







ORIGINAL

## Chatbots for medical students exploring medical students' attitudes and concerns towards artificial intelligence and medical chatbots

### Chatbots para estudiantes de medicina: exploración de las actitudes y preocupaciones de los estudiantes de medicina hacia la inteligencia artificial y los chatbots médicos

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**Cite as:** Hind B, Serhier Z, Jallal M, Bennani Othmani M. Chatbots for medical students exploring medical students' attitudes and concerns towards artificial intelligence and medical chatbots. Data and Metadata. 2023;2:115. <https://doi.org/10.56294/dm2023115>


Submitted: 01-09-2023

Revised: 24-10-2023

Accepted: 28-12-2023

Published: 29-12-2023

Editor: Prof. Dr. Javier González Argote 

Guest Editor: Yousef Farhaoui 

**Note:** Paper presented at the International Conference on Artificial Intelligence and Smart Environments (ICAISE'2023).

#### ABSTRACT

**Introduction:** artificial intelligence (AI) encompasses the concept of automated machines that can perform tasks typically carried out by humans, doctor-patient communication will increasingly rely on the integration of artificial intelligence (AI) in healthcare, especially in medicine and digital assistant systems like chatbots. The objective of this study is to explore the understanding, utilization, and apprehensions of future doctors at the Faculty of Medicine in Casablanca regarding the adoption of artificial intelligence, particularly intelligent chatbots.

**Methods:** a cross-sectional study was conducted among students from the 1st to 5th year at the Faculty of Medicine and Pharmacy in Casablanca. Probability sampling was implemented using a clustered and stratified approach based on the year of study. Electronic forms were distributed to randomly selected groups of students.

**Results:** among the participants, 52 % of students fully agreed to utilize chatbots capable of answering health-related queries, while 39 % partially agreed to use chatbots for providing diagnoses regarding health conditions. About concerns, 77 % of the respondents expressed fear regarding reduced transparency regarding the utilization of personal data, and 66 % expressed concerns about diminished professional autonomy.

**Conclusion:** Moroccan Medical students are open to embracing AI in the field of medicine. The study highlights their ability to grasp the fundamental aspects of how AI and chatbots will impact their daily work, while the overall attitude towards the use of clinical AI was positive, participants also expressed certain concerns.

**Keywords:** Medical Students; Chatbots; Artificial Intelligence; Concerns.

#### RESUMEN

**Introducción:** la inteligencia artificial (IA) abarca el concepto de máquinas automatizadas que pueden realizar tareas típicamente llevadas a cabo por humanos, la comunicación médico-paciente dependerá cada vez más de la integración de la inteligencia artificial (IA) en la asistencia sanitaria, especialmente en medicina y sistemas de asistentes digitales como los chatbots. El objetivo de este estudio es explorar la comprensión, la utilización y las aprensiones de los futuros médicos de la Facultad de Medicina de Casablanca con respecto a la adopción de la inteligencia artificial, en particular los chatbots inteligentes.

**Métodos:** se realizó un estudio transversal entre estudiantes de 1º a 5º curso de la Facultad de Medicina y Farmacia de Casablanca. Se aplicó un muestreo probabilístico mediante un enfoque agrupado y estratificado

basado en el año de estudio. Se distribuyeron formularios electrónicos a grupos de estudiantes seleccionados al azar.

**Resultados:** entre los participantes, el 52 % de los estudiantes estaba totalmente de acuerdo en utilizar chatbots capaces de responder a consultas relacionadas con la salud, mientras que el 39 % estaba parcialmente de acuerdo en utilizar chatbots para proporcionar diagnósticos relativos a condiciones de salud. En cuanto a las preocupaciones, el 77 % de los encuestados expresaron su temor por la reducción de la transparencia en la utilización de datos personales, y el 66 % expresaron su preocupación por la disminución de la autonomía profesional.

**Conclusiones:** los estudiantes de medicina marroquíes están abiertos a adoptar la IA en el campo de la medicina. El estudio destaca su capacidad para comprender los aspectos fundamentales de cómo la IA y los chatbots afectarán a su trabajo diario, aunque la actitud general hacia el uso de la IA clínica fue positiva, los participantes también expresaron ciertas preocupaciones.

