Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Impact of the coronavirus 2019 (COVID-19) pandemic on anxiety diagnosis in general practices in Germany

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ABSTRACT

Little is known about the effects of the coronavirus disease-2019 (COVID-19) pandemic on the diagnosis of anxiety disorder. Therefore, the goal of this study was to compare the number of adults with a diagnosis of anxiety disorder and the number of adults newly diagnosed with anxiety disorder in Germany between January–June 2019 and January–June 2020, and to identify potential differences in terms of sociodemographic characteristics, prescriptions and comorbidities between these patients. The study included patients with at least one consultation in one of 1140 general practices in Germany in January–June 2019 and January–June 2020. Sociodemographic characteristics included age and sex, while there were three families of drugs and nine common comorbidities available for the analysis. An increase in the number of patients with anxiety disorder was observed in 2020 compared with 2019 (January: +4%, $p = 0.643$; February: +4%, $p = 0.825$; March: +34%, $p < 0.001$; April: +8%, $p = 0.542$; May: +2%, $p = 0.382$; June: +19%, $p = 0.043$; and March–June: + 19%, $p < 0.001$). There was also an increase in the number of patients newly diagnosed with anxiety disorder between March–June 2020 and March–June 2019 (11,502 versus 9506; +21%, p-value<0.001). Antidepressants, anxiolytics and herbal sedatives were less frequently prescribed in patients newly diagnosed with anxiety disorder in 2020 than in 2019 (30.4% versus 35.6%, p-value<0.001). Finally, COPD (9.4% versus 7.9%, p-value<0.001) and asthma (11.3% versus 9.7%, p-value<0.001) were more frequent in 2020 than in 2019. Taken these findings together, public health measures are urgently needed to mitigate the negative impact of the COVID-19 pandemic on anxiety disorder.

1. Introduction

Coronavirus disease-2019 (COVID-19) started in China in December 2019 and rapidly spread to all continents, becoming a global pandemic in a matter of months (Helmy et al., 2020). COVID-19 is an infectious disease caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Helmy et al., 2020), and is characterized by pulmonary (e.g., rhinorrhea, dyspnea and cough) (Sharma et al., 2020) and extra-pulmonary symptoms (e.g., heart failure, anorexia and erythematous rash) (Lai et al., 2020). As of October 26, 2020, there were 42,512,186 people diagnosed with COVID-19 and 1,147,301 related deaths in the world (World Health Organization, 2020). In Germany, 429,181 individuals had contracted COVID-19 at some point and 10,032 individuals died of the disease (World Health Organization, 2020). The first case in Germany was reported on January 27, 2020 (Böhmer et al., 2020), while the lockdown started in this country on March 23, 2020 (Jung et al., 2020) and the first restrictions were lifted at the beginning of May 2020 (Naumann et al., 2020).

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The COVID-19 pandemic not only has negative effects on physical health but also on mental health (Galletly, 2020; Öngür et al., 2020; Vindegaard and Benros, 2020). For example, a study including 714 patients from China showed that the prevalence of post-traumatic stress disorder (PTSD) symptoms was 96.2% in the sample (Bo et al., 2020). Another study of 2458 individuals from Denmark revealed that the psychological well-being of the general Danish population was negatively impacted by the COVID-19 pandemic, and these deleterious effects were more pronounced in women than in men (Sønderskov et al., 2020). Finally, it was observed in 69 hospital staff members living in Hong-Kong that 34.8% and 14.5% of them had mild and moderate depression, respectively (Chung and Yeung, 2020). In terms of anxiety, several studies have also found that levels of anxiety have been particularly high since the beginning of the COVID-19 era (Bäuerle et al., 2020; Bendau et al., 2020; Cao et al., 2020; Jungmann and Witthöft, 2020; Kamal and Othman, 2020; Mazza et al., 2020; Moghanibashi-Mansourieh, 2020; Odriozola-González et al., 2020; Stanton et al., 2020; Tan et al., 2020), and few of these studies were conducted in Germany (Bäuerle et al., 2020; Bendau et al., 2020; Jungmann and Witthöft, 2020). Anxiety may result from the fear of contracting COVID-19 (Mertens et al., 2020), the fear of job loss (Bareket-Bojmel et al., 2020), and also lockdown-related loneliness (Bu et al., 2020) and unhealthy behaviors (e.g., decreased physical activity and increased alcohol consumption) (Ramalho, 2020; Yamada et al., 2020). Although the findings of these previous studies are of particular importance, all studies conducted in Germany used survey designs, and mental health problems were self-reported and did not rely on clinical diagnoses (Bäuerle et al., 2020; Bendau et al., 2020; Jungmann and Witthöft, 2020). As psychiatric disorders are associated with an important social stigma (Rössler, 2016), previous research may have been biased and it is possible that anxiety may have been underreported. Besides, anxiety symptoms and anxiety disorders are distinct entities, and anxiety symptoms frequently correspond to an adaptive and physiological response to a stressor requiring little, if any, specific treatment and management (Bandelow et al., 2017; Steimer, 2002). In this context, further data on the impact of the COVID-19 pandemic on the diagnosis of anxiety disorder are urgently needed.

