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Uso de ChatGPT en el Aprendizaje Basado en Proyectos en la Educación Veterinaria

Using ChatGPT in Project-Based Learning in Veterinary Education

Usando ChatGPT na aprendizagem baseada em projetos na educação veterinária

Fabiola Lydie Rochin Berumen
Universidad Autónoma de Zacatecas, Unidad Académica de Medicina Veterinaria y Zootecnia, México
fabiolauaz@outlook.com
https://orcid.org/0000-0002-8676-7768

Resumen

Este estudio de intervención educativa tuvo como objetivo evaluar cómo la implementación de herramientas de inteligencia artificial, específicamente ChatGPT, en el aprendizaje basado en proyectos (ABP) en la asignatura de Comunicación en Medicina Veterinaria, influye en la calidad de los proyectos de investigación y la resolución de casos clínicos, así como analizar las percepciones y actitudes de los estudiantes. Se utilizó un diseño mixto que combinó métodos cuantitativos y cualitativos, seleccionando una muestra de 109 estudiantes de un total de 160. Durante seis meses, se recopilaron datos a través de encuestas, entrevistas semiestructuradas y análisis de documentos. Los resultados mostraron que el 53.2% de los alumnos opina que ChatGPT contribuye a mejorar su proceso de aprendizaje, el 56% prefiere el Aprendizaje Basado en Proyectos sobre métodos tradicionales y el 46.8% se siente más motivado a participar debido al uso de esta herramienta. Las entrevistas revelaron que los estudiantes valoran la asistencia de ChatGPT para aclarar conceptos y mejorar su trabajo, aunque también expresaron preocupaciones sobre la dependencia de la herramienta y la probabilidad de obtener información incorrecta. Además, el análisis de documentos evidenció que la calidad de los proyectos de investigación mejoró significativamente tras el uso de ChatGPT, y la información presentada en los casos clínicos mostró un avance notable

en la redacción. En conclusión, el estudio indica que ChatGPT puede enriquecer el proceso educativo, mejorando la comprensión de conceptos complejos y fomentando un enfoque crítico en la investigación, por lo que se recomienda un acompañamiento constante en su implementación para garantizar un aprendizaje efectivo y un ambiente colaborativo.

Palabras Clave: Inteligencia artificial, chatGPT, ABP, educación veterinaria.

Abstract

This educational intervention study aimed to evaluate how the implementation of artificial intelligence tools, specifically ChatGPT, in project-based learning (PBL) in the subject of Communication in Veterinary Medicine, influences the quality of research projects and the resolution of clinical cases, as well as to analyze students' perceptions and attitudes. A mixed design was used that combined quantitative and qualitative methods, selecting a sample of 109 students from a total of 160. Over six months, data were collected through surveys, semi-structured interviews, and document analysis. The results showed that 53.2% of students consider that ChatGPT improves their learning, 56% prefer Project-Based Learning over traditional methods, and 46.8% feel more motivated to participate thanks to this tool. The interviews revealed that students value the assistance of ChatGPT to clarify concepts and improve their work, although they also expressed concerns about dependence on this tool and the likelihood of obtaining incorrect information. Furthermore, the analysis of documents showed that the quality of research projects improved significantly after the use of ChatGPT, and the information presented in clinical cases showed a notable advance in writing. In conclusion, the study indicates that ChatGPT can enrich the educational process, improving the understanding of complex concepts and encouraging a critical approach to research, so constant support in its implementation is recommended to ensure effective learning and a collaborative environment

Keywords: Artificial intelligence, ChatGPT, ABP, veterinary education.

