# Obstacles to the Development of the Use of Artificial Intelligence from the Point of View of Physicians Working in Selected AJA Medical Centers: A Qualitative Content Analysis Study

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## Abstract

**Background:** Considering the increasing use of decision support systems, specifically artificial intelligence (AI), in the field of medicine, our goal in this study was to identify, from the perspective of physicians working in AJA medical centers, the obstacles hindering the adoption and use of AI in the treatment and diagnosis of patients.

**Objectives:** This study investigated the obstacles faced by specialist physicians working in AJA medical centers regarding the implementation of AI in their professional practice.

**Methods:** A qualitative approach using contractual content analysis was employed. Data were collected through semi-structured, in-depth interviews and analyzed using the qualitative analysis method of Granheim and Lundman (2004) from May to July 2022. The study included 20 physicians working in selected AJA medical centers in Tehran. Sampling was conducted based on entry criteria and targeted to ensure maximum diversity.

**Results:** The study involved 20 specialist physicians (15 men and 5 women) from selected AJA medical centers in Tehran, with an average age of 42 years and an average work experience of 14 years. The identified obstacles to the development of AI in these medical centers were categorized into three main groups: Extra-organizational and organizational factors, individual factors, and educational factors. These categories included 10 subcategories: Sanctions and economic issues, organizational attitudes, rules and regulations, available facilities, quality of facilities, knowledge and attitude, individual resistance to change, education quality, educational curriculum, and clinical professors.

**Conclusions:** Iran's unique conditions pose challenges to the development and implementation of AI in its medical centers. This study highlights the need to address these obstacles by revising organizational rules and regulations and educating stakeholders on the benefits of AI. These measures could promote the use of AI in military medical centers and improve the quality of care.

*Keywords:* Artificial Intelligence, Medical Centers, Obstacles, Development, Physicians

## 1. Background

During the last few decades, artificial intelligence (AI) has garnered unprecedented attention, earning it the title of the fourth industrial revolution (1). Artificial intelligence refers to the use of computers to perform actions that previously required human recognition, judgment, and decision-making (2). Machine learning techniques can process large datasets in a trainable and flexible manner, understanding complex relationships between variables (3).

The expansion of medical knowledge and the complexity of diagnostic and treatment decisions have drawn the attention of specialists to the use of decision support systems in medical practice (4). The American Medical Association recognizes the use of AI as an effective tool to enhance the ability of physicians and other medical staff to diagnose and treat patients (5).

Artificial intelligence is essential for reducing workload and minimizing diagnostic errors (6). It has found diverse applications, ranging from screening and triage to prediction (7), and identifying diseases such as skin cancer (8) and diabetic retinopathy (9). Additionally, when combined with mammography, AI has been shown to outperform radiologists in diagnosing breast cancer (10). Furthermore, research has demonstrated that AI can be applied to develop accurate predictive models for managing chronic diseases such as type 2 diabetes mellitus (11).

The complex nature of chronic diseases, coupled with technological advancements like AI and the principles of precision medicine, holds the potential to transform traditional public health strategies into a more comprehensive and integrated approach (12).

However, due to the essential nature of physician participation and the physician-patient relationship in the diagnosis and treatment of diseases (7), AI has also raised many concerns (13). Despite the positive attitude toward AI (14) and its significant achievements, there are still numerous disagreements and uncertainties within public opinion and the scientific community regarding its use.

Challenges and obstacles include public acceptance and trust in AI (15), high costs and financial limitations, a limited number of trained experts, the lack of protocols for verifying results obtained through AI processing, concerns about the preservation and confidentiality of patient information, social barriers (1), fears about job security, and the potential reduction of treatment staff skills (16). Additionally, there may be legal and medical questions surrounding the potential consequences of integrating AI into health and treatment systems (7).

On the other hand, the development of AI relies on fostering trust in new technologies among patients and healthcare staff, ensuring the availability of necessary resources, training qualified personnel, and aligning organizational policies to support the use of diagnostic and therapeutic tools (17, 18).

In Iran, specialized physicians in military medical centers have played an effective role as diagnostic and therapeutic forces in improving the health status of society. In recent years, the health and treatment units and hospitals of the armed forces have been among the most efficient organizations in the health sector (19). Due to their inherent features and roles, these centers possess a high capability for organizing human resources, education, reconstruction, renovation, and innovation in equipment development (20). These

factors create a strong potential for the application of AI in these centers.