Therefore, the goals of this study were: (1) to compare the number of patients with a diagnosis of anxiety disorder in general practices in Germany between January–June 2019 and January–June 2020; (2) to compare the number of patients newly diagnosed with anxiety disorder during this same period of time between 2019 and 2020; and (3) to identify potential differences in terms of sociodemographic characteristics, psychoactive prescriptions and comorbidities between patients newly diagnosed with anxiety disorder in 2019 and those newly diagnosed in 2020. Given that age and pulmonary conditions (e.g., asthma and chronic obstructive pulmonary disease [COPD]) may increase the risk of severe forms of COVID-19, our hypothesis was that there would be more older adults and people with pulmonary comorbidities in 2020 than in 2019. In terms of prescribed psychoactive treatments, these differences in sociodemographic characteristics and comorbidities may result in differences in prescription patterns between 2019 and 2020.

2. Methods

2.1. Database

This study used data from the Disease Analyzer database (IQVIA). Full details of the database have been published elsewhere (Rathmann et al., 2018). Briefly, the Disease Analyzer database is composed of sociodemographic, diagnosis, and prescription data obtained in general and specialized practices in Germany. Diagnosis data are based on the German adaptation of the International Classification of Diseases, 10th revision (ICD-10), while prescription data are coded using the European Pharmaceutical Marketing Research Association (EphMRA) Anatomical Therapeutic Chemical (ATC) classification system. The quality of the data is regularly assessed by IQVIA on a number of criteria (e.g., completeness of documentation and linkage between diagnoses and prescriptions). Finally, it has been previously found that the panel of practices included in the Disease Analyzer database is representative of general and specialized practices in Germany (Rathmann et al., 2018).

2.2. Study population and variables

The study included all patients with at least one consultation in one of 1140 general practices in Germany in January–June 2019 (N = 1,930,858) and January–June 2020 (N = 1,854,742). Anxiety disorder included panic disorder (ICD-10: F41.0), generalized anxiety disorder (F41.1), other mixed anxiety disorders (F41.2 and F41.3), other specified anxiety disorders (F41.8), and unspecified anxiety disorders (F41.9). Sociodemographic characteristics included age and sex, while there were three families of drugs (antidepressants [ATC: N06A], anxiolytics [N05C] and herbal sedatives [N05B5]) and nine comorbidities available for the analysis (hypertension [ICD-10: I10], chronic heart diseases [ischemic heart diseases, heart failure and heart rhythm disorders; I20–I25 and I46–I50], diabetes [E10-E14], asthma [J45 and J46], cancer [C00–C98], COPD [J44], autoimmune inflammatory diseases [multiple sclerosis, rheumatoid arthritis, psoriasis, Crohn's disease, and ulcerative colitis; K50, K51, I40, M05, and M06], renal failure [I18 and I19], and stroke including transient ischemic attack [I63, I64 and G45]).

