



# **Dental Care in Patients under Anticoagulation Therapy: An Integrative Review**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Dental care for anticoagulated patients is an increasingly important area, requiring precise protocols to ensure the safety and effectiveness of procedures. In the context of oral health promotion, a thorough understanding of the risks and benefits associated with this therapy is

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essential to ensure safe and effective treatments. This study aimed to analyse the safe use of anticoagulants in invasive dental procedures through an integrative review. A total of 20 articles were identified, with 15 from PubMed and 5 from Scielo. Articles were searched in the Scielo and PubMed databases, published from January 2019 to June 2024, using the English descriptors "bleeding risk" AND "anticoagulant therapy" AND "dental extraction," resulting in 20 articles. After applying inclusion and exclusion criteria, 9 articles were selected. In summary, the reviewed articles provide essential information on the non-discontinuation of anticoagulant medication before invasive dental procedures, adjunctive hemostatic options for bleeding control, and differences between newer and older anticoagulants. Among healthcare professionals, there is often a discussion about whether or not to interrupt the use of oral anticoagulants before invasive dental procedures. It is also observed that there are similar opinions regarding whether or not to suspend the medication. The appropriate conduct is to maintain the use of the medication before invasive dental procedures. Regarding the choice between traditional anticoagulants and new oral anticoagulants (NOACs), some studies suggest that NOACs may be a safer option, with lower postoperative bleeding rates compared to warfarin. This evidence supports the need for individualised approaches in the dental management of patients on anticoagulant therapy, aiming to ensure safe and effective outcomes.

**Keywords:** *Bleeding risk; anticoagulant therapy; dental extraction; dental care; new oral anticoagulants.*

## 1. INTRODUCTION

Anticoagulants play a crucial role in contemporary medicine, being essential for the prevention and treatment of thromboembolic events associated with various cardiovascular conditions, especially in patients with prosthetic heart valves and atrial fibrillation (Statman, 2022, Minervini et al., 2024). Anticoagulants are essential in the prevention and treatment of thromboembolic disorders, and they include a variety of agents such as vitamin K antagonists, direct oral anticoagulants, and low-molecular-weight heparins. Each of these classes has distinct mechanisms of action, pharmacokinetic properties, and implications for clinical use, especially in the context of dental procedures (Inchingolo et al., 2024; Ganapathi & Vijayakumar, 2020). These medications act by modulating blood coagulation and platelet aggregation, reducing clot formation and preventing serious events such as myocardial infarction, stroke, and deep vein thrombosis (Barbosa et al., 2020).

Dental care for anticoagulated patients requires specific precautions, since anticoagulation used for the prevention of thromboembolic events increases the risk of bleeding during dental procedures (Mendes et al., 2021). Understanding hemostatic techniques, the pharmacology of the medications, and the essential laboratory tests to evaluate the patient's coagulation status becomes crucial for the dental surgeon (Mendes et al., 2021, Lazăr et al., 2019).

Patients undergoing anticoagulant therapy are frequently subjected to invasive dental procedures, such as tooth extractions and periodontal surgeries. Management protocols vary between maintaining, adjusting, or suspending anticoagulants, combined with the use of local hemostatics to mitigate these risks (de Almeida Gomes et al., 2025). Therefore, it is imperative that the professional carefully assess the risk and benefit of each procedure, take appropriate preoperative measures, and be prepared with a range of options to manage potential complications (Al Sheef et al., 2020, Lupi & Rodriguez y Baena, 2020).

Hemorrhagic compromise or thromboembolic episodes are particularly relevant in patients under anticoagulant therapy, especially those using vitamin K antagonists such as warfarin (Ockerman et al., 2021). Although it is the main anticoagulant drug, warfarin presents several disadvantages, including a narrow therapeutic index, delayed onset of action, and numerous drug and food interactions, requiring regular monitoring and dosage adjustments (Andrade et al., 2018, Manfredini et al., 2021).

Therefore, it is crucial to evaluate these anticoagulants through tests such as the INR (International Normalised Ratio) for warfarin, which is used to monitor blood coagulation levels. For example, if the result is within the range of 2.5 to 3.5, surgical procedures can be considered. If the INR is above 3.5, the procedure may need to be performed in a

hospital setting. However, if the INR is greater than 5, any procedure is contraindicated (Barbosa et al., 2020, Martins & Nhuch, 2019).