Considering the high patient loads, the availability of advanced equipment, and the interest of senior managers in developing AI applications in AJA medical centers, as well as the facilitation AI can provide for both healthcare workers and patients, this study was designed to target these centers as the primary focus.

In qualitative studies, the diverse meanings experienced by participants are explored, and the social structures and processes shaping these meanings are identified. This type of research reveals the rules and hidden thoughts of individuals. In other words, such research is described as "observation through the eyes of the participants" (19).

## 2. Objectives

The purpose of this study was to explore the obstacles to implementing AI from the perspective of physicians working in AJA medical centers.

## 3. Methods

### 3.1. Study Design

This research employed a qualitative approach using contractual content analysis. Data were collected through semi-structured in-depth interviews and analyzed using the qualitative analysis method of Granheim and Lundman (2004) from December 1, 2022, to February 28, 2023. Content analysis was chosen as the research method because it systematically analyzes and interprets the content of different types of thoughts, attitudes, and opinions. It involves identifying, coding, and classifying patterns and themes in the data. This method enables researchers to gain deep insights into the attitudes, values, beliefs, and opinions of individuals or groups (19).

### 3.2. Research Environment and Sampling Method

The research environment was selected AJA medical centers located in Tehran, Iran. The target population consisted of specialist physicians working in these centers. Participants were selected in a targeted manner, ensuring maximum diversity and adherence to entry criteria. Sampling continued purposively until data saturation was achieved, meaning no new concepts or materials emerged from the data analysis (21).

### 3.3. Inclusion and Exclusion Criteria

The inclusion criteria for the study were: Interest and willingness to participate, ability to communicate with the interviewer (speaking in Farsi), holding a doctorate in medicine, working as a specialist physician in one of the selected AJA medical centers, and not having completed an AI course in the last six months. Participants were considered dropouts if they were unable to continue their cooperation at any stage of the research due to reasons such as transfer to another center or withdrawal by personal request.

### 3.4. Data Collection

In this study, 20 specialist physicians working in selected AJA medical centers were interviewed face-to-face at the research team institution, adhering to the inclusion and exclusion criteria and ensuring maximum diversity in terms of work experience, age, and gender.

The interviews began with open-ended questions, such as: "How do you see the status of using AI in the diagnosis and treatment of diseases in AJA medical centers?"; "In your opinion, what are the obstacles to using AI in medical centers?"; "How do you think AI can be developed in medical centers for diagnostic and therapeutic purposes?". Additional probing questions were asked to clarify participants' responses, such as requesting more details or asking about their experiences in the field. Although the same set of questions was asked of all participants, the sequence varied depending on their responses and the flow of the interview. To create a conducive interview environment, the time and location of the interview were decided by the participants, ensuring a calm, comfortable, and quiet setting. At the beginning of each session, participants were asked for their consent to record the audio and assured of the confidentiality of their responses and recordings. Participants were given sufficient time to think and respond to questions. The interviewer took notes on key points during the session but allowed the discussion to continue until participants indicated they had no further information to add. After each interview, a summary of the participant's responses was compiled and validated by the participant. Interview durations ranged from 20 to 45 minutes, with an average of 25 minutes. Data saturation was achieved after interviewing 20 participants. All interviews were conducted by the second researcher (FK). If necessary, interviews would have continued for two additional sessions. Before each interview, the transcript of the previous session was reviewed for accuracy and clarity, and the time and place for the next session were confirmed.

### 3.5. Data Analysis

After each interview, the first step involved typing the interview transcripts immediately on the same day using Word 2017 software with the assistance of the third researcher (NM). In the second step, the researchers carefully read the interview transcripts multiple times to gain a general understanding of the content.

In the third step, the typed texts were meticulously reviewed line by line and word by word to extract the primary codes. In the fourth step, codes with similar meanings and concepts were grouped into categories, and their relationships were determined ([22], [23]). In the fifth step, the codes and categories were organized into main classes that were more comprehensive and abstract, with classes and sub-classes gradually formed ([24]). Finally, in the sixth step, all interviews and extracted codes were recorded and analyzed using MAXQDA version 10 software.

- An Example of Interview Coding

Participant number 6 stated: "We don't have much knowledge (shortage of knowledge) about AI. There may be a positive attitude in this matter, but unfortunately, we haven't undergone a training or retraining course (inadequate training) in this matter."