2.3. Statistical analyses

The number of patients with anxiety disorder was calculated for each month of the January–June period in 2019 and 2020. These numbers included either all patients with anxiety disorder or those who were diagnosed with anxiety disorder for the first time. Wilcoxon tests were further used to compare the mean rank of the number of patients with anxiety disorder and the number of patients newly diagnosed with anxiety disorder per practice for each month and for the March–June period between 2019 and 2020. Moreover, sociodemographic characteristics, psychoactive prescriptions and comorbidities were compared between patients newly diagnosed with anxiety disorder in 2019 and their counterparts newly diagnosed with anxiety disorder in 2020 using Chi-squared tests for all variables except continuous age (Wilcoxon test). A p-value of <0.05 was considered statistically significant. The analyses were carried out using SAS 9.4.

3. Results

The total number of patients with anxiety disorder in January–June 2019 and in January–June 2020 is displayed in Fig. 1. An increase in this number was observed in 2020 compared with 2019 (January: +4%, p-value = 0.643; February: +4%, p-value = 0.825; March: +34%, p-value<0.001; April: +8%, p-value = 0.542; May: +2%, p-value = 0.382; June: +19%, p-value = 0.043; and March–June: + 19%, p-value<0.001). In terms of patients newly diagnosed with anxiety disorder, there was also an increase in March–June 2020 compared with March–June 2019 (March: +40%, p-value<0.001; April: +14%, p-value = 0.418; May: +3%, p-value = 0.489; and June: +28%, p-value<0.001) (Fig. 2). A total of 9506 and 11,502 patients were newly diagnosed with anxiety disorder in March–June 2019 and March–June 2020, respectively (+21%, $p < 0.001$). The different types of anxiety disorder among newly diagnosed patients were panic disorder (29.9% in 2019 and 27.8% in 2020), mixed anxiety disorders (16.8% and 15.8%), generalized anxiety disorder (13.6% and 14.0%), and unspecified anxiety disorders (39.6% and 42.2%). Sociodemographic characteristics, psychoactive prescriptions and comorbidities of patients newly diagnosed with anxiety disorder in 2019 and 2020 are shown in Table 1. Age was significantly higher in 2020 than in 2019 (50.8 years versus 49.9 years, p-value<0.001), and the proportion of patients aged 18–30 years

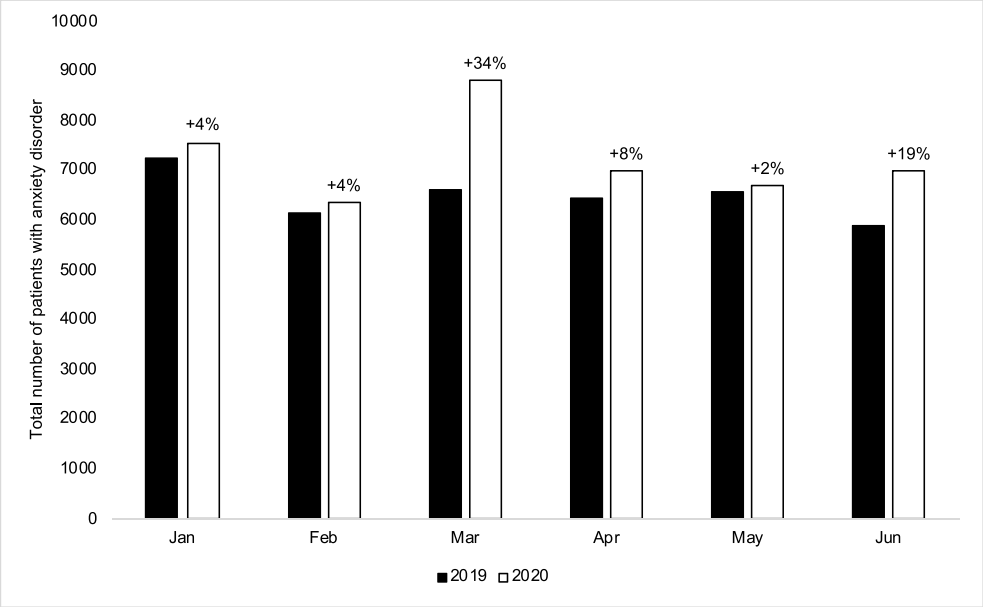

Fig. 1. Number of patients with anxiety disorder in German general practices in January–June 2019 and 2020.

