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Dental records

ANALYSIS OF INFORMED CONSENTS FOR USE IN DENTISTRY CREATED BY GENERATIVE ARTIFICIAL INTELLIGENCE.

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ABSTRACT

The consumer protection code in dentistry ensures a clear and accessible presentation of all treatment-related information. Emerging interaction platforms, where the algorithm responds in text format using natural language, enable the creation of legal texts and documents with potential applications in dentistry. The aim of this work is to evaluate the Terms of Free and Clarified Consent (TCLE) produced by OpenAI's IAG ChatGPT, analysing the data provided, from a legal point of view, considering the main procedures in daily dental practice. Secondly, we will evaluate the potential for document improvement and standardization. The creation of TCLE was requested for the specialties that present the most legal questions. A systematic analysis was carried out to assess issues such as the language, content, organization, and legibility of documents. This research shows that the ChatGPT IAG of Open AI can generate TCLEs adequate for everyday clinical practice. A closer look reveals that there are small imperfections and a tendency to use technical terms inappropriate for such documents. This feature is accentuated when equally technical terms are used in the platform prompts. Therefore, it is recommended that they be used as guides for each professional to produce their TCLE in an individualized way, following ethical and legal precepts and their experience and clinical practice.

KEYWORDS

Forensic dentistry; Dental ethics; Artificial intelligence; Communication barriers.

INTRODUCTION

In Dentistry, the duty to inform the patient is mandated by the Consumer Protection Code (CPC) and ensures that all information relevant to the treatment is not only presented in a clear and accessible

manner but with sufficient data for the patient to make an informed decision. As a legal responsibility, the Dental Ethics Code expresses the obligation to collect the patient's authorization before starting any treatment, and given the importance of this

act, it is appropriate to consider that the relevant information about the proposed treatment should be documented.

In scientific research, obtaining consent expresses the fundamental values of bioethics, being an unequivocal reference of conduct since the Nuremberg Code. Adapting this demand for clinical practice, the Informed Consent (IC) covers the expected requirements of the professional and presents the patient with information about the necessity of the treatment, the risks, and expected benefits, as well as the care to be adopted.

Traditionally, the IC is prepared based on the experience and personal relationship between the professional and patient, possibly containing specific characteristics of that professional's practice. Even so, it is common for document models to be produced and shared by professionals.

Considering the use of standardized documents combined with the legal unpreparedness in drafting ICs, it is not uncommon for some professionals to resort to internet research for guidance or even a model to use in their clinical appointments. With the advent of generative artificial intelligence (AI), it is expected that it would be possible to draft ICs among the many legal documents that these are capable of elaborating.

The emergence of interaction platforms where the algorithm responds in text format using what has come to be

known as natural language (NL) has allowed significant advancement in numerous productions in professional fields and education, with application in legal areas. To date, the ability of AIs to elaborate specific technical documents like ICs has been little explored, and inaccuracies are often reported, even considering the most used AIs in the market. However, it is not known whether the level of this inaccuracy could put the professional at risk or if it meets the expected conditions such as accessible language to the population and adequate legal characteristics.

The objective of this work was to evaluate the ICs produced by OpenAI's ChatGPT, analysing the data provided from a legal perspective, considering the main procedures in daily dental practice. Secondly, the ability to enhance the documents and their standardization was assessed.

METHOD

To develop this research, steps were thought to ensure an interaction close to what the public would obtain in front of the platform, as well as its use to define the parameters to be evaluated. Therefore, to analyse the performance and versatility of ChatGPT in drafting ICs, this research envisaged several phases:

- 1- Definition of dental procedures to be addressed.
- 2- Acquisition of ICs using technical language prompts and lay language.

- 3- Comparison of content obtained by 2 observers using technical and lay language.
- 4- Legal analysis of the content.
- 5- Testing the ability to improve content and verify the ability to assimilate suggestions for future and independent searches.