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Resumo

Este estudo de intervenção educacional teve como objetivo avaliar como a implementação de ferramentas de inteligência artificial, especificamente o ChatGPT, na aprendizagem baseada em projetos (ABP) na disciplina de Comunicação em Medicina Veterinária influencia a qualidade dos projetos de pesquisa e a resolução de casos clínicos, bem como analisar as percepções e atitudes dos alunos. Utilizou-se um delineamento misto combinando métodos quantitativos e qualitativos, selecionando uma amostra de 109 alunos de um total de 160. Ao longo de seis meses, os dados foram coletados por meio de questionários, entrevistas semiestruturadas e análise de documentos. Os resultados mostraram que 53,2% dos alunos acreditam que o ChatGPT contribui para a melhoria do seu processo de aprendizagem, 56% preferem a Aprendizagem Baseada em Projetos aos métodos tradicionais e 46,8% se sentem mais motivados a participar devido ao uso desta ferramenta. As entrevistas revelaram que os alunos valorizam a assistência do ChatGPT no esclarecimento de conceitos e na melhoria do seu trabalho, embora também tenham expressado preocupações sobre a dependência da ferramenta e a probabilidade de obter informações incorretas. Além disso, a análise documental mostrou que a qualidade dos projetos de pesquisa melhorou significativamente após o uso do ChatGPT, e as informações apresentadas em casos clínicos apresentaram notável progresso na escrita. Em conclusão, o estudo indica que o ChatGPT pode enriquecer o processo educacional, melhorando a compreensão de conceitos complexos e promovendo uma abordagem crítica à pesquisa. Portanto, recomenda-se suporte contínuo para sua implementação, a fim de garantir um aprendizado eficaz e um ambiente colaborativo.

Palavras-chave: Inteligência artificial, ChatGPT, ABP, educação veterinária.

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Introduction

Given the need to rethink the pedagogical processes faced by institutions, artificial intelligence (AI) is presented as a discipline with transformative potential in higher education, going beyond traditional instructional design. Educational Artificial Intelligence (EAI) promotes an approach oriented toward student transformation through expert systems that partially assume the task of teaching. Educational analytics is a key tool in this technological deployment (Forero et al., 2023).

With the arrival of multiple educational applications, platforms, and personal learning environments that generate data and adapt to students' needs, the learning analytics movement emerged (Lang et al., 2022). Most of these tools can be considered artificial intelligence-based systems, with few exceptions. AI is a field of study within computer science that simply makes a machine intelligent, that is, capable of thinking and reasoning (Sesé, 2023). But the thinking and reasoning of people and machines are different: when a person thinks, decides, or reasons, they draw a thousand conclusions before considering a hundred premises. Machines, however, are powerless before intuition, which is why so-called artificial intelligence commits the error inherent in repetitive argumentation: it is purely symbolic; it manipulates symbols, but there is no way for reasoning to become more than simple calculations about those symbols. In contrast, the artificial intelligence presented adopts a type of qualitative reasoning that is assumed and carried out in processes of perception, learning and interaction with the environment (Espitia and Padilla, 2022).

Artificial intelligence (AI) is a branch of computer science focused on the development of algorithms and systems capable of executing tasks with a level of performance classified as intelligent (Tramallino and Zeni, 2024) . In theory, the spectrum of applications is immense; Artificial Intelligence has been and continues to be a component of the technological "mythical culture", which sometimes generates excessive expectations that have led to disappointments that later induce forgetting but that in the long run have had something constructive. AI has emerged and evolved within the field of computer science and computing, and is currently used as a strategy in higher education (Cotrina-Aliaga et al., 2021).

AI was founded as a field approximately half a century ago, and over time it has evolved and emerged as an important discipline that has influenced our way of life and promises to do so even more markedly in the future, at least judging by the expectations it has created (Basáez and Mora, 2022). AI was founded as a field in the 1950s, with the development of computer programs that sought to simulate human thought. One of the milestones was the creation of chess programs (García et al., 2023). The goal of AI, to replicate intelligent human behavior, has motivated different theoretical approaches: the creation of programs that simulate human intelligence, the identification of the cognitive mechanisms carried out by the brain, or the emulation of those same mechanisms in information processing by computers. These more or less ambitious goals led to the emergence of several subdisciplines within AI (González and Martínez, 2020).

Project-based learning (PBL) is a methodology applied in diverse educational contexts and levels around the world, especially in higher education. Its implementation, however, has been influenced by factors such as current curricula, culture, lack of time on the part of teachers, students accustomed to traditional methodologies, and a lack of institutional resources, among other reasons.

In recent years, artificial intelligence has begun to be applied in education to mitigate certain limitations of traditional methodologies. It is important to note that, although ChatGPT can be a useful tool in the writing process, it has certain limitations. Specifically, AI has been used for the automatic monitoring and analysis of individual and collective interactions, helping to improve the quality of learning and the educational experience. This innovative approach seeks not only to optimize educational processes but also to ensure that project-based learning is more accessible and effective for all involved (Rico, 2023).

