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Scientific mentoring in undergraduate medical school: impacts on student satisfaction, engagement and production

Mentoria científica na graduação em Medicina: repercussões na satisfação, engajamento e produção discente

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ABSTRACT

Introduction: Mentoring is an academic strategy that is increasingly present in the medical course, as it promotes benefits such as the creation of welcoming and affective environments, discussion of medical content and topics related to professional training. However, little is discussed about this strategy for scientific purposes.

Objectives: To describe the implementation of the scientific mentoring program, investigate the students' perception of its implementation and performance, in addition to measuring success indicators.

Methods: This was a cross-sectional, descriptive study carried out in an undergraduate medical course, located in Salvador/Bahia. Students from the 3rd to the 4th year of undergraduate school were included. A virtual, structured, anonymous questionnaire was applied, with objective questions related to the students' profile, their perceptions in relation to the scientific mentorship program and the publication of the Term Paper (TP).

Results: Of the 143 participating students, there was a predominance of single (90.9%), brown (46.2%), female individuals (72.0%), aged 25.3±5.54 years, those who did not participate in Undergraduate Research programs (88.8%). Among those who participated in mentorships (n=101), 97.1% considered that they contributed to the development of the TP, 98.0% are in favor of maintaining its offer and 85.0% consider the strategy to be innovative. In the time frame of two academic semesters, 131 TPs were presented, of which 27.5% were published with the participation of 19 teachers, with an average of 1.89 productions/teacher.

Conclusion: Medical students are in favor of implementing the scientific mentoring system, and this strategy has shown to be feasible and effective.

Keywords: Medical Education. Professional Training in Health. Mentors. Scientific research.

RESUMO

Introdução: *A mentoria é uma estratégia acadêmica que está cada vez mais presente no curso de Medicina por promover benefícios, como a criação de ambientes de acolhimento e afetividade, e discussão de conteúdos médicos e de temas relacionados à formação profissional. Entretanto, pouco se discute acerca dessa estratégia com finalidades científicas.*

Objetivo: *Este estudo teve como objetivos descrever a implementação do programa de mentorias científicas, investigar a percepção dos estudantes sobre a sua implantação e execução, além de mensurar indicadores de êxito.*

Método: *Trata-se de estudo seccional descritivo, realizado em um curso de graduação em Medicina, localizado em Salvador/Bahia. Foram incluídos estudantes do terceiro ao quarto ano da graduação. Aplicou-se um questionário virtual, estruturado, anônimo, com perguntas objetivas relacionadas ao perfil discente, às percepções sobre o programa de mentorias científicas e à publicação dos trabalhos de conclusão de curso (TCC).*

Resultado: *Dos 143 estudantes participantes, houve predominância de solteiros (90,9%), pardos (46,2%), do sexo feminino (72,0%), com idade de 25,3 ± 5,54 anos, que não participaram de programas de iniciação científica (88,8%). Dentre aqueles que participaram das mentorias (n = 101), 97,1% afirmaram que elas contribuíram para o desenvolvimento do TCC, 98,0% se mostraram favoráveis à manutenção de sua oferta e 85,0% consideraram a estratégia inovadora. No recorte temporal de dois semestres letivos, apresentaram-se 131 TCC, dos quais 27,5% foram publicados contando com a participação de 19 professores, com média de 1,89 produção/professor.*

Conclusão: *Os estudantes de Medicina são favoráveis à implementação do sistema de mentorias científicas, tendo essa estratégia se mostrado factível e eficaz.*

Palavras-chave: *Educação Médica; Formação Profissional em Saúde; Mentores; Pesquisa Científica.*

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INTRODUCTION

The National Curriculum Guidelines (DCN, *Diretrizes Curriculares Nacionais*)[1] for the undergraduate medical course explicitly state the need for the training of scientifically critical and reflective physicians. In this sense, many medical schools have changed to offer better scientific training during undergraduate school[2]. This recommendation has become even more evident during the recent *coronavirus disease 2019* (Covid-19) pandemic scenario, which highlighted the poor quality of scientific education in the country. Corroborating this perception, it can be observed that most medical schools have a deficient scientific training[3,4], despite the growing student interest regarding this aspect[5,6].