Heparin is an anticoagulant that has been used for over 90 years. It is considered one of the main anticoagulant drugs in the world due to its ability to prevent the formation of blood clots, also known as thrombi. Additionally, its pharmacokinetics include rapid absorption in the body, which contributes to its effectiveness (Mendes et al., 2021). However, despite its benefits, the literature highlights several disadvantages associated with its use. Among these adverse effects are haemorrhages, osteoporosis, eosinophilia, skin reactions, and alterations in liver function tests (Inokoshi et al., 2020).

Furthermore, in heparin therapy, it is essential to monitor the Activated Partial Thromboplastin Time (aPTT). This test is used to assess the effectiveness of blood coagulation by measuring the time required for blood to clot in response to substances that activate the coagulation system. This evaluation is crucial for determining the coagulation status, providing vital information about its normality or abnormality (Lee et al., 2024, Osasu et al., 2021).

Due to the limitations of vitamin K antagonists, new oral anticoagulants (NOACs) such as edoxaban, dabigatran, and rivaroxaban have been introduced. As evidenced in the study conducted by NOACs have demonstrated efficacy comparable to or even superior to warfarin. These therapies have proven capable of preventing approximately two-thirds of stroke or systemic embolism cases in patients diagnosed with atrial fibrillation (AF) (Inokoshi et al., 2020, Samulak-Zielińska et al., 2019).

However, there is a diversity of opinions within both the medical and dental communities regarding the appropriate approach to ensure patient safety. In dentistry, invasive procedures such as dental surgeries, implant surgeries, and periodontal surgeries are common. The literature provides evidence indicating that most dental surgical procedures can be safely performed without a significant risk of severe bleeding, as long as the International Normalised Ratio remains within therapeutic levels (De Stefano et al., 2022, Martínez-Moreno et al., 2021).

The careful management of anticoagulated patients during dental procedures is of utmost

importance, as it aims to prevent bleeding and thromboembolic complications. In the context of oral health promotion, a thorough understanding of the risks and benefits associated with this therapy is essential to ensure safe and effective treatments. This study aims to analyse the safe use of anticoagulants in invasive dental procedures through an integrative review (Inchingolo et al., 2024).

## 2. MATERIALS AND METHODS

### 2.1 Study Design

In this study, an integrative review was conducted based on scientific articles retrieved from the following databases: Scielo and PubMed.

### 2.2 Research Question

The guiding question used was: What are the recommended approaches regarding the safe use of anticoagulants in invasive dental procedures?

### 2.3 Inclusion Criteria

Articles published from January 2019 to June 2024, in English and Portuguese, using the descriptors "Bleeding Risk", "Anticoagulant Therapy", "Dental Extraction" and their corresponding terms in Portuguese: "risco de sangramento", "terapia anticoagulante", and "cirurgia dentária".

