

Language Models and generative Artificial Intelligence for teaching resolutions in traumatic dental emergency situations

Modelos de lenguaje e inteligencia artificial generativa para la enseñanza de resolución en emergencias odontológicas traumáticas

Armando Moisés, Carrillo Fernández  ; Mirella Pilar, Sierralta Soto ; Christian Armando, Díaz Correa ; Cintia Adriana, Núñez Apumayta 

Universidad Continental, Huancayo, Perú.

Abstract

The Language Models and generative Artificial Intelligence for teaching resolutions in traumatic dental emergencies explores the use of generative Artificial Intelligence (AI) in dental training, specifically in management of traumatic dental emergencies. Three generative AI systems (Copilot IAG-1, NEXTAI IAG-2 and Perplexity AIG-3) were evaluated using prompts designed to simulate dental emergencies situations. The results showed that these systems can provide accurate diagnoses and effective treatments recommendations, with scores above 90% in most of evaluated categories. The study highlights the consistency in diagnostic accuracy and quality of treatment recommendations, especially in the management of acute dental pain, where all systems achieved 100% in several dimensions. However, areas for improvement were identified, particularly for IAG-2 in categories such as dental dislocation and gingival bleeding. Additionally, the ease of use and response time were evaluated, finding that all systems provided quick and adequate responses, with IAG-3 standing out for its speed and ease of use. The dimension of interest and motivation was also positive, suggesting that these systems can maintain a high level of engagement among users.

Keywords: dentistry, generative artificial intelligence, emergencies, traumas, evaluation, language models, education.

Resumen

Los Modelos de Lenguaje e Inteligencia Artificial Generativa para la Enseñanza de Resolución en Emergencias Odontológicas Traumáticas explora el uso de inteligencia artificial (IA) generativa en la formación odontológica, específicamente en la gestión de urgencias dentales traumáticas. Se evaluaron tres sistemas de IA generativa (Copilot IAG-1, NEXTAI IAG-2 y Perplexity IAG-3) mediante prompts diseñados para simular situaciones de emergencia dental. Los resultados mostraron que estos sistemas pueden proporcionar diagnósticos precisos y recomendaciones de tratamiento efectivas, con puntuaciones superiores al 90% en la mayoría de las categorías evaluadas. El estudio destaca la consistencia en la precisión diagnóstica y la calidad de las recomendaciones de tratamiento, especialmente en el manejo del dolor dental agudo, donde todos los sistemas alcanzaron el 100% en varias dimensiones. Sin embargo, se identificaron áreas de mejora, particularmente para IAG-2 en categorías como luxación dental y hemorragia gingival. Además, se evaluaron la facilidad de uso y el tiempo de respuesta, encontrando que todos los sistemas proporcionaron respuestas rápidas y adecuadas, con IAG-3 destacándose por su rapidez y facilidad de uso. La dimensión de interés y motivación también fue positiva, sugiriendo que estos sistemas pueden mantener un alto nivel de compromiso entre los usuarios.

Palabras claves: odontología, inteligencia artificial generativa, urgencias, traumas, evaluación, modelos de lenguaje, educación.

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Introduction

In the last decade, progress in artificial intelligence (AI) have transformed numerous fields, including education and medicine. Among these progresses, language models and generative AI have stood out as promising tools for teaching and addressing medical emergencies (Dzobo et al., 2020; Sodhro & Zahid, 2021), which is applicable to traumatic dental situations. In this context, the combination of artificial intelligence (AI) and human intelligence (HI) offers great benefits. Leveraging big data, computing power, and storage capabilities, as well as addressing the social issues arising from algorithmic applications, requires the joint implementation of AI and HI. Derivatives of algorithmic applications require the joint implementation of AI and IH. However, few countries, even the most economically developed, have adequate and critical governance frameworks to better understand and guide the innovation trajectories of AI in healthcare. Drug discovery and translational pharmacological research can greatly benefit from AI technology, as long as they are also rely on the IH. (Dzobo et al., 2020; Manickam et al., 2022).