Definition of addressed specialties

Considering the interactive nature of ChatGPT 3.5, it was asked which TCLEs the AI would be prepared to draft, obtaining the following response:

"In Dentistry, I can help draft Informed Consent (IC) for a wide variety of procedures and treatments. Some common examples include:

- *Dental extraction.*
- *Dental implants.*
- *Endodontics (root canal treatment).*
- *Dental restorations (such as fillings).*
- *Periodontal treatment (gingivitis, periodontitis).*
- *Oral surgery procedures such as removal of impacted teeth or cysts.*
- *Orthognathic surgery procedures.*
- *Orthodontic treatment.*
- *Dental whitening.*
- *Prosthetic procedures (crowns, bridges, dentures).*
- *Treatment for temporomandibular dysfunction (TMD).*
- *Treatment for bruxism (teeth grinding).*
- *Placement of orthodontic appliances.*
- *Tartar removal and dental cleaning.*
- *Root canal treatment in deciduous teeth (milk teeth).*

These are just a few examples, but I am prepared to assist in drafting Free and Informed Consent Terms for a wide range of dental procedures. It is important to note that each case is unique, and it is

recommended that the document be personalized by the responsible dentist, considering the specific needs of the patient and the peculiarities of the proposed treatment" (text generated by ChatGPT 3.5, an AI from OpenAI).

Asked about the most requested ICs, ChatGPT responded the following procedures:

"Among the ICs in Dentistry, some of the most requested and common are:

- *Dental extraction: IC for the removal of a tooth, whether it is a deciduous (milk) tooth or a permanent one, including information on risks, complications, and post-operative care.*
- *Dental implants: IC for the placement of dental implants, explaining the surgical procedure, associated risks, pre- and post-operative care, as well as possible complications.*
- *Canal treatment: IC for endodontic treatment, including information on the removal of dental pulp, use of medication, filling of the root canal, and care after the procedure.*
- *Oral surgery procedures: IC for the removal of impacted teeth, cyst extraction, bone graft surgeries, among other oral surgical procedures, with details about the procedures involved and the associated risks.*
- *Dental restorations: IC for dental restorations such as fillings (direct or indirect restorations), dental crowns, fixed bridges, explaining the materials used, the procedures involved, and possible complications.*
- *Periodontal treatment: IC for the treatment of gingivitis or periodontitis, including information about scaling and root planing, periodontal surgery, use of*

medications, necessary oral care, and possible complications.

- *Dental whitening: IC for dental whitening procedures, explaining the whitening options, possible side effects, and the care to be followed during and after the procedure.*

These are just a few examples of the most requested ICs in Dentistry. The choice of the appropriate IC will depend on the specific treatment proposed and the needs of the patient. It is important that the responsible dentist personalizes the IC, including the relevant information for the specific case and addressing the patient's questions and concerns" (text generated by ChatGPT 3.5, an AI from OpenAI).

In accordance with the questions, a thorough analysis of the literature regarding processes in Dentistry and the highly implicated dental specialties was conducted. Among the specialties potentially benefited using IC is Orthodontics. For this reason, such an area of practice was included in this research.

According to the response from the AI, it is known that the documentary approach should be carried out for each dental act, and that each specialty has infinity interventions that demand proper communication with the patient, thus needing to select some procedures of greater relevance in the context presented earlier. Therefore, ICs of the following procedures were requested in a generic manner: dental implants; dental correction by orthodontic appliance; root canal treatment; third molar extraction; tartar scraping; dental whitening; dental restoration. Subsequently, terms in

accessible language were replaced by more technical ones to assess the outcome of this change.

Acquisition of ICs

The nature of the IC allows presenting technical information with NL in a form of interaction known as PROMPT. For this reason, the motivating texts or questions were kept simple, simulating an interaction made by a professional without legal training or, even a patient.

In this stage, simple questions were used with ChatGPT 3.5:

- "Could you draft an IC about (procedure)?"

For one specialty, the research was proposed using a technical term and subsequently a lay term. The chosen procedure was endodontic treatment, where the response was recorded by asking the question using "endodontic treatment" and "root canal treatment" - Figures 1 and 2.

