Artificial Intelligence, how does this discipline impact the different generations of urology?

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Abstract:

Introduction: artificial intelligence, like human intelligence, is a complex concept to define. There is still no formal and universally accepted definition. The European Commission defines it as software systems and possibly also hardware systems designed by humans who, when faced with a complex objective, act in the physical or digital dimension, either by perceiving their environment or reasoning about knowledge. It is in full development, and its implementation in medicine has led to an improvement in clinical and surgical practice.

Objective: The objective of this article is to analyze the impact of this discipline on the different generations of urology residents and graduates in their daily practice.

Methodology: A descriptive study was carried out and the main variable of interest was to assess the use of this discipline in clinical and surgical practice in the population described. The data were collected through surveys of this population and compared with the current bibliographic evidence.

Results: The average age of the respondents was 40 years and they were mostly men, graduates. The use of this discipline was reflected in approximately 72% of the population. Its application in surgical training represents 30% and the lack of knowledge of this discipline was present in a large percentage of the study population when the comments were known.

Conclusions: most of the respondents are unaware of or do not apply the discipline of artificial intelligence in their daily practice. Those who perform it are just beginning surgical and clinical training in it.

Keywords: artificial intelligence; urology; medical training; learning; technological advances

Introduction

Artificial intelligence (AI) is defined by the European Commission as a system of software and hardware designed by humans, which, when faced with a complex object, act in the physical or digital dimension, either by perceiving its environment, through the acquisition and interpretation of structured or unstructured data and reasoning about knowledge, processing the information derived from this data and deciding on the best actions to achieve the given objective. They can use symbolic rules or learn a numerical model. That said, it's a field of computer science that focuses on creating systems that can perform tasks that normally require human intelligence, such as learning, reasoning, and perception. [1].

In the field of surgery, artificial intelligence began with the incorporation of robots, specifically the Da Vinci system. This system was approved by the FDA in 2000 to facilitate minimally invasive surgery, a robot controlled by a human from a console. These technological advances have allowed digital platforms to become part of educational programs, thus helping surgical training.

Traditionally, surgical learning was carried out in the operating room by observing the procedure and its subsequent implementation through trial and error. Later, with the arrival of laparoscopy, the first training boxes for laparoscopic skills appeared and thanks to technological advances, virtual simulators have emerged. These virtual reality surgical simulators are excellent tools for surgeon-in-training training. They provide both psychomotor skills training and an objective assessment of technique providing a clear benefit to the patient.

AI systems discover patterns by understanding both the technique and the surgical error. Therefore, the system groups participants according to their technical capacity with an educational purpose.

The system is able to improve safety and results by reducing human error, reducing the variability of surgeries.

Beyond the use of AI and machine learning, the doctor-patient relationship will continue to be irreplaceable, particularly in surgical specialties. [2-8].

The different generations of doctors have preconceptions of artificial intelligence.

It is evident that the advances of AI do not restrict any reality, it is the things that some commentators say about it that insinuate a mediated, restricted, absurdly dispossessed reality of something that anyone without too much understanding or reading would see as something absolutely obvious, that consciousness exists, which is a very singular and peculiar property of life, and that obviously, it does not seem reasonable to suppose that machines have consciousness, no matter how sophisticated they are and how many successes they achieve.

Confusing intelligence and consciousness is not recommended, all consciousness must have some form of intelligence, but not all forms of intellection must necessarily be, at all times, conscious, something that is easily admitted to anything that we notice that many times we find the true solution to a problem without knowing how exactly we have come to find it. Our brain has acted intelligently, but we have not been aware of what it has done. [9].

Methods:

A descriptive study was conducted. The population was made up of 75 students and graduates of the urology specialty from all over the country of Uruguay, since it included doctors from the capital, Montevideo, and from the interior of the country. 60% of them were women and 40% men. The minimum age described was 25 years.

For the collection of data to be described, a survey was carried out using online forms of the google forms platform. [10] It then provides graphs in which the data of the responses are updated in real form.

In addition, they could add comments on each question.

The questionnaire contained the following questions:

¿Do you know about artificial intelligence? Have you used any tools related to artificial intelligence in recent years? ¿Do you think the use of artificial intelligence is ethical? ¿Do you routinely use artificial intelligence for research in your clinical practice? ¿Do you know about surgical simulators linked to artificial intelligence? ¿Do you use the same ones? If you use them, do you consider the learning curve to be complex? ¿Do you consider this learning technique safe?

¿Do you think that the study of these new technologies should still continue? [11]

The main variable of interest was to assess the use of this discipline in clinical and surgical practice in the population described.

The data obtained from the population described were complemented with the international bibliography described in different bibliographic search engines such as Pubmed, Science Direct, Medline, Embase, Cochrane.

Results:

The population was made up of 75 students and graduates of the urology specialty from all over the country, Uruguay.

22 were students and 53 graduates. 60% of them were women and 40% men. The minimum age described was 25 years.

Regarding the items questioned in the questionnaire (Figure 1) that was used as the basis for a descriptive study of this population, the results obtained were as follows: 100% knew the term artificial intelligence (Figure 2), 60% had used tools linked to the concept of artificial intelligence in recent years. (Figure 3) 78% answered affirmatively to the question regarding whether the use of AI is considered medically ethical. (Figure 4) 72% said they use AI for medical research in their clinical practice. (Figure 5) 95% responded affirmatively to the knowledge of AI-related surgical simulators (Figure 6), only 30% acknowledged using the simulators (Figure 7) and 20% stated the complexity of the simulator (Figure 8). Of the total number of those who used these simulators, 100% considered this learning technique safe (Figure 9) and 100% of the participants considered that these new technologies should still be studied (Figure 10).