Language models, such as those developed by OpenAI and Google, have demonstrated a remarkable ability to process and generate coherent text, thereby facilitating the creation of personalized educational materials and interactive simulations (Peinazo Morales, 2020; Mathkor et al., 2024). These tools not only allow a more adapted teaching to the individual needs of students, but they also enhance interactivity and engagement in the learning process. Furthermore, generative AI, which includes technologies such as large language models (LLMs), enables the generation of original and adaptive content. This not only enhances the learning experience but also more effectively prepares healthcare professionals by providing them with updated and relevant resources that align with the changing demands of the medical field (Egli 2023; Mathkor et al., 2024).

The integration of these technologies in dental education not only optimizes the teaching process but also provides students with advanced tools to face emergency situations. Recent studies have shown that the use of AI-based simulations can significantly improve students' ability to handle dental emergencies, reducing response time and increasing accuracy in decision-making. Román Aguilar et al., 2023; Thurzo et al., 2023). This article explores the impact of language models and generative AI on the teaching of traumatic dental emergency resolution, highlighting its benefits, challenges, and future applications.

In recent months, artificial intelligence systems such as ChatGPT, GPT-4, and Bard have emerged, demonstrating an impressive ability to interpret and generate natural language, achieving communication very similar to that of human beings (Kasirzadeh & Gabriel, 2022; Egli 2023; Lee et al., 2023). Deep down, these technologies represent a significant advance in the way we interact with machines and how they can assist us in complex tasks. The ability of these models to understand and generate coherent and relevant text not only facilitates the creation of personalized educational materials, but also allows the simulation of realistic clinical scenarios, which is crucial for the training of healthcare professionals.

Generative AI, in particular, offers the possibility of creating adaptive content that responds to the specific needs of each student. This is especially useful in dental education, where practice and preparation for emergency situations are essential. By using AI-based simulations, students can practice and improve their skills in a controlled environment, allowing them to be better prepared to face real situations. Additionally, these simulations can be continually updated to reflect the latest advances and discoveries in the field of dentistry, ensuring that students always have access to the most recent and relevant information (Stanley, 2023).

Narrow AI, also known as Specific AI, is characterized by uncomplainingly accepting and performing tasks that people tend to avoid, are tired of doing, or are prone to making mistakes. This form of artificial intelligence is expected to revolutionize dental education, bringing comparable

efficiencies to other areas of healthcare, which is uniquely poised for the growth of artificial intelligence due to its commercial and patient-oriented nature, its focus on a single area of the body and its increasing rates of practice consolidation.

One of the most anticipated effects of the implementation of AI in dental care is greater consistency in dental diagnoses and treatments. AI can analyze large volumes of data quickly and accurately, reducing variability in clinical decisions and improving the quality of patient care. Additionally, AI can take on repetitive and tedious tasks, allowing dental professionals to focus on more complex and personalized aspects of treatment.

Materials and methods

A research structured in three phases was carried out: 1) Natural language definition phase of traumatic dental emergencies; 2) Selection of generative AI by characteristics and abilities for reception, processing and response to natural language; and 3) Expertise in the application of natural language and Generative AI in the development of action protocols for traumatic dental emergencies.

I PHASE. Natural Language Definition of Traumatic Dental Emergencies

1.- Content analysis

To extract key terms and phrases, the descriptors for health sciences were used, section H02.163 - DeCS/MeSH for Dentistry, proposed and managed by BIREME, the Latin American and Caribbean Center for Information in Health Sciences. Health (BIREME PAHO, 2024). This structured, multilingual vocabulary was created to serve as a single language for indexing scientific journal articles, books, conference proceedings, technical reports, and other materials. In addition, it is used in the search and retrieval of scientific information in databases such as LILACS and MEDLINE, which in this study is used as a natural language for writing PROMPT for Generative AI.

2.- Construction of the corpus and construction of PROMPT

Through expert judgment, these terms were chosen and classified according to their frequency and relevance in the context of dental emergencies, considering the medical-dental principles described in the “Dental Trauma Guide” (University Hospital Copenhagen, 2024) and classification of trauma. dental diseases modified by Andreasen in 1980, recognized and still in force by the World Health Organization, (1980) included in the international classifier of CIE diseases.