The assessment of information for decision-making facilitates the improvement of the teaching and learning experience by responding to the needs and interests of individual students, which is considered relevant for achieving meaningful learning and promoting academic retention. This branch of artificial intelligence can be considered an opportunity for PBL, as it provides tools that give students information about what is happening in the classroom, with the aim of improving teaching and learning processes (Montes, 2021).

The great qualities of project-based learning, as well as its principles and benefits, lie in the realities of *inductive learning* and in response to the principles of situational cognition or the practice of strategies and procedures. The most notable characteristics of project-based learning are:

The realization of an authentic or reality-like experience. The development of tasks that offer opportunities to learn and understand the world in a real-life context. Problem-based learning is one of the types of tasks proposed by Thomas Michell in 1962. At the university, as a socially committed entity, there is a need to train critical, educated, and proactive professionals capable of solving and anticipating problems in their professional specialty, as well as confidently facing new problems or problems with little specific content. Hence the need to design a university curriculum that fosters the mental activity of those who learn. Well-designed educational projects are a powerful stimulus for the mental activity required for the personal construction of new knowledge (Alca and Vidal, 2023).

It provides intellectual tools. Individual or group research into current or situated problems requires students to transform their information and knowledge, which implies the

acquisition of intellectual habits: reasons that demonstrate something, valid conjectures, convincing arguments, and a more critical attitude toward their discourse (García et al., 2023).

The most representative proposals that integrate Artificial Intelligence into Project-Based Learning have been presented. Its integration offers significant opportunities for students by allowing them to analyze data more efficiently, automate repetitive tasks, receive personalized recommendations and create predictive models, which enriches their learning process and promotes the development of key skills, as well as critical thinking and creativity (Torres et al., 2024).

In higher education, artificial intelligence tools and technologies such as intelligent tutoring systems, personalized learning platforms, predictive analytics, and automated assessment platforms can be used to improve teaching, learning, and institutional management. These tools promote the customization of the educational experience, tailoring content to individual student needs, providing rapid and accurate feedback, and making informed data-driven decisions, helping to improve the quality of education and prepare students for today's workforce.

Artificial intelligence in education has a positive impact by enabling personalized learning, providing instant feedback, facilitating access to educational resources, automating administrative tasks, and predicting academic outcomes. These benefits contribute to improving the quality of teaching and learning, promoting a more student-centered, efficient, and effective approach to education (Marcos et al., 2023).

Using ChatGPT

ChatGPT is a language model created by the OpenAI organization. It is based on the Transformer architecture model and is one of the largest language models ever developed, reaching 175 trillion parameters. ChatGPT is capable of encoding both the text being read and the context of the sentence, as well as previous sentences. ChatGPT entails thousands of hours of training on unstructured text. In this way, it was "taught" to answer trivia questions, complete sentences, translate text, and generate natural language .

This model was developed to exist and respond to human questions and interactions in the most human-like way possible. Initially, ChatGPT was only capable of sending responses of between 2 and 3 sentences with sufficient length. Later, a variant was released

with 175 trillion parameters, making it the largest artificial neural network. The limits to these previous examples and their executions offer truly surprising results, generating coherent and relevant text in response to user questions and requests, allowing for dynamic and versatile interactions on a wide range of topics (Sarrazola, 2023).

Using ChatGPT in higher education offers multiple benefits, such as personalized learning, where students can receive instant answers to their questions and access additional resources, thus fostering more autonomous learning tailored to their individual needs. Additionally, it can facilitate the creation of educational content, assist in writing assignments, and provide instant feedback, improving the efficiency of the educational process.

However, it also poses significant challenges, such as excessive dependence on it; tools such as ChatGPT can lead to a decrease in the development of critical and independent thinking skills among students; there is a risk that it may be used for plagiarism or the production of academic work without due personal effort, which could compromise academic integrity (Sabzalieva and Valentini, 2023).

Veterinary Education

Almost any discipline in the veterinary field could apply the ChatGPT model. In the initial stage of a veterinary medicine student's career, a teacher could motivate and inspire the student with a workshop where he or she proposes to the ChatGPT general and simple problems for the student but sufficiently relevant from the perspective of veterinary medicine, so that the student strengthens skills in solving clinical cases, through inductive inference that integrates learning models . participatory .

In this way, ChatGPT can be very useful as an intelligent assistance tool for consultation and case resolution by the student, facilitating meaningful learning through problem solving from a clinical approach in the training stage (Choudhary et al., 2023).