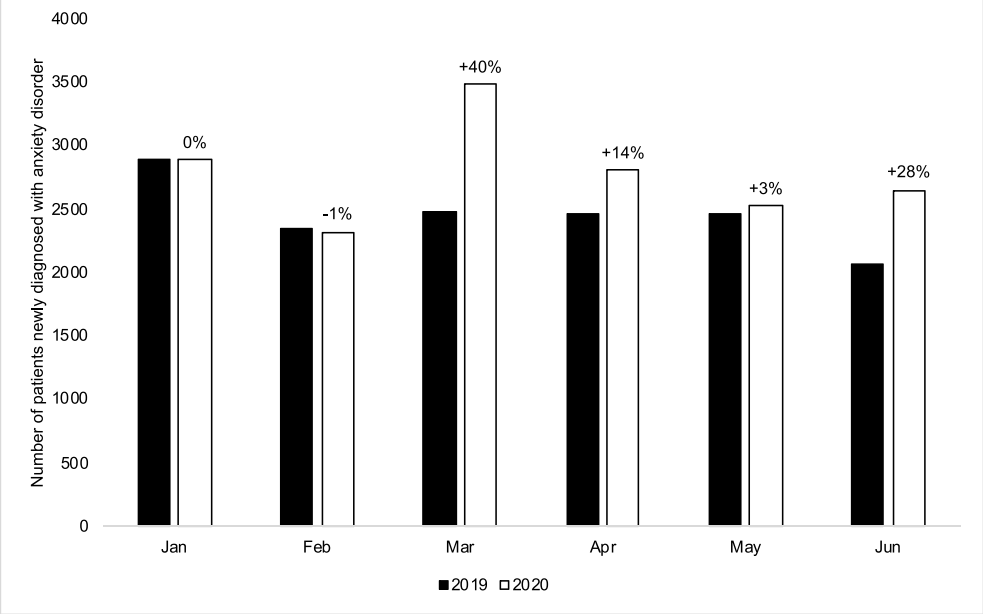

Fig. 2. Number of patients newly diagnosed with anxiety disorder in German general practices in January–June 2019 and 2020.

was significantly lower in 2020 than in 2019 (16.8% versus 20.3%, $p < 0.001$). Moreover, 35.6% and 30.4% of patients newly diagnosed with anxiety disorders were prescribed antidepressants, anxiolytics or herbal sedatives in 2019 and 2020, respectively (p-value<0.001). Furthermore, COPD (9.4% versus 7.9%, p-value<0.001) and asthma (11.3% versus 9.7%, p-value<0.001) were more frequent in individuals newly diagnosed with anxiety disorder in 2020 than in 2019. Finally, there was no significant difference between 2020 and 2019 in terms of sex and other comorbidities (hypertension, chronic heart diseases, diabetes, cancer, autoimmune inflammatory diseases, renal failure, and stroke including transient ischemic attack).

4. Discussion

4.1. Main findings

This study examined data from 1140 general practices in Germany, and showed that the total number of patients with anxiety disorder and the number of patients newly diagnosed with anxiety disorder were higher in March–June 2020 than during the same months of the prior year. Interestingly, the increase in the number of patients newly diagnosed with anxiety disorder was particularly high for March (+40%). In addition, the mean age of individuals with anxiety disorder was significantly higher in 2020 than in 2019. Finally, the prevalence of use of antidepressants, anxiolytics and herbal sedatives significantly decreased between 2019 and 2020, while the prevalence of COPD and asthma increased. To the best of our knowledge, this is to date one of the largest

Table 1
Sociodemographic characteristics, psychoactive prescriptions and comorbidities of patients newly diagnosed with anxiety disorder in January–June 2019 and 2020.