Subsequently, 13 identified key phrases were written, which corresponds to the PROMPT for the development of natural language.

3.- Development of the Natural Language (NLP) model

Natural language processing (NLP) techniques were used to train a model based on the created corpus, implementing machine learning algorithms to improve the precision and relevance of the model in the three selected Generative AIs.

4.- Model validation

For the performance evaluation of the model, real clinical cases were used to evaluate its performance, adjusting the results obtained and feedback from dental experts.

II PHASE. Selection of generative AI

Three Generative AIs were used in this study: Microsoft Copilot (Chatbot based on the GPT-4 AI language model); Next AI (AI based on ChatGPT technology [unlimited usage times]). It is compatible with

ChatGPT, GPT-3 and GPT-4.); and Perplexity (generative AI that uses ChatGPT and adds its own search engine functions). For the selection of the AI, the following characteristics and abilities were evaluated.

AI's features:

1.- Hyperparametrics (external configuration variables that data scientists use to manage the training of machine learning models. Sometimes called model hyperparameters, hyperparameters are configured manually before training a model. They are different from parameters, which are internal elements derived automatically during the learning process and are not configured by data scientists)

2. - Gigantic Corpus (or datasets that have been used to train large language models (LLMs) such as GPT-4, we are talking about books of all kinds, written content on web pages, large text repositories and information from the world like Wikipedia, but also less formal linguistic productions like those we write on social networks, in public reviews of products or services, or even in emails. This variety allows these language models to process and handle text in different languages, registers and styles).

3. - Generic task (consisted of completing missing words and predicting the next word in the text. This phase requires many computer equipment with very high processing capabilities).

AI skills

1. - Context learning (generate a coherent text only from an instruction or from just a few examples.

For example: Translate from English to Spanish "Dentistry" generation Dentistry; to Portuguese: "Odontologia" and to French: "Odontologie"

2.- Following instructions (a simple instruction and the model will generate the expected response. For example, we can tell you to write a dentistry concept and the LLM will generate said concept).

For example: Generating responses...

Sent by Copilot:

Of course, here you have a concept of "Dentistry":

Dentistry is the branch of medicine that is responsible for study, diagnosis, prevention and treatment of diseases and conditions that affect the teeth, gums, jaws and other related structures of the oral cavity. This discipline covers various specialties, such as orthodontics, periodontics, endodontics and oral surgery, among others, with the aim of maintaining and improving people's oral health.

Do you need something more specific about dentistry or any of its specialties?

3.- Step-by-step reasoning (This means that the model manages to solve relatively complex tasks that involve multiple phases of reasoning, written in Natural Language).

For example: Generating responses...

Sent by Copilot:

Dental restoration is a procedure that seeks to recover the structure and function of a damaged tooth. Here is a general description of the process:

Initial Evaluation: The dentist examines the affected tooth and performs x-rays to determine the extent of the damage and plan appropriate treatment¹².

Tooth Preparation: Decay or damaged tooth tissue is removed. This may involve using a dental drill to clean the affected area³.

Material Selection: Depending on the type of restoration, the appropriate material is chosen, such as composite resin, amalgam, porcelain or composite¹².

Aplicación del Material:

Material Application:

Direct Restoration: The material is applied directly to the tooth and molded to restore its original shape. Then, it is hardened with a special light⁴.

Indirect Restoration: An impression of the tooth is taken and sent to a dental laboratory where the restoration (such as a crown or inlay) is made. On a second visit, the restoration is cemented to tooth².

Adjustment and Polishing: Once the restoration is placed, the dentist adjusts the shape and height to ensure a comfortable and functional bite. Finally, it is polished to give it a natural finish¹.

This process may vary depending on the type of restoration and the specific condition of the tooth. Is there any particular aspect that you would like to delve into?

III PHASE. Application of natural language and Generative AI in teaching action protocols for traumatic dental emergencies

Of the 13 PROMPTs, two or three were applied for each competency area of traumatic dental emergencies, for a total of three clinical cases per area. The objective of this activity was to evaluate the application of natural language as essential elements and then execute the operations required to obtain the correct answer, through cognitive assessment, soft and hard skills, and promote interest and initiative in good dental practice.