### 3.6. Data Trustworthiness and Rigor

This study adhered to the criteria of Lincoln and Guba to ensure the quality of the results ([25]). To enhance the credibility of the research, the principle of diversity in sampling was observed, and participants who met the inclusion criteria were selected. At the end of each interview, the researchers summarized their general understanding of the participants' responses and obtained their approval. The second researcher, having worked in selected AJA medical centers for 20 years, established strong rapport with the participants to facilitate coordination of interview sessions. To ensure confirmability, the researchers analyzed the data and shared the findings with two qualitative research experts for review and feedback, incorporating their suggestions. All interviews, handwritten notes, and coded texts were securely stored for later review. To enhance dependability, all project collaborators participated in the analysis and coding process, contributing their insights during meetings. The final classes and sub-classes were agreed upon and approved by all authors. To improve transferability, a detailed description of the entire research process was provided,

and participant quotes were directly included in the findings.

### 3.7. Ethical Considerations

This study was approved by the Ethics Committee of AJA University of Medical Sciences with the code IR.AJAUMS.REC.1401.141. Necessary permissions for data collection were obtained from relevant authorities, and verbal informed consent was secured from participants. The study's objectives were explained to participants, who joined the research voluntarily and without coercion. Researchers were committed to maintaining confidentiality and protecting the identities of participants throughout the study. If requested, the results were made available to participants. Trust and honesty were upheld during the data collection, analysis, and interpretation processes. Adherence to the principles of the research ethics committee was ensured throughout the study.

## 4. Results

The participants in this study were 20 specialist physicians (15 men and 5 women) working in selected AJA medical centers in Tehran. The average age of the participants was 42 years, and their average work experience was 14 years. The demographic profile of the participants, including age, sex, and marital status, is presented in Tables 1. and 2.

In this study, after analyzing 185 codes, the obstacles to the development of AI in selected AJA medical centers were categorized into three main categories: Extra-organizational and organizational factors, individual factors, and educational factors, with a total of 10 sub-categories (Table 3).

According to the participants, extra-organizational and organizational factors and their subclasses are significant barriers to the development of AI in AJA medical centers. International sanctions against Iran, coupled with economic issues at the national level and economic problems within medical centers, were identified as major obstacles to advancing AI in these settings. Participants also noted that economic challenges have impacted the availability and quality of facilities necessary for utilizing AI in patient care and treatment.

Below are some examples from the interviews:

"Due to the economic issues of our country, we have a lot of shortages. I can almost say that we don't have much ability in regular and up-to-date purchase of tools and equipment necessary for the development of AI in the hospital, and this can affect the quality of our work" (participant number 8).

"Perhaps one of the reasons for the insufficient development of AI in our hospitals is the laws. However, we have limitations due to our special military conditions, and we cannot introduce any technology without much attention and care" (participant number 15).

"In my opinion, the authorities still do not have an enthusiastic vision about bringing AI to hospitals, and this shows that the attitude of the hospital is such that they do not think much about AI. They are mostly involved in hospital management and daily work" (participant number 8).

In this study, it was determined that individual factors and their subclasses are also significant influences on the development of AI in AJA medical centers.

Additionally, one of the main categories identified in this study was educational factors. Participants noted that AI was not included in their educational curriculum. They also highlighted that professors lacked the necessary skills in this area, and the overall quality of education regarding AI was not satisfactory.

"Perhaps the problems in our medical centers cause not a very good view of AI. Either way, AI can be a job competitor for many of us" (participant number 4).

"We don't have much knowledge about AI. There may be a positive attitude in this matter, but unfortunately, we haven't undergone a training or retraining course in this matter" (participant number 6).

"In my opinion, one of the factors that is effective in this case is our professors. They do not have the necessary and sufficient skills in this matter" (participant number 18).

## 5. Discussion

In this study, obstacles to the development and use of AI were examined from the perspective of specialist physicians working in selected AJA medical centers. The findings revealed that organizational and extra-organizational factors, such as sanctions and economic issues, governing attitudes, rules and regulations, available facilities, and the quality of these facilities, are among the main barriers to adopting AI in military medical centers. Sanctions and economic challenges hinder the purchase or acquisition of AI tools and facilities, while strict laws and regulations create additional obstacles to its development in military environments. Military centers face unique limitations,

**Table 1.** Participants' Characteristics

| Characteristics | No. |
|---|---|
| **Age (y)** | |
| 30 - 40 | 10 |
| 41 - 50 | 6 |
| More than 51 | 4 |
| **Sex** | |
| Female | 5 |
| Male | 15 |
| **Work experience (y)** | |
| 5 - 10 | 6 |
| 6 - 11 | 7 |
| 12 - 17 | 3 |
| 18 years and more | 4 |