**Palabras clave:** Estudiantes de Medicina; Chatbots; Inteligencia Artificial; Preocupaciones.

## INTRODUCTION

The healthcare system is currently undergoing a digital revolution, and artificial intelligence (AI) will play a crucial role in shaping the everyday practices of medical professionals.<sup>(1)</sup> The advent of digital applications, which can be accessed irrespective of location and time, has opened up new possibilities in medicine and health communication, consequently altering the doctor-patient dynamic.<sup>(2)</sup> The increasing significance of e-health applications, wearable devices, and AI tools like chatbots empowers patients to gather their own health data.<sup>(3,4)</sup> Additionally, the digital integration of patients, hospitals, physicians, and other healthcare services is driving a shift from a doctor-centered approach to a more patient-centered model of treatment.<sup>(5)</sup> In order to harness the potential of these technological advancements and ensure optimal care for patients, future medical practitioners must possess the appropriate skills.<sup>(6)</sup>

Machine learning (ML) is a branch of artificial intelligence (AI) that enhances its capabilities by learning from data and experiences, rather than relying on predefined rules as in traditional approaches.<sup>(7)</sup> Progress in ML has yielded numerous advantages in terms of accuracy, decision-making, fast processing, cost-effectiveness, and the ability to handle intricate data.<sup>(8)</sup> Chatbots is an example of AI systems that have evolved through the application of ML techniques.

The objective of this study is to explore the understanding, utilization, and apprehensions of future doctors at the Faculty of Medicine in Casablanca regarding the adoption of artificial intelligence, particularly intelligent chatbots.

## METHODS

In April 2023, a cross-sectional study was conducted among students from the 1st to 5th year at the Faculty of Medicine and Pharmacy in Casablanca. The sample size was determined using Epi Info software, taking into account a percentage of 52 % of medical students taken from a European article who had knowledge in terms of AI in radiology, with a precision of 5 %. The calculated sample size was 335 students.

Probability sampling was implemented using a clustered and stratified approach based on the year of study. Electronic forms were distributed to randomly selected groups of students.

The data analysis was performed using R software, and the association was assessed using the chi-square test with a significance level of 5 %.

## RESULTS

### Socio-demographic characteristics

A total of 393 responses were received from participating students, with a mean age of  $20,6 \pm 1,84$  years. Among the respondents, women comprised 67 % of the sample, indicating a significant female predominance.

We note a predominance of 5th year students 22,4 % followed by 4th year medical students 20,1 %.

### Attitudes of medical student toward intelligent chatbots in medicine

Among the participants, 52 % of students fully agreed to utilize chatbots capable of answering health-related queries, while 39 % partially agreed to use chatbots for providing diagnoses regarding health conditions. Most respondents, accounting for 67 %, expressed agreement with the use of chatbots for scheduling appointments for patients.

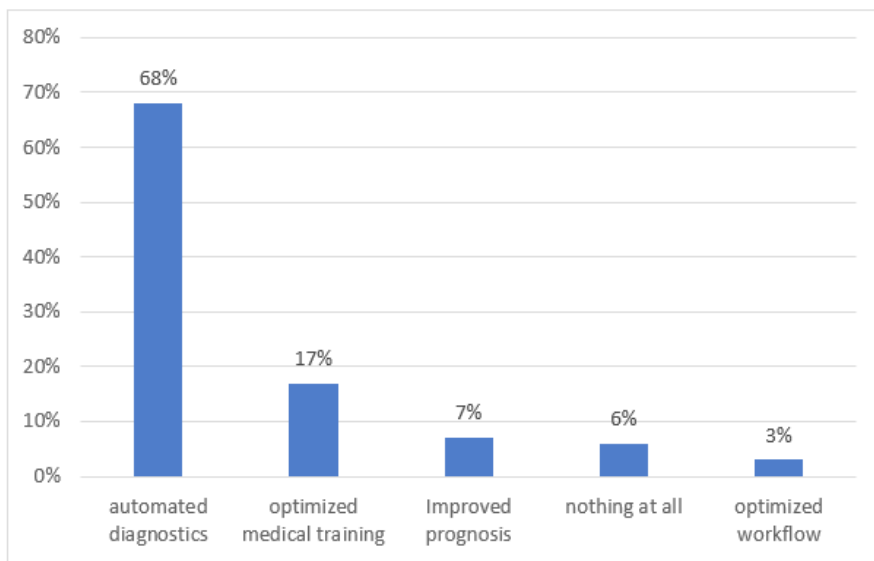
Additionally, 52 % strongly supported the utilization of chatbots to assist them in addressing health concerns and to provide supplementary information about their well-being. (table 1)