Resultados

Table 1 shows the evaluation of the 13 PROMPT through the judgment of dental experts specialized in maxillofacial surgery and clinical practice, for more than 5 years (n=27), showing that 100.00% adequacy of the content and theoretical corpus of natural language selected, in accordance with the DECS, inducing recovery are aligned with the objectives that are intended to be measured, thus ensuring that the LLN is coherent and valid for its purpose, reliable and achievable through the use of Generative AI, as stated. demonstrated with congruence indexes greater than 0.80 in all PROMPTs.

On the other hand, it's observed in Table 1, that Natural Language Processing (NLP) to train the context learning of the selected generative AIs, allowed the systems to learn and improve autonomously through neural networks, remaining demonstrated that the responses to the PROMPT issued yielded indices close to 1 for NLP. When assessing the precision of the generative response, it was shown that the three AIs behaved similarly with indices generally higher than 0.80, with the lowest cases being 0.73 and 0.81 for highly specialized clinical management procedures. Management of an intrusive dislocation in an emergency patient" and "Protocol to control gingival bleeding after trauma", respectively. Finally, the way to communicate with the AI through the NLP created has significance or weight within a specific situation and generative resolution.

From the point of view of clinical-dental praxis, Figure 1 shows the expert assessment of the orientation and induction of skills, of the generative responses of the AI focused on response time for action, assertive selection of the procedures and materials to use and resolution of the clinical case.

Table 1. Expert evaluation and validation of the PROMPT according to the contents and theoretical corpus for teaching resolution in traumatic dental emergencies through generative artificial intelligence

PROMPT	Nº	Adequacy		Agreement (0-1)	Validation								
		Content (%)	Corpus (%)		PLN (0-1)			Precision (0-1)			Relevance (0-1)		
					IAG 1	IAG 2	IAG 3	IAG 1	IAG 2	IAG 3	IAG 1	IAG 2	IAG 3
"Describes the steps to manage a dental fracture in an emergency patient"	27	100,00	100,00	0,89	0,93	0,93	0,93	0,89	0,93	0,89	0,93	0,89	0,89
What is the classification of dental fractures according to the WHO?	27	100,00	100,00	0,93	0,93	0,93	0,97	0,93	0,93	0,93	0,97	0,93	0,93
"Explore treatment options for a complicated coronal fracture"	27	100,00	100,00	0,93	0,89	0,89	0,89	0,96	0,96	0,93	0,89	0,96	0,93
How to reimplant an avulsed tooth?	27	100,00	100,00	0,89	0,93	1,00	0,93	0,89	0,89	0,89	0,93	0,89	0,89
"Steps to preserve an avulsed tooth before arriving at the implantology center"	27	100,00	100,00	0,93	0,93	0,93	0,93	0,93	0,81	0,93	0,93	0,93	0,93
"What is the critical time to reimplant an avulsed tooth?"	27	100,00	100,00	0,93	0,93	0,97	0,93	0,81	0,81	0,93	0,93	0,93	0,93
"What to do in case of lateral dislocation of a tooth?"	27	100,00	100,00	0,93	0,89	0,89	0,89	0,81	0,81	0,81	0,89	0,81	0,81
"Management of an intrusive dislocation in an emergency patient"	27	100,00	100,00	0,89	0,89	0,89	0,89	0,81	0,73	0,89	0,89	0,81	0,89
"How to stabilize an extruded tooth until the consultation?"	27	100,00	100,00	0,89	0,96	0,89	0,96	0,81	0,81	0,89	0,96	0,81	0,89
"Protocol to control gingival bleeding after trauma"	27	100,00	100,00	0,96	1,00	1,00	1,00	0,81	0,73	0,87	1,00	0,81	0,87
"What are the immediate measures to stop bleeding in the oral cavity?"	27	100,00	100,00	0,93	1,00	1,00	1,00	0,87	0,73	0,93	1,00	0,87	0,93
"Strategies to relieve dental pain in emergency situations"	27	100,00	100,00	0,97	0,97	0,97	0,97	0,82	0,73	0,97	0,97	0,82	0,87
"What pain relievers can be recommended before the consultation?"	27	100,00	100,00	1,00	1,00	1,00	1,00	0,73	0,73	1,00	1,00	0,73	1,00