Legal Analysis of ICs

The platform allows conversations to be stored under a title editable by the user. Therefore, it was requested that each observer keep the results until the end of the research. The response to each question was copied in full into a MSWord document, respecting the established order.

Two observers read the terms and pointed out through comments in the texts which items they disagreed with, would adjust, found unnecessary, or incomplete. The results were tabulated in a spreadsheet.

For each IC, 10 questions (Q₁ to Q₁₀) were answered with: " *Completely (3), Partially (2), Very Little (1), and No (0)*".

Q₁. Does the IC correspond to the researched procedure?

Q₂. Was the indication of the treatment duly presented?

Q₃. Were the risks of the treatment presented?

Q₄. Were the benefits of the procedure presented?

Q₅. Were the care and participation of the patient clarified?

Q₆. Were warnings included?

Q₇. Does the IC include risks that are not inherent to the procedures but result from errors or accidents (negligence)?

Q₈. Is the language comprehensible and accessible to patients?

Q₉. Were technical terms included without explanations and clarifications?

Q₁₀. Were inaccurate or erroneous information included?

Analysis of the platform version

One of the ICs were chosen and inserted into Chat GPT version 4.0. Thus, it was assessed whether this would be able to improve and reduce possible issues observed in version 3.5 - Figure 3.

RESULTS

Regarding the content of the ICs with LN, documents were drafted that could easily add to the practice of dental

surgeons. However, a more attentive and detailed look begins to locate points where the information provided could be improved. Figure 4 presents the results of the evaluation of the ICs from each specialty containing the qualitative analysis of each question.

DISCUSSION

This article seeks to understand an emerging doubt among professionals about the use of AIs for drafting ICs, as well as to present the benefits and limitations of the use of AI for document production in the daily routine of a dental office. The purpose of using NL tools explored in this investigation unites two of its most explored applications: obtaining specific knowledge and understanding of norms and legislations relevant to professional practice.

It is increasingly clear that the creation of LN can reduce the barrier of legal ignorance for a large part of the citizens in the sense of facilitating the understanding of what is being proposed and will be executed, and for this reason, its use should be exercised and disseminated among health professionals^{20,21} by creating and updating terms containing facilitated language^{13,14}. No matter the area or the purpose of the document, the inaccuracies and possible divergences created by the AI always require the analysis of a specialist in Forensic Dentistry. This was confirmed in tests carried out to assess the quality of the content generated currently.

IC for Root Canal Treatment (drafted by Chat GPT 3.0) - Accessible language

I, [PATIENT NAME], have understood and been duly informed by Dr. [DENTIST NAME], dental surgeon, about the root canal treatment procedure I am about to undergo. I have received complete and comprehensible information about the risks, benefits, alternatives, limitations, and care related to endodontic treatment. All my doubts and concerns were satisfactorily addressed.

1. Procedure Description:

O tratamento de canal, também conhecido como tratamento endodôntico, é um procedimento odontológico realizado para tratar uma polpa dentária danificada ou infectada. O processo inclui as seguintes etapas:

- a) Local anaesthesia to minimize discomfort during the procedure.
- b) Opening the tooth crown to access the dental pulp.
- c) Removal of the affected dental Pulp.
- d) Careful cleaning and disinfection of the root canals.
- e) Filling the root canals with obturation material to prevent reinfection.
- f) Restoration of the tooth crown with a filling or prosthetic crown.

2. Expected Benefits:

- a) Relief of pain caused by infection or inflammation of the dental pulp.
- b) Prevention of the spread of infection to other areas of the tooth or mouth.
- c) Preservation of the affected tooth, avoiding extraction.
- d) Restoration of normal masticatory function.

3. Risks and Complications:

- a) Discomfort and sensitivity in the teeth and gums after the procedure.
- b) Persistent inflammation or infection requiring further treatment.
- c) Fracture of the tooth during or after the canal treatment.
- d) Accidental injury to adjacent structures such as nerves or blood vessels.
- e) Difficulty obtaining a complete filling of the root canals.
- f) Need for endodontic retreatment or apical surgery in complex cases.
- g) Risk of allergic reactions to the materials used in the root canal treatment.