Regarding the ethical and privacy elements in the use of ChatGPT in higher education, although the use of ChatGPT is very convenient, universities must consider the aforementioned aspects and adopt this tool to interact with their students, prior to this the authenticity of learning must be ensured, it was clearly suggested that many learning contexts should be based on the inspection of the teacher who plays an active role in the supervision and evaluation to check the quality of the projects and in this way mechanisms are

implemented to verify that the works presented by the students are the result of their own effort, understanding and not simply results generated by artificial intelligence, this not only protects the integrity of the educational process, but also encourages meaningful learning, where students develop critical and analytical skills that are essential in their training (Arriaga and González, 2023).

It is crucial to highlight the importance of ethics and responsibility in the use of artificial intelligence (AI) in academic contexts, especially in areas such as the semantic correction of academic papers and the monitoring and guidance of students by teachers. In this sense, it is essential that educators are aware of the implications of using these tools and the need to properly cite the authors, recognizing their work and avoiding plagiarism, as Leal (2023) points out, the projects must be interesting, current with a social contribution and describe artificial intelligence algorithms applied to pedagogical tasks.

Furthermore, it is essential to emphasize that current trends in education point towards more collaborative and student-centered learning (Salgado and Aguilar, 2021) , which implies that the use of tools such as ChatGPT must be aligned with these pedagogical practices. It is expected that more and more universities will use Artificial Intelligence technologies that adapt to their needs to stimulate and involve students in learning processes. One of the aspects to consider is to use these environments to stimulate critical thinking, promote autonomy and, at the same time, participation. In this sense, the role of teachers is essential to guide and supervise this use. On the other hand, and according to the principles of education, there must be compatibility between the learning objectives and the technology used (Ruiz, 2023).

Method

This educational intervention study was conducted using a mixed-method, explanatory sequential design. The concepts of use, perception, and impact of ChatGPT in the context of PBL were clearly defined, providing a precise methodological operationalization that allows for a more rigorous analysis of the results. The research focused on evaluating the impact of artificial intelligence, specifically ChatGPT, on project-based learning (PBL) in the subject of Communication in Veterinary Medicine. A representative sample of 160 students from groups "A, C, and D" of the Bachelor's Degree in Veterinary Medicine and Animal Husbandry at the Autonomous University of Zacatecas

was selected using random sampling to ensure adequate and equitable representation of different levels of academic performance.

Data collection was conducted through a combination of methods. A survey was administered to all students to assess their perceptions of the use of ChatGPT in PBL and their level of satisfaction with the learning process, using a 5-point Likert scale ranging from *strongly disagree* to *strongly agree* . The survey content included specific questions about the timing and conditions of ChatGPT application during the learning sessions, allowing for the reconstruction of the actual pedagogical context in which it was implemented. ChatGPT was applied throughout the semester's practice, where students used the tool to solve clinical cases and develop projects. The survey consisted of 15 items, and Likert scales were used to measure the intensity of the responses, thus ensuring the validity of the perceptions expressed by the students.

In addition, semi-structured interviews were conducted with a selection of 20 students, allowing for an in-depth exploration of their experiences and attitudes toward the implementation of ChatGPT in their education. A questionnaire was developed that covered topics such as perceptions of ChatGPT support for learning, challenges faced, and application of knowledge, ensuring that these were linked to the specific learning outcomes expected to be achieved with the intervention. Response coding followed a thematic approach, and data saturation was considered when analyzing the interviews, ensuring that all relevant perspectives were captured. A document analysis was also conducted by reviewing the students' written work on selected clinical cases, assessing the clarity, coherence, and quality of the writing using a specific assessment guide that considered aspects such as structure, content, and application of acquired knowledge. This analysis used a formalized rubric that allowed for an objective assessment of the quality of the projects, ensuring transparency in the data collection process and consistency in the assessment.

The survey data were analyzed using descriptive statistical techniques to provide clear insights into student opinions. For the interviews, a content analysis was conducted to identify themes and patterns in the responses. This qualitative analysis was explicitly connected to robust methodological approaches, such as thematic analysis, to ensure its rigor and validity.