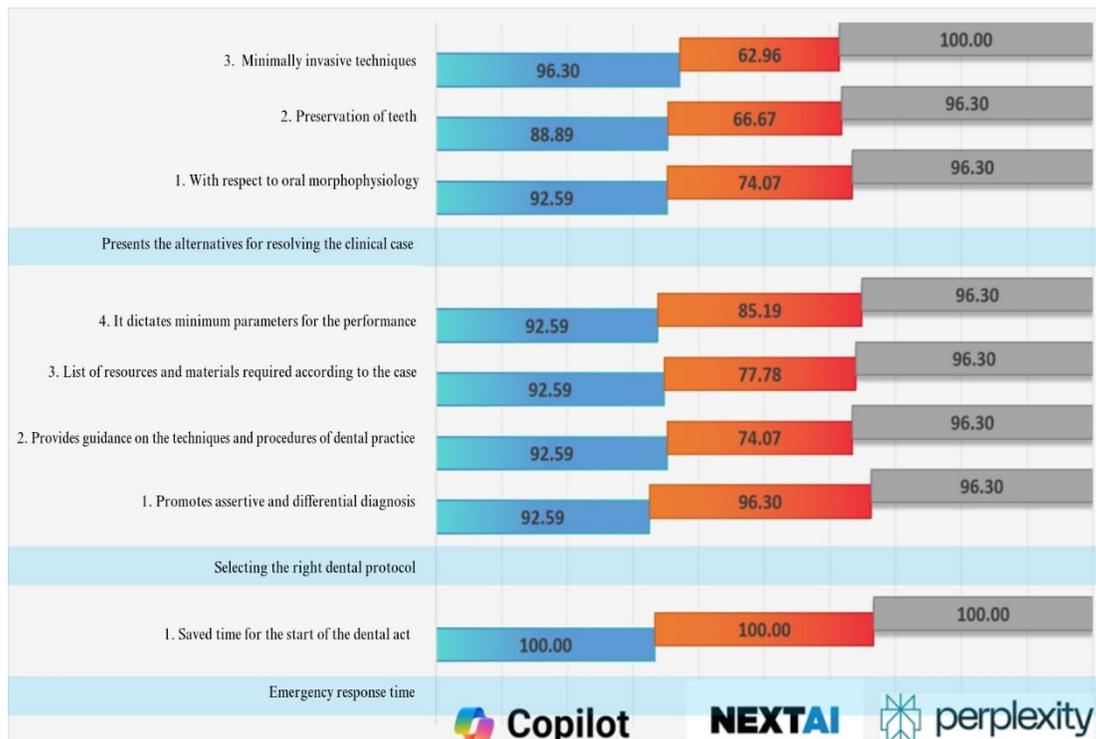


Figure 1. Validation evaluation of the Natural Language model for resolution of traumatic dental emergencies through generative artificial intelligence

Through the expertise of 5 systems engineers specialized in Bayesian, Grid and Random hyperparametric valuation; It values operability as optimal with estimated values close to 1 in the

different items for the characteristics and abilities of generative AI, since in each iteration it works with a relatively small number of hyperparameters that mainly determine the result of the model; concluding that the three selected generative AIs can be trained for medical-dental protocols with congruent recoveries and generations and in accordance with the theoretical corpus, principles, foundations and methods described in advance (Figure 2). Finally, we conclude that it provides us with a visual comparison of the abilities of three AI systems in several parameters crucial for their performance, allowing a quick and understandable evaluation of their capabilities.

