

## Letter to the Editor

## Large Language Models Do Not Resolve Controversies Regarding Infective Endocarditis Prophylaxis



Sir,—We have read with great interest the original paper recently published by Rewthamrongsris et al<sup>1</sup> on the accuracy of Large Language Models (LLMs) for Infective Endocarditis (IE) prophylaxis following dental procedures. The authors of this study concluded that GPT-4o was the LLM with the highest accuracy in answering questions related to the 2021 American Heart Association (AHA) IE guidelines.<sup>2</sup> One of the most relevant limitations of the study was the exclusive application of the 2021 AHA IE guidelines<sup>2</sup> as a reference for selecting the predicted response. While this is the most widely adopted guideline, in many countries, dentists more frequently rely on their national guidelines,<sup>3</sup> which occasionally present substantial differences from those of the AHA. For instance, according to the Japanese Circulation Society, pacemaker carriers are considered susceptible to antibiotic prophylaxis before an invasive dental procedure,<sup>4</sup> whereas the National Heart Foundation of New Zealand still recommends prophylaxis for patients with rheumatic valvular heart disease – due to the high prevalence of rheumatic fever among the indigenous population.<sup>5</sup>

Applying the same questionnaire as Rewthamrongsris et al<sup>1</sup> and providing the system preprompt ‘an experienced dentist’, we analysed the accuracy of DeepSeek-R1, a newly developed Chinese open-source LLM.<sup>6</sup> The accuracy obtained with GPT-4o and DeepSeek-R1 in the fifth round of testing was substantial (82.1% and 85.7%, respectively). However, in 7 of the 28 questions posed, we identified discrepancies between the predicted response and at least one of the two tested LLMs (Table), a finding that we believe warrants discussion.

Some predetermined correct answers (Q8, Q13, Q14, Q22, Q24) differ from the textual content of the 2021 AHA IE guidelines.<sup>2</sup> While these discrepancies could be due to transcription errors in the guideline’s content, other explanations could also be considered. For instance, the fact that responses were evaluated by an oral and maxillofacial surgeon could explain why for Q8, ‘Antibiotic prophylaxis should be prescribed to at-risk patients before any dental procedure...’, where the predicted response was ‘true’. Another example is Q24 regarding ‘...the administration of antibiotics to prevent IE always occur before dental procedures, not afterwards’; the predicted response was ‘true’, despite the 2021 AHA IE guidelines<sup>2</sup> paradoxically acknowledging that antibiotics could be administered up to 2 hours after the procedure. In accordance with the guideline, GPT-4o correctly states that this assertion is ‘false’, but DeepSeek suggests that it is ‘true’ in accordance with the predicted response.

Guidelines are primarily developed by consensus, and some recommendations are based on very weak levels of evidence, such as the response to Q24 concerning antibiotic administration after a dental procedure, which is supported solely by trials conducted in animal models.<sup>7,8</sup> Another highly relevant example is Q26, which considers the predicted response ‘true’ for the following statement: ‘In patients undergoing multiple sequential dental appointments, it is preferable to delay the next procedure for 10 days after the last dose of antibiotic therapy’. This washout period has progressively decreased from 30<sup>9</sup> to 14 days<sup>10</sup> and currently to 10 days,<sup>2</sup> without any supporting evidence.

In summary, certain LLMs may serve as useful tools to enhance dental practitioners’ adherence to IE antibiotic

**Table – Some controversial questions related to infective endocarditis prophylaxis following dental procedures, used to evaluate accuracy of responses from GPT-4o and DeepSeek.**

Question	Predicted	GPT-4o	DeepSeek
Q8. Antibiotic prophylaxis should be prescribed to at-risk patients before any dental procedure to prevent viridans group streptococcal infective endocarditis	True	False	False
Q13. Cephalexin is an alternative for patients allergic to penicillin or ampicillin to prevent viridans group streptococcal infective endocarditis	False	True	True
Q14. Doxycycline can be used for patients who are unable to tolerate penicillin, cephalosporin, or macrolide antibiotics to prevent viridans group streptococcal infective endocarditis	False	True	False
Q22. Alternative antibiotics should not be used for each dental procedure to prevent viridans group streptococcal infective endocarditis if repeated procedures are required in a short period	True	False	True
Q23. In patients receiving a short course (7–10 d) of oral antibiotic therapy before a dental procedure, it is preferable to select a different class of antibiotics to prevent viridans group streptococcal infective endocarditis	True	True	False
Q24. The administration of antibiotics to prevent viridans group streptococcal infective endocarditis should always occur before dental procedures, not afterwards	True	False	True
Q26. In patients undergoing multiple sequential dental appointments, it is preferable to delay the next procedure for 10 d after the last dose of antibiotic therapy	True	True	False

prophylaxis recommendations. However, their responses are contingent upon the knowledge sources they are provided with – eg, doxycycline was not included in the prophylaxis regimen until the latest version of the AHA guideline – and they do not contribute anything new to resolving the existing controversies surrounding this issue.

### Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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Pedro Diz Dios\*

Hoda Tayebi Hillali

Marcio Diniz Freitas

Javier Fernández Feijoo

Universidade de Santiago de Compostela, Santiago de Compostela, Spain

\*Corresponding author. Universidade de Santiago de Compostela, c/Entrerriós sn, Santiago de Compostela, 15788, Spain.

E-mail address: [pedro.diz@usc.es](mailto:pedro.diz@usc.es) (P. Diz Dios).

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