Among the factors that can influence this scenario of deficient training in scientific research are the fact that teaching is strongly focused on care content, the lack of specific and quality guidance, the reduced institutional stimulus, in addition to the low pedagogical and scientific engagement of the teaching staff working in the undergraduate courses[3,6,7].

Added to these factors, it is important to highlight the recent scenario of expansion in the number of enrollments in medical schools in the country, generating a possible deficit of mentors for the number of new students who lack scientific development in their training. This relationship between mentor and medical student is especially important in the scientific education of these students[8,9]. In this scenario of deficient scientific development, higher education institutions (HEIs) need to adopt new strategies to stimulate the interest of medical students in scientific research and, consequently, achieve the objectives of the DCN. In this context, the curricular restructuring and the implementation of scientific mentorships can contribute to better scientific training of the student body and the increase in the course scientific production.

Mentoring constitutes a relationship of guidance, training, counseling and support between more experienced professionals (mentors) and young beginners (mentees), with recognized benefit for both parties involved[10-12]. Despite being an old concept[13], mentorships are increasingly present in the academic environment[14-16] and are taking different formats[17-19]. In general, there are benefits such as the creation of welcoming and affective environments, discussion of medical content, in addition to topics related to professional training (such as time management, physical and mental health care, among others)[20,21]. However, little is discussed about this strategy for scientific purposes.

Based on these considerations, this study aims to describe the process of implementation and systematization of the scientific mentoring program in an undergraduate medical course, in addition to investigating the perception of students and teachers/mentors about its implementation and performance and measuring the success indicators of this academic tool.

METHODS

Study location

The present study was carried out in the undergraduate medical course of Centro Universitário FTC (UniFTC), located in the city of Salvador, state of Bahia, Brazil. The course, established in 2004 and currently with grade 4 attributed by the Ministry of Education, underwent a recent reformulation of its pedagogical plan, instituting a total workload of 8,000 hours. Of these, 200 hours are dedicated to the scientific research axis, represented by the disciplines of Scientific Methodology (I and II) and the Term Paper (I and II). These disciplines are offered sequentially, from the 5th to the 8th semesters of undergraduate school, and each one has a teacher who is the course supervisor, totaling four teachers. In addition, the position of the support coordinator was created, in this case, of Fundamental Life Sciences and Research, who manages all basic and research disciplines. The course receives 180 students per semester, with an estimated 720 students attending the disciplines of the research axis every semester.