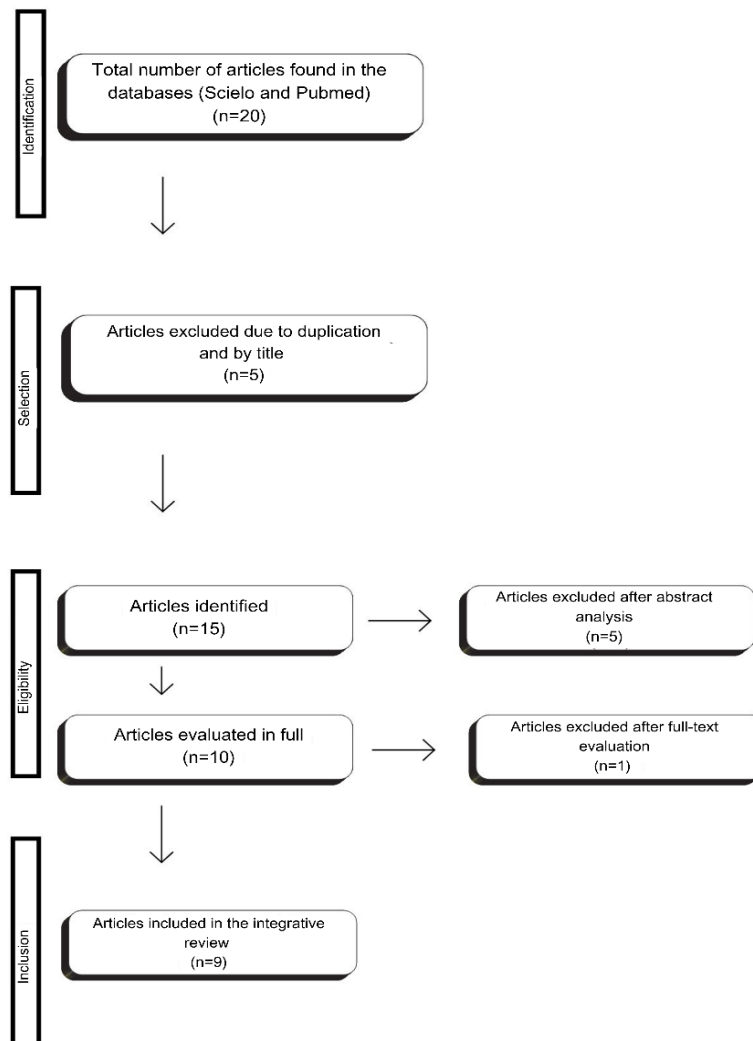
The Boolean operator used was AND with the following combinations: "bleeding risk AND anticoagulant therapy AND dental extraction".

### 2.4 Exclusion Criteria

Articles published outside the selected period, classic works on the study of anticoagulants in dentistry, other literature reviews, research not available in Portuguese or English, duplicate articles in the databases, and studies that do not directly address the guiding question.

### 2.5 Collection Procedures

The data collection was conducted by a single researcher during the months of February and March 2024. Using English descriptors, articles published between January 2019 and June 2024 were examined.



**Fig. 1. Flowchart of the inclusion of selected articles**

Source: Authors (2024)

A total of 20 articles were identified, with 15 from PubMed and 5 from SciELO. The process of identification, selection, eligibility, and inclusion is shown in Fig. 1.

### 3. RESULTS AND DISCUSSION

A comparison was made between the articles included in the sample, selected based on specific inclusion criteria, to determine their relevance to the main question and to identify any elements not pertinent to the scope of the study. The results of this analysis are presented in Table 1.

Among healthcare professionals, there is often a discussion about whether or not to interrupt the

use of oral anticoagulants before invasive dental procedures. Although it is a common belief that discontinuation may reduce the risk of haemorrhages or thromboembolic events, recent studies suggest that there is no advantage in suspending the medication before these procedures. On the contrary, this may increase the risk of thromboembolic and hemorrhagic events (Inokoshi et al., 2020, Lee et al., 2024, De Almeida Gomes et al., 2025).

Research supports this conclusion, highlighting that discontinuing the medication before dental surgeries is not recommended (Al Sheef et al., 2020, Berton et al., 2019). Berton et al. examined simple tooth extractions in several patients, of whom a minority experienced postoperative

bleeding, which was not severe, indicating that discontinuation of the medication is unnecessary (Berton et al., 2019). Similarly, in the studies by Al Sheef et al., out of a total of 539 patients

undergoing dental extractions, only a minority experienced postoperative bleeding, most of whom were using warfarin (Al Sheef et al., 2020, Ganapathi & Vijayakumar, 2020).