**Table 2.** Demographic Characteristics of The Participants

| Participant's Code | Age (y) | Sex | Marital Status |
|---|---|---|---|
| 1 | 30 | Male | Single |
| 2 | 30 | Male | Single |
| 3 | 30 | Female | Single |
| 4 | 37 | Female | Married |
| 5 | 32 | Male | Married |
| 6 | 31 | Female | Single |
| 7 | 31 | Female | Single |
| 8 | 34 | Male | Single |
| 9 | 33 | Male | Single |
| 10 | 33 | Male | Married |
| 11 | 52 | Male | Married |
| 12 | 45 | Male | Married |
| 13 | 41 | Male | Married |
| 14 | 56 | Male | Married |
| 15 | 45 | Female | Married |
| 16 | 44 | Male | Married |
| 17 | 47 | Male | Married |
| 18 | 41 | Male | Married |
| 19 | 55 | Male | Married |
| 20 | 52 | Male | Married |

particularly regarding equipment and facilities, which were thoroughly considered in this study.

Regulatory facilities play a critical role in prioritizing safety and establishing guidelines for new medical devices, products, and drugs. Similarly, AI systems require proper regulations to ensure their safe and effective use. For AI tools to be implemented, their safety and diagnostic accuracy must be validated. An effective screening tool should have high sensitivity to ensure that significant cases of real patients are not missed, as untreated cases can have serious health consequences (26). Additionally, a lack of knowledge among decision-makers about evidence-based applications of AI, combined with sanctions and the high costs of purchasing and developing AI tools, serves as another significant barrier to its use (27).

Other findings revealed that individual factors, such as insufficient knowledge, negative attitudes, and individual resistance to change, are additional obstacles to the development and use of AI in military organizations. A lack of a positive vision and attitude toward AI, coupled with viewing it as a competitor, was

**Table 3.** Categories and Subcategories Extracted from Data Analysis

| Categories | Subcategories |
| --- | --- |
| **Extra-organizational and organizational factors** | (1) Sanctions and economic issues; (2) the attitude governing the organization; (3) rules and regulations; (4) available facilities; (5) quality of available facilities |
| **Individual factors** | (1) Knowledge and attitude; (2) individual resistance to change |
| **Educational factors** | (1) Quality of education; (2) educational curriculum |

identified as one of the key individual barriers. In this study, participants expressed concerns about AI potentially threatening their employment. They believed there was a possibility that AI could replace their roles, a finding consistent with the results of other studies (28, 29). However, this finding contrasts with other qualitative studies related to AI, which have shown that participants are generally not concerned about AI replacing their tasks (16, 30). It appears that individual resistance to change and reluctance to adopt AI may stem from insufficient knowledge about the technology among the participants in our study. This aligns with findings from other studies, which also identified insufficient knowledge as a significant barrier to the development and use of AI (31, 32).

The present study highlighted that the lack of integration of AI into the educational curriculum and the shortage of skilled professors are among the key educational factors hindering the development of AI. The advancement of AI systems necessitates knowledgeable personnel to build, maintain, and improve these systems. Critical tasks such as tagging data, training, and testing an AI system demand significant resources, including time, finances, and personnel expertise.

Designing training programs for healthcare workers on AI and its specific algorithms also requires skilled human resources, which is unattainable without an effective health system supported by experienced professors (33). Similarly, other studies have shown that no specific training programs or algorithms currently exist in the field of AI (34, 35).

### 5.1. Limitations

Due to the specific conditions of the research environment, participants in this study may not have shared all aspects of their experiences. Although efforts were made to build trust during data collection, participants may have been influenced by organizational restrictions during the interviews. Additionally, given the qualitative nature of the study, caution is needed in generalizing the findings.

Another limitation is that most participants lacked direct experience with AI in their daily lives. Although some general information about the research question was provided before the interviews, the term "artificial intelligence" was intentionally not defined precisely. As a result, participants' interpretations of what AI meant may have varied, potentially leading to misunderstandings.

### 5.2. Conclusions

The use of AI in healthcare provided by military centers offers significant benefits, but the obstacles to its implementation in these organizations must be addressed. This study may contribute to the advancement of AI in military centers by encouraging revisions to organizational rules and educating stakeholders on the benefits of its application.

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### Footnotes

**Ethical Approval:** This study was approved by the Ethics Committee of AJA University of Medical Sciences with code IR.AJAUMS.REC.1401.141 .

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**Informed Consent:** Informed consent was obtained from all participant.

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