4. Alternatives:

- a) Extraction of the affected tooth.
- b) Not undergoing any treatment, which could lead to additional complications such as intense pain, infection, or bone loss.

5. Post-treatment Care:

- a) Use of prescribed medications as directed by the dentist, such as painkillers or antibiotics if necessary.
- b) Avoid biting or chewing with excessive force on the treated tooth until the final restoration.
- c) Rigorous oral hygiene, including brushing and using dental floss daily.
- d) Attend follow-up appointments as recommended by the dentist to assess the efficacy of the treatment and perform the final restoration.

By signing this Informed Consent, I declare that I have read, understood, and agree with all the information provided. I received the opportunity to ask questions, and all my doubts were duly clarified by Dr. [DENTIST NAME]. I am aware of the risks, benefits, alternatives, and care related to the canal treatment.

Patient's Name: _____

Patient's Signature: _____

Date: _____

Dentist's Name: _____

Dentist's Signature: _____

Date: _____

Figure 1. Example of IC for canal treatment drafted by Chat GPT 3.5 - accessible language.

IC for Endodontic Treatment (Drafted by Chat GPT 3.5) – Technical language

I, [PATIENT NAME], have understood and been duly informed by Dr. [DENTIST NAME], dental surgeon, about the endodontic treatment (canal treatment) procedure I am about to undergo. I have received complete and comprehensible information about the risks, benefits, alternatives, limitations, and care related to endodontic treatment. All my doubts and concerns were satisfactorily addressed.

1. Procedure Description:

Endodontic treatment, also known as root canal treatment, is a dental procedure performed to treat infected, inflamed, or damaged dental pulp. The process includes the following steps:

- a) Local anaesthesia to minimize discomfort during the procedure.
- b) Access to the dental pulp through the opening in the tooth crown.
- c) Careful removal of the affected dental pulp.
- d) Cleaning and disinfection of the root canals.
- e) Filling the canals with obturation material to prevent reinfection.
- f) Closure of the access with temporary or definitive restoration depending on the case.

2. Expected Benefits:

- a) Relief from pain or discomfort caused by infection or inflammation of the dental pulp.
- b) Prevention of the spread of infection to other areas of the tooth or mouth.
- c) Preservation of the affected tooth, avoiding extraction.
- d) Restoration of normal masticatory function.

3. Risks and Complications:

- a) Temporary discomfort or sensitivity after the treatment.
- b) Persistent infection that may require further treatment.
- c) Accidental damage to adjacent structures such as neighbouring teeth, nerves, blood vessels, or maxillary sinuses.
- d) Breakage or fracture of the tooth during or after the canal treatment.
- e) Formation of a dental abscess.
- f) Need for endodontic retreatment in complex cases.
- g) Unsatisfactory aesthetic results.

4. Alternatives:

- a) Not undergoing endodontic treatment, which could lead to additional complications such as intense pain, infection, or loss of the affected tooth.
- b) Considering the extraction of the affected tooth and considering replacement options such as dental implants or dentures.

5. Post-treatment Care:

- a) Use of prescribed medications as directed by the dentist, such as painkillers, anti-inflammatories, and/or antibiotics if necessary.
- b) Avoid hot or hard foods and beverages immediately after the treatment.
- c) Maintain adequate oral hygiene, including brushing and using dental floss daily.
- d) Attend follow-up appointments as recommended by the dentist to assess the efficacy of the treatment and perform the definitive restoration.

By signing this Informed Consent, I declare that I have read, understood, and agree with all the information provided. I received the opportunity to ask questions, and all my doubts were duly clarified by Dr. [DENTIST NAME]. I am aware of the risks, benefits, alternatives, and care related to endodontic treatment.

Patient's Name: _____
Patient's Signature: _____
Date: _____

Dentist's name: _____
Dentist's Signature: _____
Date: _____

Figure 2. Example of IC for endodontic treatment drafted by Chat GPT 3.5 - technical language.