**Table 1. Results obtained from the databases**

<b>Title</b>	<b>Author / Year</b>	<b>Objective</b>	<b>Results</b>
Usefulness of platelet-rich fibrin as a hemostatic agent after dental extractions in patients receiving anticoagulant therapy with factor Xa inhibitors: a case series	Mourão et al. 2019	To evaluate the clinical outcomes of applying platelet-rich fibrin (PRF) for hemostasis after tooth extraction in patients receiving anticoagulant therapy with factor Xa inhibitors.	The study involved 25 patients. The results showed that the application of PRF was effective in stopping bleeding after tooth extraction in all patients undergoing therapy with factor Xa inhibitors, with no reported complications. Furthermore, soft tissue healing was favourable during suture removal, 10 days after the procedure, with no signs of infection or delayed healing.
Should we fear direct oral anticoagulants more than vitamin K antagonists in simple single tooth extraction? A prospective comparative study	Berton et al. 2019	To evaluate the effect of oral anticoagulants on perioperative and postoperative bleeding during simple single-tooth extractions, comparing patients treated with vitamin K antagonists (VKAs) and patients taking direct oral anticoagulants (DOACs).	The study included 65 patients in each group, totalling 130 tooth extractions. The groups were similar regarding preoperative, perioperative, and postoperative variables. Only one patient in the DOACs group and two in the VKAs group required medical evaluation due to post-extraction bleeding. There was no statistically significant difference in postoperative bleeding between the groups ( $P = .425$ ), suggesting that interruption of DOAC therapy is not necessary for simple extraction of a single tooth.
Risk of postoperative bleeding following dental extractions in patients on antithrombotic treatment	Al Sheef et al. 2020	To investigate the incidence of postoperative bleeding after tooth extractions in adult patients using antithrombotic medications in Saudi Arabia.	Out of a total of 539 patients, only 1.7% of extraction appointments were associated with postoperative bleeding. The highest risk of bleeding was observed in patients receiving warfarin (3.88%), while those using clopidogrel did not have a significant bleeding risk.

Title	Author / Year	Objective	Results
			Women showed the highest bleeding rate, with most of them using NOACs.
Postoperative bleeding after dental extraction among elderly patients under anticoagulant therapy	Inokoshi et al. 2021	Analyse and compare the bleeding that occurs after tooth extraction in elderly patients with health problems who were using anticoagulant medications.	The study involved 232 patients. The incidence of postoperative bleeding varied with the type of anticoagulant: rivaroxaban (32.4%), apixaban (18.2%), warfarin (17.3%), and edoxaban (5.7%). Dabigatran did not result in postoperative bleeding. Analyses indicated a higher risk with rivaroxaban compared to edoxaban or dabigatran.
Bleeding Complications in Anticoagulated and/or Antiplatelet-Treated Patients at the Dental Office: A Retrospective Study	Martinez Moreno et al. 2021	Evaluate hemorrhagic complications in anticoagulated patients treated with antiplatelet agents after simple tooth extractions over a period of 4 years.	In 418 tooth extractions, five severe hemorrhagic complications occurred in three patients (2.11%). Of the five events, four occurred in patients treated with NOACs (1.68%) and one occurred in a patient anticoagulated with acenocoumarol (0.42%; $P = .003$ ).
Tranexamic acid and bleeding in patients treated with non-vitamin K oral anticoagulants undergoing dental extraction: The EXTRACT-NOAC randomized clinical trial	Ockerman et al. 2021	Evaluate the postoperative outcomes of patients who underwent tooth extractions and used a 10% tranexamic acid (TXA) mouthwash or a placebo.	In the study, 106 patients received TXA (mean age 74.8 years; 81 men) and 112 received a placebo (mean age 72.7 years; 64 men). In the TXA group, there were 46 cases of bleeding, while in the placebo group, 85 cases were recorded. It was concluded that TXA does not seem to reduce the rate of bleeding during or immediately after the procedure, but it may reduce bleeding at later stages and in cases of multiple tooth extractions.
Is L-PRF an effective hemostatic agent in single tooth extractions? A cohort study on VKA and DOAC patients	Berton et al. 2023	Evaluate the efficacy of L-PRF as a hemostatic agent in patients undergoing treatment with vitamin K antagonists (VKAs) or direct oral anticoagulants (DOACs) who require a simple extraction of a single tooth.	A total of 112 patients (59 in the DOACs group and 53 in the VKAs group) were included. Postoperative bleeding occurred in nine patients (17%) in the VKAs group and nine patients (15.3%)