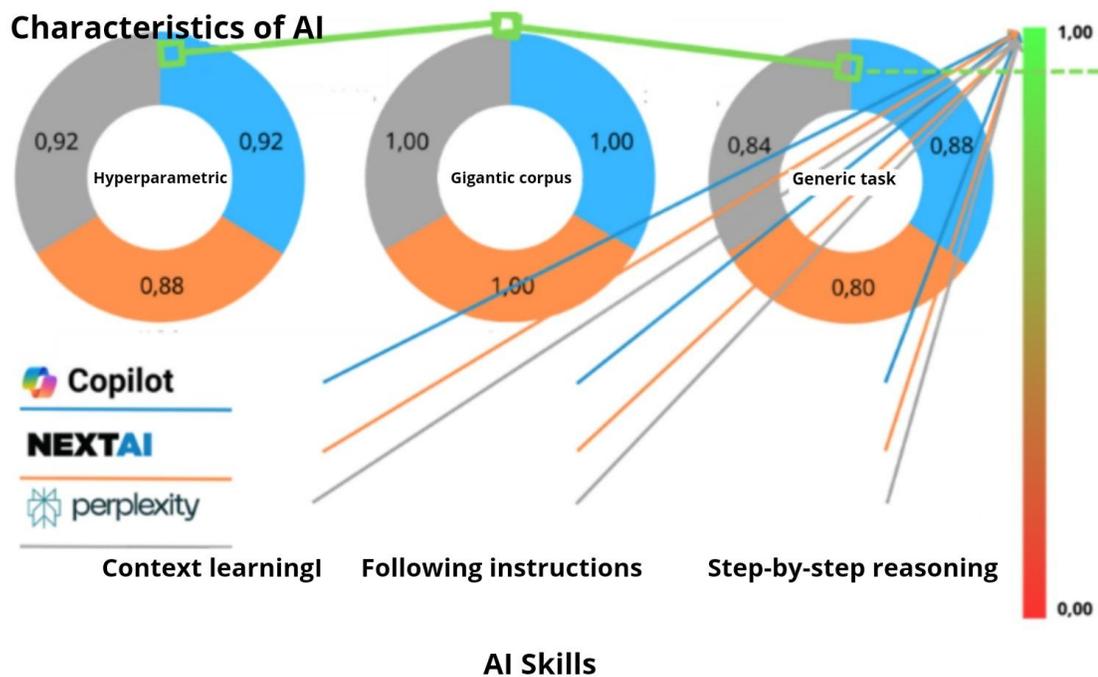


Figure 2. Operability of the Natural Language model for resolution of traumatic dental emergencies through generative artificial intelligence

Table 2 evaluates the content of searches generated using PROMPTS to address traumatic dental emergencies through generative artificial intelligence (AI). The form is divided into several competency areas, each of which is evaluated using different prompts. Large differences in system performance were observed in areas such as tooth dislocation and gingival bleeding from the gums. In particular, IAG-2 scores slightly lower than IAG-1 and IAG-3 in these categories. This finding suggests that while generative AI systems are effective overall, there are specific areas that require further optimization to achieve consistent performance.

100% (n=53) of the dental professors who participated in the “model validation” study agreed that real clinical cases were used to evaluate their performance. This approach allowed for a more precise and contextualized evaluation of teachers' skills and knowledge, since real clinical cases reflect authentic and complex situations they face in their daily practice.

In addition, the results obtained were adjusted to more accurately reflect the performance of the participants. This adjustment was made through a detailed analysis of the data collected, ensuring that the evaluations were fair and representative of the teachers' actual capabilities.

Comments from dental experts were incorporated, adding an additional layer of validation and credibility to the study. The experts provided constructive feedback based on their extensive experience and knowledge in the field of dentistry, which helped identify areas for improvement and reinforce the

strengths of the evaluated teachers. This collaboration with experts also facilitated the implementation of best practices and higher standards in dental education.

