# ChatGPT in orthodontics: limitations and possibilities

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Artificial Intelligence (AI) simulates human intelligence in machines capable of rational response and actions. AI's growth in healthcare, particularly in dentistry, has been remarkable in aiding clinical practices from appointment scheduling to treatment outcome predictions. In orthodontics, AI effectively handles tasks such as automated landmark detection, diagnosing orthodontic needs, assessing maxillary constriction, and selecting appliances. ChatGPT, an AI-based program by OpenAI, excels in generating human-like responses, making it useful across many applications, including those in dentistry. AI enhances personalised patient communication, supports diagnosis and decision-making, digitises patient data, and aids in disease prevention and treatment. In addition, ChatGPT offers support in personalised care, billing, and patient health monitoring. Patients benefit from its help in finding providers, scheduling initial appointments, accessing health information, improving healthcare access and service effectiveness. However, there are limitations. ChatGPT sometimes produces nonsensical responses and poses privacy risks associated with patient data. Generated medical advice might not therefore match professional expertise. Despite these issues, if trained properly, ChatGPT could significantly enhance medical knowledge dissemination. Future studies should weigh the benefits of AI against its risks, and users must verify AI-generated information with reliable sources to ensure effective patient care.
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Artificial Intelligence (AI) can be defined as the simulation of human intelligence in a machine capable of processing and acting rationally.[1] The growth of AI in healthcare has been exponential in recent years, afforded by advancements in machine learning, natural language processing (NLP), and image analysis.[2] The AI technological advancements have given rise to both aspirations and apprehensions, particularly in dentistry, which has applied AI to facilitate clinical practice from appointment scheduling to the prediction of treatment outcomes.[3–5]

In orthodontics, AI has proven effective in automated anatomic landmark detection and analysis,[6–8] diagnosing the need for orthodontic extraction,[9] assessing maxillary constriction[10] and impacted canines,[11] determining the need for orthodontic treatment,[12,13] predicting treatment outcomes,[13,14] selecting orthodontic appliances,[15] and evaluating growth and development.[10,16–18]

Chat generative pre-trained transformer (ChatGPT) is an AI-based computer program, developed by OpenAI (San Francisco, CA, USA), that has been trained on extensive datasets to produce, when prompted, responses that are human-like to to enable the carrying out of complex tasks and engaging in meaningful conversations with users. The model's ability has provided a promising tool for a wide range of applications, particularly in dentistry.

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ChatGPT's clinical advantages encompass personalised patient communication, improved diagnosis, support for decision-making, digital recording of patient data, and contributions to disease prevention, and treatment.[5] Dentists also benefit from ChatGPT's support for personalised care, billing, and the continuous monitoring of patients' dental health.[5] Particularly valuable for patients, ChatGPT aids in finding healthcare providers, scheduling appointments, and accessing healthcare information.[2] Its full-time availability contributes to improved access to health information for individuals unable to seek care during regular hours.[2] The applications enhance patient empowerment, raise service effectiveness and safety, improve sustainability, expand access to quality care, and empower patients by enabling interaction in natural language.[5]

Although there is a growing trend towards the use of ChatGPT in dental areas,[3,4,19–21] few studies have evaluated its accuracy in providing precise and high-quality information to address questions related to clear aligners,[22,23] interceptive orthodontics,[24] temporary anchorage devices,[23] and digital imaging in orthodontics.[23] The assessment of ChatGPT's knowledge and responses concerning orthodontic topics indicated a generally positive acceptance by evaluators, emphasising ChatGPT's capability to deliver high-quality information in these specific areas.[23–27] However, two versions of ChatGPT have also been evaluated for aiding systematic review processes, including the formulation of PICO questions, selecting keywords, and creating Boolean queries. Past results have shown that, when optimally configured, both ChatGPT 3.5 and 4 can be pivotal tools for generating PICO-driven queries in orthodontics.[25]

The limitations of ChatGPT in healthcare are multifaceted. Despite efforts to sanitise training data, the model's lack of genuine understanding occasionally leads to nonsensical or inappropriate responses.[28] Consequently, the tool can provide answers to scientific questions in the field of orthodontics with less than ideal precision and without scientific validity.[22,26] In addition, patient data breaches pose significant concerns, especially in privacy-sensitive contexts, creating a risk of compromise during the necessary fine-tuning process.[5,22,24,28] While AI systems like ChatGPT can assist in diagnosis and treatment planning, they may not match the expertise of trained professionals, and sole reliance for medical information is not advisable.[22,24,25] However, if trained by experts on a comprehensive dataset, language models like ChatGPT have the potential to significantly improve medical knowledge dissemination in healthcare applications and assist in scientific research.[22,29]

The widespread adoption of ChatGPT by a substantial proportion of the population appears inevitable, and the transformative potential of ChatGPT in dentistry is a promising development that demands careful consideration. For this reason, future studies must determine whether the benefits of integrating chatbots outweigh potential risks in supporting healthcare actions. Additionally, orthodontists and patients should be aware of the limitations and actively verify information with reliable sources. With a comprehensive understanding of the strengths and weaknesses, such technologies may be responsibly harnessed to effectively enhance patient care.

## Conclusion

The use of ChatGPT reveals significant early promise but requires careful attention and a considered approach. Further development is necessary to improve the reliability and robustness of the AI tools before their full clinical integration. Orthodontists must be aware of the limitations of ChatGPT to use it effectively. However, through ongoing training, the implementation of regulations, and a focus on patient care, ChatGPT can complement and enhance dental practice, resulting in better patient outcomes and experiences.

## Conflict of interest

The authors declare that there is no conflict of interest.

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