It is essential to distinguish between perceived impact and actual learning. Using indicators of academic achievement or documented performance to verify these effects, participants' quotes were incorporated to illustrate the findings and provide a deeper

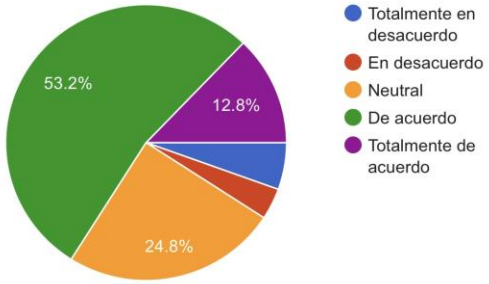
understanding of their experiences. Document analysis facilitated comparison of the quality of projects before and after the introduction of ChatGPT, assessing its impact on improving the clarity and effectiveness of presentations. This comprehensive approach provided a comprehensive view of ChatGPT's impact on learning in the subject of Communication in Veterinary Medicine.

Results

Specific learning outcomes expected from the intervention included improved quality of research projects, the development of critical skills for clinical case resolution, and increased collaboration among students, as well as the effective application of theoretical knowledge in practical situations, using ChatGPT as a tool to enrich their learning process.

The data collected reveal that the perception and attitudes of students of the subject of Communication in Veterinary Medicine of the Academic Unit of Veterinary Medicine and Zootechnics towards the implementation of artificial intelligence in project-based learning can be summarized in the following points (see Figure 1):

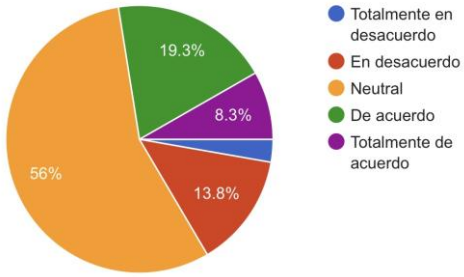
Figure 1. Using ChatGPT can improve my learning



Own elaboration

The results obtained in Figure 1 show that 53.2% of students agreed that using ChatGPT could improve their learning. This data suggested that more than half of the students recognized the potential of artificial intelligence as a valuable tool to enrich their educational process in this specific area.

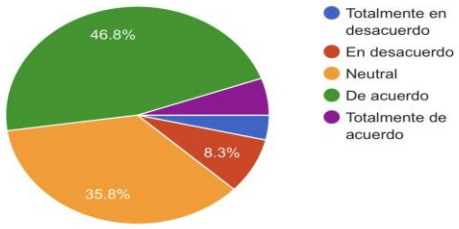
Figure 2. I prefer to learn through projects rather than traditional methods



Own elaboration

The results in Figure 2 indicate that 56% of students prefer to learn through projects instead of using traditional methods. This indicator highlights students' inclination toward more active and participatory learning approaches. In contrast, only 2.8% of respondents strongly disagreed with this preference, suggesting that most students value project-based methodology as an effective alternative for their learning.

Figure 3. ChatGPT integration motivates me to participate more actively



Own elaboration

The results in Figure 3 indicate that 46.8% of students agree with the integration of ChatGPT into project-based learning (PBL), noting that this methodology motivates them to participate more actively in their educational process. Furthermore, 35% of students remain neutral regarding this integration, suggesting that a considerable portion of the student population has no clear opinion about the impact of ChatGPT on their learning. This data highlights the importance of continuing to explore and evaluate students' perceptions of the use of artificial intelligence in their studies.

In this regard, interviews with students about their experience with ChatGPT in Project-Based Learning (PBL) revealed that, although AI is considered a useful tool for

accessing information and facilitating learning, it also raises concerns about dependency and a lack of initiative to conduct independent research. Many noted that ChatGPT provided erroneous or outdated information, highlighting the need to be specific in their queries and verify information with reliable sources. Furthermore, students expressed a desire for training on the proper use of ChatGPT and agreed that its use should be moderated to avoid superficial learning. Overall, the use of ChatGPT is considered valuable, but its use should be balanced to maximize its educational benefits.

also showed significant improvements in various areas of student learning. Throughout the six-month intervention study, document analysis revealed a notable increase in the quality of projects following the implementation of ChatGPT . Comparing work completed before and after its use, a notable increase in the clarity, structure, and depth of content was observed. Students demonstrated an increased ability to apply their theoretical knowledge to the analysis of clinical cases, which translated into a greater understanding of fundamental concepts in veterinary medicine and animal husbandry. Furthermore, the use of ChatGPT facilitated access to relevant information and academic resources, which enriched the research process and fostered a more critical and analytical approach.