IC for Root Canal Treatment (Drafted by Chat GPT 4.0) - Accessible language

I, [patient name], holder of ID No. [insert number] and Social Number No. [insert number], after being duly informed and having had the opportunity to discuss all my doubts with Dr(a). [dentist name], registered under Inscription No. [insert number], voluntarily consent to undergo canal treatment on tooth [tooth number].

1. Treatment Description:
Root canal treatment is an endodontic procedure that involves removing the inflamed, infected, or necrotic pulpal tissue (nerve) from within the tooth. After removal, the tooth's canal will be cleaned, disinfected, and filled with a special material to seal the canal and prevent future infections.

2. Treatment Benefits:

- **Pain Relief:** Eliminates pain caused by infection or inflammation of the nerve.
- **Tooth Preservation:** Allows the natural tooth to be maintained, avoiding the need for extraction.
- **Function Restoration:** Restores the functionality of the tooth for chewing and aesthetics.

3. Possible Risks and Complications:

- **Pain and Swelling:** Pain and swelling may occur after the procedure, generally controllable with medication.
- **Tooth Fracture:** The tooth may become more fragile and susceptible to fractures
- **Recurrent Infection:** There is a possibility of not eliminating the infection, requiring retreatment.
- **Treatment Failure:** In rare cases, the treatment may not be successful, requiring additional procedures, including endodontic surgery.

4. Treatment Alternatives:
Alternatives include not undergoing treatment, which may lead to the progression of the infection and potential loss of the tooth, or tooth extraction followed by replacement options such as implants or bridges.

5. Post-Treatment Care:
I commit to following the post-treatment instructions provided by the dentist, including oral hygiene care, use of prescribed medications, and attendance at follow-up appointments.

6. Consent:
I fully understand the procedures, benefits, risks, and alternatives associated with the proposed canal treatment. I am aware that my questions have been satisfactorily answered, and I consent to the treatment.

Place and Date: [insert place and date]

Patient's Signature

Dentist's Signature

Witness' Signature

Figure 3. Example of IC for canal treatment drafted by Chat GPT 4.0 - accessible language.