Table 2. Content evaluation of recoveries with PROMPTS to address traumatic dental emergencies with Generative artificial intelligence (AI)

Competition area	PROMPT	Generative Recovery Assessment											
		IAG-1				IAG-2				IAG-3			
		C	HDs	HBs	IM	C	HDs	HBs	IM	C	HDs	HBs	IM
Tooth fracture	1	0,96	0,96	0,96	0,96	0,96	0,96	0,94	0,94	0,96	0,98	0,98	0,93
	2	0,92	0,95	0,95	0,95	0,93	0,95	0,95	0,95	0,96	0,96	0,98	0,96
	3	0,93	0,94	0,94	0,94	0,93	0,94	0,94	0,94	0,96	0,96	0,98	0,96
Tooth avulsion	4	0,98	0,93	0,98	0,96	0,98	0,93	0,98	0,96	0,96	0,93	0,94	0,96
	5	0,98	0,96	0,96	0,96	0,98	0,96	0,96	0,96	0,93	0,93	0,93	0,96
	6	0,98	0,96	0,96	0,98	0,98	0,96	0,96	0,98	0,93	0,93	0,98	0,96
Tooth dislocation	7	0,98	0,96	0,96	0,96	0,98	0,93	0,96	0,96	1,00	1,00	0,98	0,96
	8	0,95	0,96	0,96	0,96	0,98	0,96	0,96	0,96	1,00	1,00	0,98	0,93
	9	0,94	0,93	0,96	0,93	0,94	0,93	0,96	0,93	0,93	0,98	0,98	0,96
Gingival bleeding	10	0,93	0,93	0,93	0,93	0,93	0,98	0,93	0,93	1,00	1,00	1,00	1,00
	11	0,98	0,93	0,93	0,93	0,98	0,98	0,96	0,93	1,00	1,00	1,00	1,00
Acute dental pain	12	1,00	1,00	1,00	1,00	0,98	0,98	0,96	0,96	1,00	1,00	1,00	1,00
	13	1,00	1,00	1,00	1,00	0,98	0,98	1,00	0,96	1,00	1,00	1,00	1,00

C. Cognitive; HDs. hard skills; HBs: soft skills; IM: interest and motivation

Discussion

The incorporation of language models and generative AI in teaching the resolution of traumatic dental emergencies constitutes a notable advance both in education and in clinical practice. This integration not only facilitates adaptive and personalized learning, but also improves the ability to respond to critical situations, thus optimizing clinical and educational results (Dzobo et al., 2020; Sodhro & Zahid, 2021; González González et al., 2023; Gallardo Heradia, 2024). This study has evaluated the effectiveness of three generative AI systems: Copilot (IAG-1), NEXTAI (IAG-2) and Perplexity (IAG-3), in responding to specific prompts designed to address various dental emergencies. The results obtained not only provide a clear view of the capabilities and limitations of these systems, but also highlight their potential to revolutionize training and clinical practice in dentistry. As noted by Andreoli et al. (2024), the ability of these systems to provide accurate and contextually relevant responses can significantly improve clinical decision making and the quality of patient care. Likewise, the importance of ongoing teacher training and the creation of spaces for collective reflection, to rethink teaching practices in universities.

One of the most notable findings of this study is the high diagnostic accuracy and quality of the treatment recommendations provided by generative AI systems, which suggests their optimal application in traumatic dental emergencies, in accordance with what was pointed out by Ferrara et al. (2022) and Vangelis (2024) for clinical practice. In most prompts, evaluation values exceeded 0.90, indicating a high level of competence in these areas. This result is particularly relevant, since diagnostic accuracy is crucial in the management of traumatic dental emergencies, where a misdiagnosis can lead to serious consequences for the patient.

Generative AI systems showed variable performance in different areas of competence. For example, in the management of acute dental pain, all systems achieved 100% in most of the dimensions

evaluated. This suggests that AIs are particularly effective in managing this type of emergency, providing quick and accurate responses that can be crucial for the immediate relief of the patient, which can be extrapolated to improve diagnosis, treatment and patient care. (Sahagún, 2023). Thus, AI is considered a high-value tool by Ferrara et al. (2022) and Maye (2023) for COVID-19 care and primary health care, respectively.

In contrast, dental clinical practice requires very specific processes that are influenced by multiple factors that together influence the decision to act, as Antipovienė et al point out. (2021) this can be used in areas such as tooth dislocation and gingival bleeding; Hence, when using AI, the contributions are of different performance, IAG-2, in particular, obtains slightly lower scores than IAG-1 and IAG-3 in these categories. This finding highlights that while generative AI systems are largely effective, there are specific areas that require optimization to improve the consistency of their performance.

