of the positive impact of AI on the quality of medical services. On one hand, the observed relationships may stem from a better familiarity with diagnostic services and the frequency of their utilization, as well as a perceived need for improvements in terms of diagnostic quality, fewer errors, etc. Undoubtedly, this could be an interesting direction for further research.

In countries facing a significant shortage of medical professionals, there will be a strong temptation to increase the intensity of utilizing AI-based solutions. The development of technology applications will also necessitate the enhancement of skills among physicians collaborating with AI technology. Research focused on assessing the dynamics of developmental processes, including physicians' skills, problem-solving abilities, and patient knowledge, appears to be both forward-looking and desirable directions for investigation.

Exploring the factors determining societal acceptance of AI applications in medical diagnostics is one of the potential areas for research exploration.

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