Variable	Patients newly diagnosed with anxiety disorder in March–June 2019 (N = 9506)	Patients newly diagnosed with anxiety disorder in March–June 2020 (N = 11,502)	P-value
Sociodemographic characteristics			
Age in years, mean (standard deviation)	**49.9 (19.4)**	**50.8 (18.6)**	**<0.001**
Age 18–30 years	**20.3**	**16.8**	**<0.001**
Age 31–40 years	**15.2**	**16.0**	
Age 41–50 years	**15.6**	**16.1**	
Age 51–60 years	**19.2**	**21.3**	
Age 61–70 years	**13.2**	**13.7**	
Age >70 years	**16.6**	**16.1**	
Women	36.1	36.9	0.198
Men	63.9	63.1	
Psychoactive prescriptions			
Antidepressants	**17.9**	**16.0**	**<0.001**
Benzodiazepines	**11.8**	**9.4**	**<0.001**
Herbal sedatives	**5.9**	**5.0**	**0.010**
Any	**35.6**	**30.4**	**<0.001**
Comorbidities diagnosed prior to anxiety disorder			
Hypertension	34.7	36.0	0.061
Chronic heart diseases[a]	19.2	19.2	0.999
Diabetes	12.7	12.0	0.156
Asthma	**9.7**	**11.3**	**<0.001**
Cancer	8.3	8.2	0.710
Chronic obstructive pulmonary disease	**7.9**	**9.4**	**<0.001**
Autoimmune inflammatory diseases[b]	5.8	6.2	0.177
Renal failure	5.0	5.1	0.818
Stroke including transient ischemic attack	3.4	3.7	0.268

Data are percentages unless otherwise specified.
[a] Chronic heart diseases include ischemic heart diseases, heart failure and heart rhythm disorders.
[b] Autoimmune inflammatory diseases include multiple sclerosis, rheumatoid arthritis, psoriasis, Crohn's disease, and ulcerative colitis.

studies from Germany on this topic, while it is also the first study to use diagnosis and clinical data.

4.2. Interpretation of findings

Only few studies have focused on the effects of the COVID-19 pandemic on anxiety levels in Germany (Bäuerle et al., 2020; Bendau et al., 2020; Jungmann and Witthöft, 2020). A cross-sectional study of 15,704 German residents aged ≥18 years revealed that 44.9%, 14.3%, 65.2%, and 59.0% of the sample had generalized anxiety, depression, psychological distress, and COVID-19 related fear, respectively (Bäuerle et al., 2020). An online survey, including 6233 participants from March 27 to April 6, 2020, further found a positive correlation between COVID-19 related media consumption and symptoms of anxiety, depression and COVID-19 related fear (Bendau et al., 2020). Finally, it was observed in 1615 individuals from Germany that anxiety in relation to the virus significantly increased between December 2019 and March 2020, and around one out of two participants had moderate-to-severe COVID-19 related anxiety in March 2020 (Jungmann and Witthöft, 2020). Although these previous findings are of particular interest, one should bear in mind that anxiety disorders and isolated anxiety symptoms are different entities. Taking this into consideration, the results of previous studies on the impact of the COVID-19 on anxiety levels may not be generalizable to anxiety disorders. In this context, the present findings are novel, and this retrospective study showed that the COVID-19 was also associated with an increase in the number of patients diagnosed with anxiety disorder in general practices in Germany. Interestingly, this increase was particularly high in March 2020, and this likely corresponds to the first weeks of lock-down in this country. In addition, the prevalence of use of antidepressants, anxiolytics and herbal sedatives was significantly lower in 2020 than 2019. It is possible that general practitioners may have been more reluctant to prescribe these treatments, given that there was some uncertainty regarding the duration of the COVID-19 pandemic with the possibility of a relatively short health crisis and an initial stressor lasting only several weeks. Finally, this study found that patients newly diagnosed with anxiety disorder were older and more frequently had asthma or COPD in 2020 than in 2019, suggesting that the incidence of anxiety disorders is particularly high in people at an increased risk for severe forms of COVID-19.