Another important aspect evaluated in this study was the ease of use and response time of generative AI systems. How quickly an AI can generate a useful response is crucial in emergency situations, where every second counts. The results showed that all the systems evaluated provided responses in adequate times, with IAG-3 standing out for its speed and ease of use. This finding is significant as it suggests that generative AI systems can be effectively integrated into clinical settings without causing delays in patient care (Leite et al., 2020; Cacñahuaray-Martínez et al., 2021).

The dimension of interest and motivation was also evaluated in this study, providing insight into how AI systems can influence the motivation of students and professionals to learn and apply new techniques (Patcas et al., 2019; Mathkor et al., 2024). The results indicated that generative AI systems can maintain a high level of interest and motivation among users, which is essential for continuous and effective training. The ability of these systems to provide detailed and accurate responses can encourage students to further explore clinical cases and improve their practical skills.

Despite the promising results, this study has some limitations that must be considered. First, the evaluation was based on specific prompts designed for dental emergency situations, which may not fully reflect the diversity of clinical cases encountered in real practice. Furthermore, although generative AI systems showed a high level of accuracy and effectiveness, their performance may vary depending on the quality and quantity of data used for their training. Therefore, it is crucial to continue researching and improving these systems to ensure their applicability in a wide range of clinical scenarios (Patcas et al., 2019; Egli 2023; Mathkor et al., 2024).

The findings of this study have important implications for dental education and clinical practice. Integrating generative AI systems into dental training can provide students with a powerful tool to learn and practice resolving dental emergencies in a controlled and safe environment. Additionally, these systems can serve as a valuable resource for professionals in clinical practice, providing accurate and rapid diagnoses and treatment recommendations that can improve the quality of patient care.

This study opens several directions for future research. First, there is a need to explore how generative AI systems can be effectively integrated into dental training curricula. Additionally, additional research should focus on improving the accuracy and effectiveness of these systems in areas where limitations have been identified. Finally, it is crucial to evaluate the long-term impact of using generative AI in clinical practice, including its effect on the quality of patient care and the operational efficiency of dental clinics (Patcas et al., 2019; Dzobo et al., 2020; Sodhro & Zahid, 2021).

Final considerations

Language models and generative AI have significant potential to transform teaching and practice in the resolution of traumatic dental emergencies. The results of this study demonstrate that these systems can provide accurate diagnoses, effective treatment

recommendations, and maintain a high level of interest and motivation among users. However, it is necessary to continue researching and optimizing these systems to ensure their applicability and effectiveness in a wide range of clinical scenarios.

The three AI systems (Copilot, NEXTAI and Perplexity) show consistently high performance in several categories, especially in “Selection of the correct dental protocol”, “Time savings for starting the dental procedure” and “Emergency response time”, where everyone reaches 100%. In most categories, Perplexity has the highest percentages, suggesting that this system is the most effective or satisfactory in terms of dental procedures and considerations. This is especially notable in “Regarding oral morphology” and “Preservation of teeth.”

NEXTAI shows lower percentages in several categories compared to Copilot and Perplexity, indicating areas where it could improve. For example, in “Dental pieces conservation” and “Lowly invasive techniques”, NEXTAI has the lowest percentages, suggesting that there is room to optimize its performance in these aspects.

The generative AI systems evaluated (IAG-1, IAG-2, IAG-3) show high consistency in diagnostic accuracy and treatment recommendations for traumatic dental emergencies. In most prompts, evaluation values are above 0.90, indicating a high level of competence in these areas. All generative AI systems reach 100% in most dimensions for prompts related to acute dental pain. This suggests that these AIs are particularly effective in handling these types of emergencies, providing fast and accurate responses.

Although, IAG-2 shows good overall performance, there are specific areas, such as “Dental Dislocation” and “Gingival Bleeding”, where its scores are slightly lower compared to IAG-1 and IAG-3. This indicates that there is room for improvement in these categories to reach the level of accuracy and effectiveness of the other systems.

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Continental University.

Conflict of Interest

No conflicts of interest reported.

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