Study design

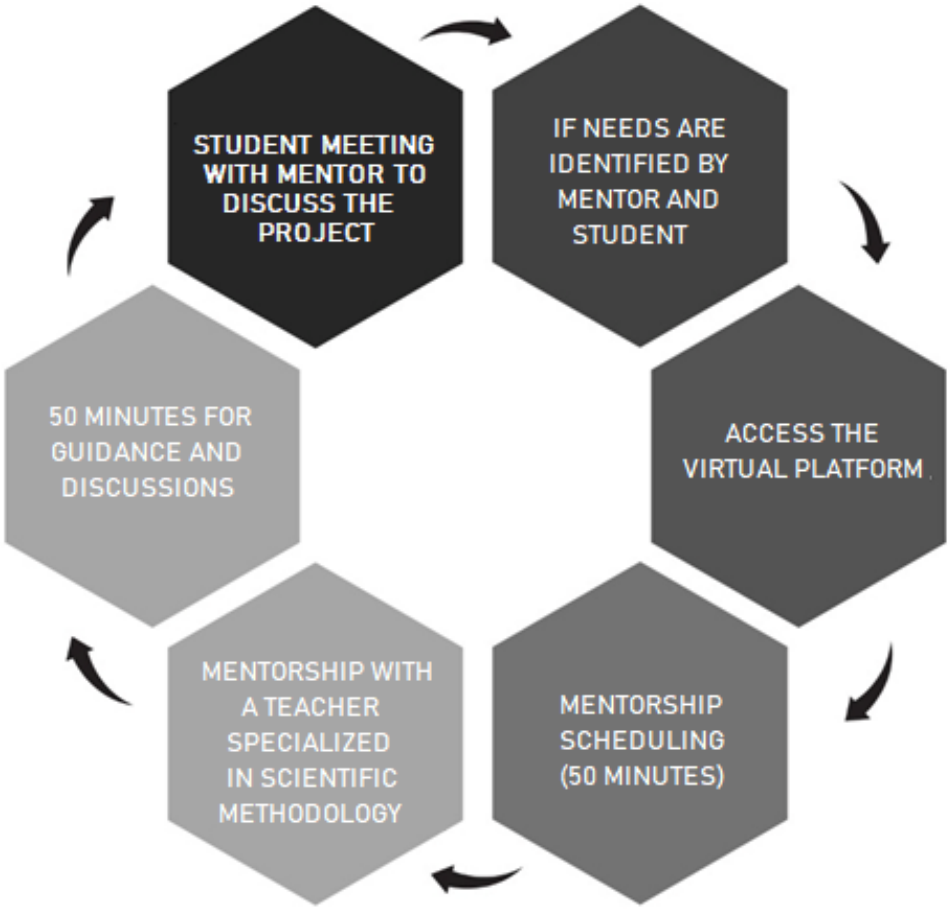
In this scenario, an observational, cross-sectional and descriptive study was carried out, which included students from the 3rd to 4th years of undergraduate school.

Model for scientific mentoring implementation

The research coordination and its supervising teachers met with the objective of devising strategies to improve the conditions of scientific production of the course, benefiting students, teachers, the course and the HEI itself in internal and external evaluations, as well as – and mainly – contributing to a better scientific formation of its student body.

For this purpose, in 2020, it was decided to offer the scientific mentoring service to interested students, in an extracurricular way. To offer these mentorships, the four supervising teachers of the disciplines in the research axis received a complementary workload of 12 hours to dedicate to this strategy. The students, in turn, were able to schedule approximately 60-minute meetings with mentors to specifically discuss their Term Paper (TP) under development, from its conception to data analysis, writing and final presentation. Scheduling the meetings was optional and the participation of the advisors in these meetings was allowed and encouraged. The meetings took place synchronously through the BlackBoard institutional platform. The mentoring process flow is shown in Figure 1.

Figure 1. Organizational chart of the scientific mentoring process offered by the medical course.



Source: the authors (2022).

Data collection and analysis

A virtual, structured, anonymous questionnaire was applied, containing objective questions related to the student profile (gender, age group, marital status, ethnicity, academic period in progress, participation in the Institutional Program for Undergraduate Research Scholarships [Pibic, *Programa Institucional de Bolsas de Iniciação Científica*] and the type of Pibic), in addition to perceptions regarding the scientific mentoring program. The Likert scale was used, considering three strata for the analysis: agreement (total or partial), indifference and disagreement (total or partial). The students were also able to evaluate the performed mentorships by assigning grades from 0 to 10 points. Additionally, to evaluate the success of the implemented strategy, a survey was carried out on the number of TPs published by the students under the advisory of the institution's teachers in Annals of Congresses and scientific journals.

Potential respondents were invited to participate in the research using the snowball method, a non-probabilistic sampling technique in which existing study subjects recruit future subjects[22]. The questionnaire was structured through the Google Forms platform, and the participation link was initially sent to the class leaders involved in the scientific axis disciplines, who subsequently recruited their peers through specific groups of messaging applications and social networks of the research coordination. The data were tabulated and analyzed using the Excel program, with the variables presented as descriptive measures. The comparison between the grades attributed to scientific mentoring by the students from different semesters was performed using the one-way ANOVA test. Values of $p<0.05$ were considered statistically significant.