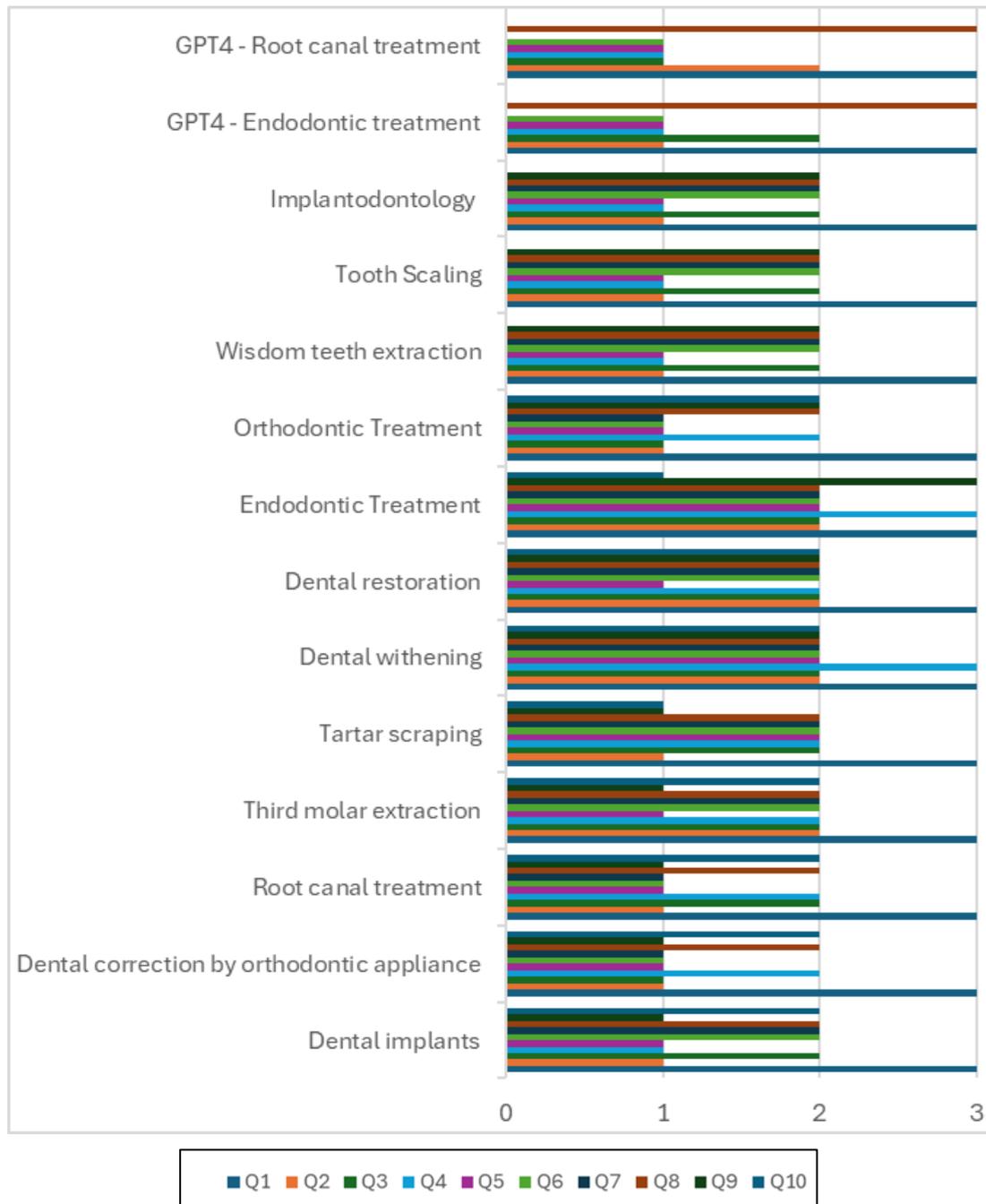


Figure 4. Results of the analysis of each IC. Legend: 0 – No; 1 – Very little; 2 – Partially; 3 – Completely.

In general, all terms drafted by the tested AI offered good organization parameters. Apparently, there is a well-established definition regarding the need to expose characteristics of the addressed treatment, its risks, benefits, treatment alternatives when available, and likely consequences of not performing the

proposed procedures, in addition to characteristics of the diagnosis and the necessary control for a satisfactory prognosis.

Among the main "failures" observed are the use of technical language, the presentation of the possibility of professional errors instead of inherent risks

to the procedures, and the lack or inaccuracy of some concepts. In the context of language, the researched ICs with colloquial language tended to present terms more appropriate for patient reading. Technical language is inappropriate and, in the essence of bioethics and the CDC's precepts, can invalidate the IC in its legal character. The terms created by Chat GPT version 4.0 were more effective, with more accessible languages and fewer technical terms, which was expected. GPT4 was improved to be more robust, with more consistency and factuality in the responses, in addition to more responsible AI use.

A rigorous and specialized look can detect some inconsistencies, repetition of information, and deficiencies in certain items. Lack of warnings or detailed explanations regarding patient care and cooperation, specifically their responsibility and involvement in post-procedure care, was a recurring feature.

The Forensic Dentist or the General Practitioner may use these mechanisms as a guide. An AI tool cannot be the author because it does not have the means to respond to the responsibility expected by those who play this role²³⁻²⁵. However, the use of information generated without due citation is considered a form of plagiarism. If consulted about the authorship of the material developed by the platform, the response was as follows^{26,27}. When asked about the authorship of the material created by the platform, the response provided was as follows:

"When using information or answers generated by ChatGPT or other AIs, it is important to attribute the source to OpenAI or the relevant AI source instead

of attributing authorship to a specific person. You can refer to the specific model as 'ChatGPT, an AI developed by OpenAI' (ChatGPT 3.5)".