**Table 1. Attitudes toward intelligent chatbots in medicine**

	Completely ready N (%)	Partially ready N (%)	Not quite ready N (%)	Not at all ready N (%)	I Don't know N (%)
To respond to your health-related questions	204(52,0)	140(35,6)	24(6,0)	17(4,4)	5(5,0)
To give diagnoses on your health condition	81(20,6)	152(38,7)	75(19,1)	70(17,8)	15(3,8)
To you propose care	86(21,9)	155(39,4)	67(17,0)	71(18,1)	14(3,6)
To conduct certain tests or examinations	126(32,1)	156(39,7)	53(13,5)	35(8,9)	23(5,8)
Planning your appointments with patients	263(66,9)	99(25,2)	9(2,3)	12(3,1)	10(2,5)
To Support you in matters of health and provide you with additional information	205(52,2)	148(37,7)	20(5,1)	10(2,5)	10(2,5)

**Potential applications of AI in medicine perceived by medical student**

Among students, 68 % noted the importance of AI in automating diagnostics, followed by the optimization of continuing education for 17 % of respondents. (figure 1)



**Figure 1. Perceived potential applications of AI in medicine**

**Medical students concerned about the use of AI in clinical practice**

When it comes to apprehensions surrounding the integration of artificial intelligence into their clinical practice, 77 % of the respondents expressed fear regarding reduced transparency regarding the utilization of personal data.

Additionally, 66 % expressed concerns about diminished professional autonomy, while an equal percentage of 62 % were worried about being overwhelmed by the increased reliance on artificial intelligence in their daily work. In terms of job security, 56 % of the participants agreed with the notion that they would face negative consequences as a result of the widespread adoption of AI. (table 2)

**Table 2. Medical students concerned about the use of AI in medicine**

Questions	Agree	Neutral	Disagree
I am concerned that there is less transparency about how personal data is used	298(77,0)	51(13,2)	38(9,8)
I'm afraid of having less autonomy at work	257(66,6)	71(18,4)	58(15,1)
I fear that my qualifications are no longer sufficient for the requirements of my field of work	184(61,5)	80(20,7)	69(17,8)
I am afraid of being overloaded by the use of artificial intelligence in my daily work	241(62,5)	77(19,9)	68(17,6)
I am afraid to lose my job after the widespread use of AI	216(56,0)	65(16,8)	105(27,2)

## DISCUSSION

Artificial intelligence (AI) encompasses the concept of automated machines that can perform tasks typically carried out by humans.<sup>(9,10,11,12)</sup> The field of AI is rapidly evolving, and numerous applications have already become part of our daily lives, such as speech and text recognition and email spam filters.<sup>(13,14,15)</sup> However, the potential of AI to revolutionize global health in low- and middle-income countries is also being explored due to its ability to apply advanced analytical methods to large datasets involved in complex diagnostic tasks.<sup>(16)</sup>

In our study, we found that 52 % of medical student completely agreed to utilize chatbots that can answer health-related questions, while 39 % partially agreed to use chatbots for diagnosing health conditions. In a separate study of medical students, 50 % showed partial willingness to use chatbots for answering health-related questions, while 59 % were not willing to use them for health diagnoses.<sup>(17)</sup>

Furthermore, the majority of respondents (67 %) agreed with using chatbots to schedule appointments for patients, and 52 % strongly supported their use in providing support for health issues and delivering additional health information.<sup>(18)</sup> Concerning Potential applications of AI in medicine perceived by medical student, 68 % noted the importance of AI in automating diagnostics, followed by the optimization of continuing education for 17 % of respondents.<sup>(19,20,21,22)</sup>

Regarding concerns about AI use in clinical practice, 56 % expressed fear of job loss due to its generalization, while 77 % were concerned about the lack of transparency regarding the use of personal data. Additionally, 67 % expressed fears of reduced autonomy and being overloaded by the use of AI in their daily work.<sup>(23,24)</sup> These findings align with an article that highlighted concerns about computerized chatbots, including decreased human presence, which can lead to increased distrust in healthcare services. Healthcare professionals and patients often lack confidence in chatbot capabilities, which can raise concerns about clinical care risks, liability, and increased workload rather than reduced workload.<sup>(23,24,25)</sup>

## CONCLUSION

According to this research, it is evident that medical students are open to embracing AI in the field of medicine. The study highlights their ability to grasp the fundamental aspects of how AI and chatbots will impact their daily work. While the overall attitude towards the use of clinical AI was positive, participants also expressed certain concerns. These concerns mainly revolved around the lack of transparency regarding the utilization of personal data and the potential loss of autonomy when working with AI in medical practice.

Considering the future advancements in the healthcare workplace, it becomes crucial to underscore the importance of incorporating these new core competencies into medical curricula. This will enable physicians to actively participate in shaping the technological trajectory of patient treatment, equipped with comprehensive knowledge and confidence in utilizing AI tools.

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## FINANCING

The authors did not receive financing for the development of this research.

**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

**AUTHORSHIP CONTRIBUTION**

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