Moreover, aiming to evaluating the perception of the mentors-teachers involved in this intervention, a semi-structured interview was carried out based on a script that included the following items: advantages, disadvantages, facilitating aspects and obstacles to the scientific mentoring strategy in the undergraduate medical course. For the qualitative analysis, the speeches were categorized considering the key concepts identified.

Ethical aspects

All study participants were informed about the objectives and methodology of the research, guaranteeing the confidentiality about the data origin. Voluntary participation took place through the virtual signature of the Free and Informed Consent Term (FICT). The present study is in line with Resolutions 466/12 and 510/16 of the National Health Council (CNS, *Conselho Nacional de Saúde*) and was approved by the Research Ethics Committee of the *Instituto Mantenedor de Ensino Superior da Bahia* (CAAE n. 47770721.4.0000.5032, Opinion n. 5.375.931).

RESULTS

The research sample consisted of 143 students (19.9% of the total number of students) with a mean age of 25.3±5.54 years, mostly single (90.9%), of self-declared brown ethnicity (46.2%) and female (72.0%). Additionally, few students claimed to be part of the Institutional Program for Undergraduate Research Scholarships (PIBIC) (11.2%) and, among those who participated, most were voluntary (68.8%) (Table 1).

Despite the low number of students in the Undergraduate Research program, when the entire studied sample was asked about the importance of the TP in the academic training of future physicians, the majority of students declared that they agreed with the need for this curricular activity (73.5%). Of the total number of respondents, 70.6% participated in the scientific mentoring activities offered by the course. Of these, 97.1% considered that this activity contributed to the development of the TP. In this sense, when asked if the mentoring activities should be maintained, the students showed a highly favorable perception towards the maintenance of this activity (98.0%). We also observed that 82.2% of the students said they did not know or were not aware of another HEI that provides scientific mentoring and 85.0% agreed that it was an innovative strategy

Table 1. Profile of the medical students participating in the study (n=143).

Characteristics	Sample (n=143)
Age (in years), AM±SD	**25.3±5.54**
Gender, n (%)	
Female	103 (72.0)
Male	40 (28.0)
Ethnicity, n (%)	
Yellow	2 (1.4)
White	65 (45.5)
Brown	66 (46.2)
Black	10 (6.9)
Marital status, n (%)	
Married	12 (8.4)
Divorced	1 (0.7)
Single	130 (90.9)
Academic semester in progress, n (%)	
5th Semester	26 (18.2)
6th Semester	68 (47.6)
7th Semester	18 (12.6)
8th Semester	31 (21.7)
Participation in formal activities of Undergraduate Research (Pibic), n (%)	
No	127 (88.8)
Yes	16 (11.2)
Type of Undergraduate Research (Pibic), n (%)	
Scholarship	5 (31.3)
Voluntary	11 (68.8)

n: absolute frequency; %: relative frequency; AM: arithmetic mean; SD: standard deviation; PIBIC: Institutional Program for Undergraduate Research Scholarships.
Source: Prepared by the authors.

(Table 2). Finally, when analyzing the scores attributed by the students to the performed mentoring activities, an overall score of 8.84 ±1.95 points was observed, with no statistically significant differences between the semesters.

The teacher's perception was also investigated and taken into account in this study. The teachers involved in the mentoring activities emphasized (i) the increase in student interest in scientific research, (ii) the quality of the term papers and (iii) the possibility of using the remote model as the main strengths of the strategy. Among the weaknesses, (i) the student's dependence on the mentor and (ii) the conflict of ideas between the mentor/advisor and the mentor/teacher (Chart 3) stood out.

When analyzing the success of the implemented strategy, it was observed that, of the TPs presented in 2021, at the end of the first year of the implementation of scientific mentoring activities, 27.5% were published in Annals of Congresses or scientific journals (Table 3). Of these, a total of 19 teachers participated in the authorship, being 11 physicians and eight non-physicians, with a *per capita* average of 1.89 productions per teacher (maximum of six and minimum of one authorial participation).