Title	Author / Year	Objective	Results
			in the DOACs group. None of the patients required medical support for bleeding management. Seven days after the surgery, no cases of post-extraction complications were reported.
Platelet-rich fibrin ensures hemostasis after single-tooth removal under factor Xa inhibitors - a clinical prospective randomised split-mouth study	Kyyak et al. 2023	Compare the local hemostatic effect of platelet-rich fibrin (PRF) inserted into the extraction socket in patients using factor Xa inhibitors (FXa), also known as direct oral anticoagulants (DOACs), with a gelatin sponge (GS), compared to the therapeutic standard without interruption of oral anticoagulant therapy.	Twenty-one patients and 42 teeth were evaluated, and in 67% of cases, mild postoperative bleeding was controlled 30–90 minutes after extraction, with no subsequent bleeding. There was no difference between the PRF and GS groups in terms of bleeding events, nor among the medications rivaroxaban, apixaban, and edoxaban (all $P > .15$ ).
Risk of post-operative bleeding after dentoalveolar surgery in patients taking anticoagulants: a cohort study using the common data model	Lee et al. 2024	Evaluate the factors that increase the likelihood of bleeding after dentoalveolar surgery in patients who are using anticoagulant medications.	A total of 537 patients were studied, of whom 35 (6.5%) experienced postoperative bleeding. Among these, 21 (8.6%) continued anticoagulant therapy, while 14 (4.8%) discontinued treatment. The type of anticoagulant used ( $P = .037$ ), tooth extraction with bone grafting ( $P = .016$ ), and type of implant ( $P = .032$ ) were associated with bleeding. In the group of patients who maintained anticoagulants, atrial fibrillation (OR = 6.051) and the use of vitamin K inhibitors (OR = 3.679) significantly increased the risk of bleeding.

Source: Authors (2024)

It is also observed that there are similar opinions regarding whether or not to suspend the medication (Martínez-Moreno et al., 2021). However, five cases of severe haemorrhage occurred, which were related to the type of medication. In this study, these haemorrhages occurred in patients who were using new oral anticoagulants, unlike the case reported by (Al Sheef et al., 2020), where most haemorrhages

occurred in patients using warfarin, one of the most classic vitamin K antagonists worldwide.

Therefore, the appropriate conduct is to maintain the use of the medication before invasive dental procedures. The mentioned studies support this recommendation, emphasising that discontinuation is an inadequate measure that may pose risks to the patient (Al Sheef et al.,

2020, Inokoshi et al., 2020, Lee et al., 2024, Martínez-Moreno et al., 2021, Berton et al., 2019).

Another commonly discussed topic is the choice between traditional oral anticoagulants, such as warfarin and heparin, and new oral anticoagulants, such as dabigatran, rivaroxaban, and edoxaban. According to the studies, warfarin, a vitamin K antagonist, was associated with higher rates of postoperative bleeding (Al Sheef et al., 2020, Lee et al., 2024).

Traditional anticoagulants have been widely recognised and used for many years. However, with advancements in the medical field, there is a growing question about their suitability for contemporary practices. This is due to the development of new oral anticoagulants in recent years, aimed at offering more modern, safer, and more effective alternatives to these older medications.

However, contradicting these findings, another study demonstrated that rivaroxaban, a new oral anticoagulant, predominantly showed the highest bleeding rates, surpassing even vitamin K antagonists (Inokoshi et al., 2020). On the other hand, patients using edoxaban and dabigatran had satisfactory results, with only a minimal proportion experiencing bleeding with edoxaban and no patients experiencing bleeding with dabigatran.

Regarding the choice between traditional anticoagulants and new oral anticoagulants (NOACs), some studies suggest that NOACs may be a safer option, with lower postoperative bleeding rates compared to warfarin (Lee et al., 2024, Martínez-Moreno et al., 2021). However, it is important to note that results may vary among different NOACs. While some, such as rivaroxaban, may present higher bleeding rates compared to others, it is notable that dabigatran showed excellent results, with zero reported cases of bleeding (Andrade et al., 2018, Inokoshi et al., 2020).

Berton et al. compared postoperative bleeding rates in patients using NOACs and vitamin K antagonists, and the results showed no significant differences, being quite similar (Berton et al., 2019). Thus, it can be noted that NOACs perform better than conventional anticoagulants, as postoperative bleeding rates are lower; in some cases, they are similar, but overall, NOACs show better results.