There are two major hypotheses to explain the increase in the number of anxiety disorder diagnoses in Germany since the beginning of the COVID-19 outbreak. First, anxiety may directly result from the fear of the virus and the disease per se, and there is a strong body of literature underlying the negative impact of infectious disease pandemics and epidemics on mental health. For example, a cross-sectional survey conducted in Sierra Leone in July 2015 in the context of the Ebola epidemic (N = 3564) showed that the prevalence of any symptom of anxiety/depression and PTSD was 48% and 76%, respectively, and that the presence of these symptoms was associated with knowing someone quarantined for Ebola and perceiving Ebola as a threat (Jalloh et al., 2018). Interestingly, a study using telephone survey data from the United Kingdom (N = 997) also found that the swine flu outbreak had negative effects on anxiety levels with 23.8% of the sample having anxiety about this infectious disease (Rubin et al., 2009). Second, it is also possible that the lockdown (first day of lockdown in Germany: March 23, 2020 (Jung et al., 2020)) has played an important role in the recent increase in the number of patients with anxiety disorder. Indeed, millions of people are expected to lose their job in the world because of the COVID-19 pandemic (Kawohl and Nordt, 2020), and job insecurity may increase the incidence of anxiety (Boya et al., 2008). Moreover, a study including 1468 individuals from the United States revealed that the prevalence of serious psychological distress had increased from 3.9% in 2018 to 13.6% in 2020, and 13.8% of the participants felt often or always lonely (McGinty et al., 2020). Meanwhile, previous longitudinal research has indicated that loneliness is a strong predictor of generalized anxiety disorder and major depressive disorder after adjusting for several potential confounding factors such as sex, age and financial strain (Domènech-Abella et al., 2019).

4.3. Implications and directions for future research

Based on these findings, the number of people with anxiety disorder has increased in Germany since the beginning of the lockdown. Implementing policies mitigating the economic impact of the COVID-19 pandemic, reducing social media use, improving social support, and increasing physical activity may help prevent the occurrence of anxiety disorder in the general public during the COVID-19 era. In addition, providing accurate and consistent information to older adults and people with asthma and COPD may favor the decrease in the incidence of anxiety disorder in these vulnerable populations. Moreover, the increase in the number of patients diagnosed with anxiety disorder highlights the importance of facilitating access to mental health services. Unfortunately, previous research has shown that the COVID-19 pandemic was associated with a reduction in psychiatric emergency consultations (Hoyer et al., 2020; Pignon et al., 2020) and in referrals to psychiatric services (Kølbæk et al., 2020). Therefore, measures should be taken to alleviate the negative effects of the current pandemic on psychiatric care. Finally, after identifying patients with anxiety disorder, general practitioners may consider prescribing specific treatments (e.g.,

antidepressant and anxiolytic drugs) and, if necessary, refer these patients to mental health professionals in order to improve the management of anxiety disorder. In terms of future research, more studies are needed to better understand the factors favoring the occurrence of these anxiety disorders in the context of the COVID-19 pandemic.

4.4. Strengths and limitations

The strengths of this study are the high number of patients and general practices included in this study. However, the present findings must be interpreted with caution given that the study also has some limitations. First, although general physician is a primary contact for physical and psychological symptoms in Germany, a small proportion of patients may have been diagnosed with anxiety disorder in psychiatric practices, and the number of individuals with anxiety disorder may have, therefore, been underestimated. In contrast, it is also possible that some patients with isolated anxiety symptoms were misdiagnosed and that the prevalence of anxiety disorder was overestimated. Second, there may be a significant portion of the population that has anxiety disorder, but did not seek treatment, which would not be captured in these data (Bijl et al., 2003). Third, several sociodemographic characteristics (e.g., marital status, loneliness and social support) and health behaviors (e.g., physical activity and unhealthy diet) were not available in the database, although these variables may be associated with the diagnosis of anxiety disorder. Finally, anxiety disorder diagnosis relied on the ICD-10 classification only, and there was no data on the severity and the symptoms of anxiety.

5. Conclusions

This study showed that the number of patients with anxiety disorder increased in Germany since the beginning of the COVID-19 pandemic. Interestingly, the prevalence of use of antidepressants, anxiolytics and herbal sedatives decreased between 2019 and 2020, while individuals with anxiety disorder were older and were more likely to also have asthma and COPD. Further research is needed to corroborate these findings and to identify factors favoring the occurrence of anxiety disorder during the COVID-19 pandemic.

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Author contributions

Louis Jacob contributed to the design of the study, managed the literature searches, wrote the first draft of the manuscript, and corrected the manuscript. Lee Smith, Ai Koyanagi, Christian Tanislav, Marcel Konrad, and Jae Il Shin contributed to the design of the study and corrected the manuscript. Karel Kostev contributed to the design of the study, performed the statistical analyses, and corrected the manuscript. All authors contributed to and have approved the final manuscript.

Declaration of conflicts of interest

The authors declare that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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