Table 2. Perception of the student body regarding the mentoring program in the undergraduate medical course (n=143).

Student perception	n (%)
According to the DCN for medical courses, the TP is an important element in academic training. Do you agree?	
I totally agree	59 (41.3)
I partially agree	46 (32.2)
I neither agree nor disagree	9 (6.2)
I partially disagree	18 (12.6)
I totally disagree	11 (7.7)
Did you participate in the scientific research mentoring activities offered for your semester?	
No	42 (29.4)
Yes	101 (70.6)
*Do you consider that scientific research mentoring activities contributed to the development of your TP?**	
I agree	98 (97.0)
I neither agree nor disagree	1 (1.0)
I disagree	2 (2.0)
I am not able to answer	42 (N/A)
*From your perspective, should scientific research mentoring activities be maintained in the coming semesters?**	
No	1 (1.0)
I don't know	1 (1.0)
Yes	99 (98.0)
I am not able to answer	42 (N/A)
*Do you know of another institution that offers activities similar to our mentoring system?**	
No	83 (82.2)
Yes	18 (17.8)
I am not able to answer	42 (N/A)
*Do you consider the implementation of scientific mentoring activities in the medical course to be innovative?**	
I agree	85 (84.1)
I neither agree nor disagree	11 (10.9)
I disagree	5 (5.0)
I am not able to answer	42 (N/A)

n: absolute frequency; %: relative frequency; DCN: National Curriculum Guidelines; TP: Term Paper; HEI: Higher Education Institution; *Relative frequency calculated considering a total of 101 students who reported having had scientific research mentoring; N/A: Not Applicable.
Source: Prepared by the authors.

Chart 3. List of strengths and weaknesses of the strategy according to the perception of teachers/mentors.

Teacher	Strengths	Weaknesses
#1	**Advantages:** Increase in meaningful learning Increase in joint scientific production (teachers and students) Increase in the quality of work Increased interest in Scientific Research **Facilitating Aspects:** Hybrid model (in-person and remote) Possibility of scheduling Possibility of participation of the advisor	**Disadvantages:** Extracurricular workload Student dependence on the mentor **Main Obstacles:** Insufficient workload Conflict of ideas (advisor vs. mentor)
#2	**Advantages:** Constant monitoring and control of work progress Assistance for regular classes **Facilitating aspects:** Hybrid model (in-person and remote)	**Disadvantages:** Student dependence on the mentor **Main obstacles:** Lack of commitment of some students
#3	**Advantages:** Increase in meaningful learning Increase in the quality of work **Facilitating aspects:** Transmission of good results among the students Transmission of good results among the teachers	**Disadvantages:** Student dependence on the mentor **Main obstacles:** Conflict of ideas (advisor vs. mentor) Lack of commitment of some students
#4	**Advantages:** Constant monitoring and control of work progress Flexibility of hours Increase in student production Increase in teaching production Increase in the quality of work Increased interest in Scientific Research **Facilitating aspects:** Workload dedicated exclusively to the strategy Hybrid model (in-person and remote) Possibility of scheduling Transmission of good results among students	**Disadvantages:** Student dependence on the mentor **Main obstacles:** Conflict of ideas (advisor vs. mentor) Thematic diversity

Source: Prepared by the authors.

Table 3. Analysis of the scientific production derived from the Term Papers presented in 2021 (n=131).

TPs presented in 2021	Sample (n=131)
Published TPs, n (%)	
Total	36 (27.5)
Scientific articles*	25 (69.4)
Congress presentations*	11 (30.6)
*Classification **, n (%)*	
A3	1 (4.0)
B1	14 (56.0)
B2	5 (20.0)
B3	2 (8.0)
B4	1 (4.0)
Without classification	2 (8.0)

Continues...