Overall, the results suggest that the integration of ChatGPT as an AI tool in project-based learning significantly contributed to the development of essential competencies in future veterinary medicine professionals. This evolution in the quality of the projects indicates that the integration of ChatGPT had a positive impact on the learning process and on the academic production of the students. students .

Discussion

The implementation of artificial intelligence (AI) in project-based learning has proven to be an effective strategy for improving students' academic performance, as evidenced in this study. AI's ability to facilitate access to academic resources and analysis tools supports the assertions (de Rubio et al., 2023) in their article, "Artificial Intelligence in Higher Education: A Transformative Approach," which highlights that the technology enriches the learning process by providing up-to-date and relevant information.

The results obtained in this study are consistent with the perspective of Travieso and Ortiz (2018) in their article *Problem-based learning and project-based teaching: different teaching alternatives* , who argue that project-based learning allows students to apply their

knowledge in practical contexts. This application not only improves the understanding of complex concepts but also encourages the development of essential skills for their future professional careers. AI-powered collaboration between students also aligns with the research of (Dieste et al., 2019), which indicates that teamwork contributes to more meaningful and in-depth learning.

Furthermore, the practical approach adopted in this study is reflected in the theory of Mercado et al., (2019), in their doctoral thesis *entitled Analysis and evaluation of interactivity processes in virtual learning environments* , who argue that social interaction in online learning environments enhances the educational experience. The collaboration observed during the development of the projects suggests that AI not only acts as a computing resource, but also creates a collaborative learning environment that is essential for the development of interpersonal skills.

However, it is crucial to recognize that the implementation of AI in higher education must be accompanied by constant support for teachers and students. The present study coincides with the authors Inca et al., (2024) in their article *Challenges of education for the implementation of artificial intelligence* where they emphasize that adequate training in the use of these technologies is essential to maximize their effectiveness in the classroom. Without adequate training, the potential benefits of AI may be limited, which underscores the need for a comprehensive approach to the integration of these tools into the educational curriculum.

Conclusions

The implementation of ChatGPT as an artificial intelligence (AI) tool in project-based learning (PBL) in higher education, particularly in the field of Veterinary Medicine Communication, offers significant advantages by combining in-person interaction with virtual technologies, enriching the educational experience and fostering more active and autonomous learning. However, it is essential that educational institutions provide ongoing support during this integration of AI into project-based learning, fostering a collaborative environment and ensuring adequate student training.

This not only maximizes the benefits of AI, but also addresses concerns about dependence on these tools and the potential for misinformation, while encouraging independent research and critical thinking, thus contributing to the comprehensive and effective education of future professionals.

Furthermore, this integration has a positive impact on society by preparing students to face the challenges of the contemporary world of work, and on the scientific community by fostering innovation and the development of new educational methodologies that can be replicated and adapted in different contexts.

Future Lines of Research

- ✓ Long-term impact of AI on academic and professional performance
- ✓ Students' and teachers' perceptions of the integration of chatGPT as an AI tool
- ✓ Comparison between traditional teaching methods and project-based learning with AI

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Annex 1. Project content Learning Project Based

Introduction

Development

Clinical Case

Patient profile: (patient ID or name, species, race, age, color, gender, weight, distinguishing features, date of birth, origin (urban/rural), reason for consultation, vaccination and deworming schedule, diet, previous illnesses, previous surgeries, reproductive status, family history, habitat.

Medical history (Anamnesis): It consists of the information provided by the owner about the pathology or problem that the patient presents at the time of the consultation.

General Physical Examination: General clinical evaluation, composed of 15 parameters in which the patient's pathological state is assessed (temperature, capillary refill time, heart rate, respiratory rate, pulse, etc.).

Complementary Diagnostic Tests: These are tests that confirm the diagnosis (blood count, blood chemistry, x-rays, ultrasound, etc.).

Presumptive diagnosis. This is a diagnosis based on the patient's suspected pathology.

Definitive diagnosis. This is the diagnostic result based on the patient's clinical examination, which gives us the name of the patient's pathology.

Control and prevention. Biosecurity measures

Treatment. A series of medications prescribed or administered to the patient based on the pathology presented.

Conclusion

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