INTELIGENCIA ARTIFICIAL (IA)

Es posible agregar comentarios

Conoce usted la IA?
○ No
○ Sí

Ha utilizado en los últimos años alguna herramienta vinculadas a la inteligencia artificial?
☐ SI
☐ NO

Cree que es ético el uso de inteligencia artificial?
○ Sí
○ No

Utiliza habitualmente inteligencia artificial para investigación en su practica clínica?
○ Sí
○ No

Conoce los simuladores quirúrgicos vinculados a inteligencia artificial?

○ Sí

○ No

Utiliza los mismos?

○ Sí

○ No

Si los utiliza considera que es compleja la curva de aprendizaje?

○ Sí

○ No

Considera segura esta técnica de aprendizaje?

○ Sí

○ No

Cree que aun debe continuar el estudio de estas nuevas tecnologías?

○ Sí

○ No

Figure 1: Google forms questionnaire format.
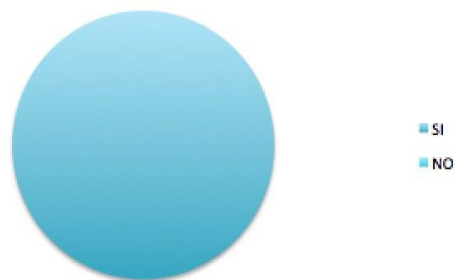
CONOCE USTED LA IA?

■ SI
■ NO

Figure 2: 100% answered affirmatively to the 1st question of the questionnaire.

**HA UTILIZADO EN LOS ÚLTIMOS
AÑOS ALGUNA HERRAMIENTA
VINCULADA A LA IA?**

SI
NO

Figure 3: 60% answered affirmatively to the 2nd question of the questionnaire.

CREE QUE ES ÉTICO EL USO DE IA?

SI
NO

**HA UTILIZADO EN LOS ÚLTIMOS
AÑOS ALGUNA HERRAMIENTA
VINCULADA A LA IA?**

SI
NO

Figure 3: 60% answered affirmatively to the 2nd question of the questionnaire.

CREE QUE ES ÉTICO EL USO DE IA?

SI
NO

HA UTILIZADO EN LOS ÚLTIMOS AÑOS ALGUNA HERRAMIENTA VINCULADA A LA IA?

Figure 3: 60% answered affirmatively to the 2nd question of the questionnaire.

CREE QUE ES ÉTICO EL USO DE IA?

Figure 10: 100% answered affirmatively to the 9th question of the questionnaire.

Regarding the comments obtained, the population described that they knew the term artificial intelligence, but the vast majority do not recognize its definition as such. A large percentage believes that they have used tools related to it, but given that not all the population handles the term it well, it is possible to bias this question. Regarding the question related to the ethics of its use, many demonstrated knowledge argued with scientific articles available on multiple bibliographic platforms. The knowledge of surgical simulators was amply demonstrated with solid arguments, as well as the answers regarding safety and learning technique.

Discussion:

AI is seen in our environment as an innovative and popular tool, but evidently knowledge about it is still precarious in the urological field. We consider that the implementation of it, as well as the knowledge of its edges, is not widely developed in our environment due to the number of elderly urologists and outside the line of research.

As we have previously demonstrated, many are still governed by ancient learning techniques based on observing the procedure and its subsequent implementation through trial and error exercises. [12-14]

We also highlight that the availability in the country of AI-based surgical simulators are not widely available and accessible to the entire urological population. Those who reside and practice their profession in the interior of the country do not have access to these technologies, and it is these who are mostly limited in surgical skills linked to AI as well as to continue the line of research with other tools also available for AI. Recently, in 2023, surgery using a robot technique was incorporated into the Urology Chair, Dr Levin Martinez, Hospital de Clínicas Dr Manuel Quintela, Montevideo, Uruguay, the only chair of the specialty of said university hospital. [15-17]

This has implied a break in the Uruguayan history of urology and the method of teaching and learning residents. Thus, the generations of residents in progress and those who are starting initially have AI tools from the beginning of their training. That is why the young participants of this descriptive study are the ones who know and handle these new technologies for the most part.

The learning curve is just in full swing at the center given the recent incorporation of the robot. In any case, those who are in training are residents and teachers with different academic degrees, who for several years have been using AI tools in lines of research, having benefited in recent years from these new technologies both in clinical practice and in surgical skills.

There is another center in Montevideo, Uruguay, for private health, not linked to the academic field, which also has this technology for years. Graduated urologists who still participate in academic activities in the single urological chair also participate in this service, so, with their learning curve already completed, they share knowledge with those who are starting it. [18].

Conclusions:

We conclude that the greatest impact of this new discipline is on the younger generations, mainly residents and university professors, who have easy access to surgical simulators and are on their learning curve. In addition, it is these who, turned to research, use AI not only with simulator models, but also through GPT chat computing.

Regarding the older generations who are reluctant to change and who do not have easy access to the centers where the surgical simulators are located, we detect greater ignorance of this discipline.

Through the interrogation carried out digitally, and as a database of this descriptive study, we can affirm that 100% of the participants

They agreed that this new booming discipline must continue to expand widely.

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Contributions of the authors: The authors worked together throughout the development of the article, search and organization of information, synthesis and writing of it.

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