Table 3. Continuation

TPs presented in 2021	Sample (n=131)
Congress presentations, n (%)	
National	11 (100)
International	---

TP: Term Paper; *relative frequency calculated considering 36 published TPs; **Articles stratified according to the classification of the *Chrome Qualis* (single area) extension, with the relative frequency calculated considering 25 published articles.
Source: Prepared by the authors.

DISCUSSION

In the present study, the evaluated students attending the 3rd and 4th years of the undergraduate medical course showed, especially in relation to participation in mentoring, a major involvement in the proposed scientific activities. This perception is in agreement with previous studies that indicate that most medical students agree that scientific research is an important institutional experience[3,6,9,23-25]. This fact makes us realize that there is a great confined scientific potential to be developed within the scope of Medical Education. The search for differentiation in their curricula for the competitive residency tests, for the increasingly competitive job market, in addition to the improvement in a certain area of knowledge, can help to explain this engagement[26]. Moreover, the benefits of participating in undergraduate research are well documented for graduates, institutions and the academic community. This experience has been associated with increased employability[9], a factor that enhances the relevance of adequate scientific training.

In line with this reasoning, we observed that, despite being feared by many students, the TP is considered essential by a large part of the student body[5,6]. In this context, it is important to highlight that this activity is stimulated by the DCN[1] for undergraduate medical courses that value a more critical, investigative and authentic medical training[18]. Moreover, it is known that the interest of medical students increases if there is curricularization of research activities[27]. However, although it is not possible to specify it in numbers, it is believed that, due to the difficulty in performing consistent projects, the number of medical courses that have well-implemented Undergraduate Research programs is still scarce[8].

As previously described, scientific mentorships were implemented aiming to provide students the incentive, support and goals for the initial implementation of the research project until its final presentation. In this scenario, despite constituting an extracurricular activity and, therefore, not mandatory, most students actively sought mentorships and, on a scale of zero to ten, classified them with an average grade above 8.5 in all the evaluated semesters. This result indicates a lack of quality scientific monitoring, an apparent reality in several medical schools in the country.

Despite these positive data regarding the students' interest in scientific research, there is a contrast with the widely known fact that there is a shortage of medical professionals who effectively pursue an academic and scientific career[23]. The School of Medicine faculty does not, in general, have a solid scientific background and hardly remains active in research, especially in private schools, due to their attributions and professional routine outside the academic environment. This can be evidenced by the fact that 76.3% of the teachers at the evaluated institution do not have a Lattes curriculum or have it outdated for more than 12 months (administrative data provided by the institution). Moreover, there is a lack of pedagogical-scientific engagement on the part of teachers, especially physicians, who carry out teaching activities with dilettantism[7].

Still from the student perspective, 98.0% of the students agreed that the scientific mentoring strategy should be maintained as an extracurricular activity in the course. This perception sheds light on the need to implement educational innovations that are viable in medical schools. In a society marked by the dissemination of fake news on social networks, rethinking the scientific training of future physicians must be a priority commitment of the actors involved in the academic management of Medical Education. This is due to the fact that the acquisition of these skills will contribute to the future professional performance of students, making them able to ground their actions on the best scientific evidence. In this context, the recent pandemic caused by the new coronavirus exposed the poor scientific training of the Brazilian society, not excluding health professionals[28].

Well-structured programs for scientific development and production in medical courses can be quite successful[4,29]. However, in some institutions, especially Colleges and University Centers, these programs are hardly feasible due to the scarcity of investments, the limited availability of mentoring

teachers with *stricto-sensu* postgraduate degrees and exclusive dedication to the large student demand[30]. Here, the mentoring system showed to be a feasible, viable and successful strategy, so that only four experienced teachers, each assigned to offer two mentoring shifts, were able to meet an estimated demand of about 720 students in the development of their activities. Moreover, the success indicators were not limited to the positive perception of students, but also to production metrics. Approximately three out of ten presented TPs had already been published in Annals of Congresses and/or indexed scientific journals, which indicates the achievement of the training objectives with the strategy implementation. In contrast, other studies indicate a student production index that is well below the one presented here[3]. However, more than metrics, in-depth scientific engagement is the greatest mark and legacy that the course can leave for these future medical professionals.