When utilizing this resource, it is recommended that professionals cite the authorship and ensure that the produced material adheres to ethical and legal principles based on their expertise.

In informal tests that follow the same pattern of consultation but using other AIs, significant differences between the platforms were observed. For this reason, in this research, it was opted to compare the terms generated by a platform that currently presents itself prominently in the digital scene. Whether in the form of approach or in the content itself, each of them presented different results, and if the professional resorts to these tools, a comparison and evaluation of the content that most closely matches their clinical practice is recommended. It is still recommended that each IC be carefully personalized according to the experience of the dentist with their area of practice and the peculiarities of each patient.

However, the potential of using AIs is undeniable and indisputable. If, on the one hand, the specialist in Legal Dentistry may see or foresee a possible reduction in their fields of activity, on the other hand, the clinician should see an increase in terms of importance and indispensability of the obligation to inform. The availability of suitable tools such as AIs makes this type of service defect even more inexcusable. This is, in the context of a lawsuit, considering the opportunity and ease of access to means with sufficient qualities to

provide information, as extensively exposed in this article, reduces any justifications from the professional in not adequately fulfilling this requirement of the CDC. In this field, it is emphasized that the terms generated by the tested AI, being drafted for each type of treatment, are better than the generic documents or the famous "model" terms commonly available on various websites on the internet and exchanged among professionals. Moreover, these are infinitely better than the total absence of records that can prove that the information was duly passed on to the patient, thus being an incentive for taking this care.

Finally, the question for a more philosophical debate remains: could the existence of increasingly capable AIs to perform dental analyses one day reduce the threshold of patients' hypo-sufficiency? The hypothesis presented here is an example of the many paradigms that access to AIs should present to us in the

coming years. Certainly, scholars from the fields of Law and Health must include this debate and understanding of the continuous and increasingly rapid changes that society has witnessed with the advent of technology in the field of health information.

CONCLUSION

This research reported that the AI of ChatGPT from Open AI can generate ICs sufficiently good for everyday clinical practice. A closer look revealed some minor imperfections and a tendency to use technical terms inappropriate for such documents. This characteristic was accentuated when equally technical terms were used in the platform's prompts. Therefore, it is recommended that they be used as guides so that each professional can produce their IC individually, following ethical and legal precepts and their clinical practice and experience.

RESUMO

Na Odontologia, o dever de informar o paciente é previsto pelo Código de Defesa do Consumidor e garante que todos os dados, pertinentes ao seu tratamento, sejam apresentadas de maneira clara e compreensível. O surgimento de plataformas de interação, em que o algoritmo responde em formato de texto utilizando o que se passou a ser conhecido como linguagem natural, permite a criação de artigos e documentos de caráter jurídico, os quais potencialmente podem ser utilizados na Odontologia. O objetivo desse trabalho foi avaliar os Termos de Consentimento Livre e Esclarecidos (TCLE) produzidos pela IAG ChatGPT da OpenAI, analisando os dados fornecidos, do ponto de vista odontolegal, considerando os principais procedimentos no cotidiano odontológico. Secundariamente foi avaliada a capacidade de aprimorar os documentos e sua padronização. Foi solicitada a criação de TCLE para as especialidades que mais apresentam questionamentos jurídicos. Uma análise sistematizada foi desempenhada para avaliar questões como a linguagem, o conteúdo, a organização e legibilidade dos documentos. Essa pesquisa relatou que a IAG do ChatGPT, da Open AI é capaz de gerar TCLEs suficientemente adequados para a prática clínica cotidiana. Um olhar mais atento revelou que há pequenas imperfeições e uma tendência de uso de termos técnicos, inadequados para tais documentos. Esta característica se acentuou quando utilizados termos igualmente técnicos nos prompts da plataforma. Por isso, recomenda-se que sejam utilizados como guias para que cada profissional produza seu TCLE de maneira individualizada, seguindo preceitos éticos, jurídicos e da sua experiência e prática clínica.

PALAVRAS-CHAVE

Odontologia legal; Ética odontológica; Inteligência artificial, Barreiras de comunicação.

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