After invasive procedures, especially in patients under treatment with anticoagulant medications, the risk of postoperative bleeding increases. To mitigate this concern, hemostatic options are available, such as platelet-rich fibrin (PRF), tranexamic acid, and hemostatic gelatin sponge. These solutions are used to control and reduce the risk of bleeding, providing a safer and smoother recovery for patients.

According to the findings of Mourão et al. and Berton et al., who investigated the effectiveness of PRF, favourable results were achieved (De Almeida Barros Mourão et al., 2019, Berton et al., 2023). Mourão observed that, in patients undergoing tooth extractions while under treatment with NOACs, the use of PRF resulted in no postoperative bleeding and favourable healing, with no signs of infection or late complications (De Almeida Barros Mourão et al., 2019). On the other hand, the results of Berton partially diverged from those of Mourão (Berton et al., 2023).

Despite the different results, Berton et al. recorded postoperative bleeding in a minority of patients, both in the NOAC group and in the vitamin K antagonist group. However, it is important to note that the incidence of bleeding was low relative to the total number of surgeries performed (Berton et al., 2023).

Other options for hemostatic control were also investigated. For example, one study analysed the use of 10% tranexamic acid mouthwash (Ockerman et al., 2021), while another evaluated PRF or gelatin sponge (Kyyak et al., 2023). Both studies were conducted on patients undergoing invasive procedures while under treatment with VKAs or NOACs.

Ockerman et al. conducted a study comparing tranexamic acid mouthwash with a placebo rinse. The results revealed that patients who used 10% tranexamic acid had significantly less bleeding than those who received the placebo, highlighting the favourable effectiveness of this mouthwash (Ockerman et al., 2021). However, although tranexamic acid does not appear to reduce the bleeding rate during or immediately after the procedure, it proved effective in the postoperative period by reducing bleeding.

Kyyak et al. conducted a comparative study between PRF and gelatin sponge after surgical procedures. The results indicated that both have similar hemostatic effectiveness. For patients



who experienced mild bleeding after surgery, the bleeding was controlled between 30 to 90 minutes after the extraction, with no subsequent recurrence (Kyyak et al., 2023). Consequently, it was possible to note that both PRF and gelatin sponge presented comparable hemostatic effects, as there was no discernible difference in their performance.

Significant factors regarding oral anticoagulants and their effects in dentistry are highlighted. A crucial issue was the frequent doubt about whether to suspend the medication before invasive dental procedures, such as dental surgeries.

Additionally, VKAs and NOACs were analysed. Although conventional anticoagulants have been used for decades, when compared to the new ones, it is observed that VKAs still have satisfactory performance and may be superior in some specific cases, as demonstrated in a study where rivaroxaban showed a higher risk of bleeding compared to warfarin (Inokoshi et al., 2020). However, in general, NOACs demonstrated superior performance, with a lower incidence of bleeding, especially in patients treated with dabigatran (Andrade et al., 2018).

Furthermore, complementary strategies to reduce the risk of bleeding in patients using anticoagulants after invasive procedures were explored. PRF and tranexamic acid mouthwash stand out, having shown positive results in controlling postoperative haemorrhage (Ockerman et al., 2021, Berton et al., 2023, Kyyak et al., 2023, De Almeida Barros Mourão et al., 2019).

The dental protocol for anticoagulated patients recommends not suspending the medication before invasive procedures. In more complex situations, the use of hemostatic agents is suggested as an adjunct for more effective hemorrhagic control, especially in multiple extractions. The choice between VKAs and NOACs varies depending on each case, and it is still difficult to determine the ideal option. Thus, it is essential to conduct further clinical studies to evaluate which anticoagulant medication is most appropriate in different scenarios.

#### 4. CONCLUSION

The analysed studies provide a solid foundation of information regarding the use of oral anticoagulants in dentistry, particularly in relation to invasive procedures. They emphasise the

importance of maintaining continuous medication use prior to dental procedures, rather than discontinuing it, as the latter may lead to complications such as haemorrhages and thromboembolic events. Furthermore, they explore hemostatic options as adjuncts in the prevention of postoperative bleeding and compare the advantages and disadvantages of conventional anticoagulants with the newer anticoagulants. In this way, this evidence-based practices offer greater safety and efficacy in the treatment of these patients, ensuring satisfactory outcomes and minimising risks.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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