As limitations of the study, it is important to point out that part of the results is based on the student's perception which, although valid, may have an evaluation bias. Moreover, the impossibility of comparing the metrics of scientific production (quantity and quality) is a characteristic of this cross-sectional study and the sample obtained through the snowball method. However, the significant number of participating students, their mostly positive perception, as well as the percentage of studies published in the course throughout one year of activities should be highlighted and we believe it to be an important indicator of success. Additionally, given that the platform used to schedule the mentorships did not request the names of all the members that participated in the meetings, it was not possible to cross-reference the data to reliably correlate the production (quantity, quality) of the students who received mentoring with those who did not. It is worth noting that little is discussed about mentoring for scientific purposes and, in general, studies that deal with the subject are essentially descriptive, with little or no quantitative analysis and success indicators[31]. Therefore, the implementation of innovative strategies such as the one described in this study should be encouraged, in addition to being constantly monitored and analyzed through studies with increasing methodological robustness.

Finally, the fundamental perception of the mentors/teachers, the key subjects in the implementation of the strategy, was recognized here. Among the highlighted positive aspects, the increase in the quality of the work and the students' significant learning were especially mentioned. Hence, there is a teacher acknowledgement of the success of scientific mentorships, since the main objectives of its implementation have been achieved. In addition, the teachers/mentors highlight the use of the remote model as a facilitating aspect of mentoring performance.

On the other hand, the students' dependence on the figure of the mentor was mentioned by all teachers as a disadvantage. This may be related to the reported lack of assistance and scientific training of the teachers/advisors[3], especially the physicians[7].

Moreover, regarding the strategy itself, it is important to highlight the challenges faced during its implementation that guarantee its feasibility. One of the most relevant challenges is the potential guidance conflicts between teachers/mentors and work advisors. To mitigate this possibility, two main actions were carried out during the mentorship implementation course. The first was the training of mentors, who were instructed not to act effectively on the advisor's specific competences. As examples, mentors cannot have access to the text outside of the scheduled times, nor do they make changes to them, only giving suggestions and recommendations. Therefore, advisors are asked to work in the development and in-depth analysis of the TP, paying special attention to the scientific-methodological and ethical aspects of the work. Furthermore, the invitation to advisors to participate in mentoring was widely publicized, and this moment is not, therefore, exclusive to students, but to the working group.

The scarcity of studies that evaluate the implementation of scientific programs in medical education indicates the difficulty in applying consistent and successful practices in Brazilian medical schools[8]. For this reason, studies such as the present one are important and reinforce the need to better explore the topic and publish valuable information for the dissemination of good pedagogical practices within the scope of scientific research in the medical field.

CONCLUSION

The study showed that medical students are aware of the importance of the research activity and demonstrate a favorable perception of the implementation of the scientific mentoring system, which has shown to be feasible and potentially effective. Therefore, we can observe the usefulness of mentoring and of an educational plan aimed at stimulating research, in which the student is followed on a serial basis throughout their training, with permanent incentive and the establishment of goals, ranging from understanding the importance of the subject to the effective publication of a scientific work. Moreover, it is possible to contemplate the mentor as an essential instrument in the construction of scientific knowledge.

AUTHORS' CONTRIBUTION

Luiz Fernando Quintanilha contributed to the project design, collection and interpretation of data and the final writing of the manuscript. Katia de Miranda Avena contributed to

the project design and the final writing of the manuscript. Evelise Maria Labatut Portilho, Mariana Araújo Pereira and André Nogueira Nazar contributed to data interpretation and manuscript review. Bruno Bezerril Andrade contributed to data interpretation, manuscript review and the final writing of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest related to this study.

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