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RESEARCH ARTICLE

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The effects of academic unprofessional behaviour on disciplinary action by medical boards: Systematic review and meta-analysis

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Abstract

Objective: The objective of this study is to evaluate the association of disciplinary actions by regulatory councils and unprofessional behaviour during medical graduation.

Methods: A search strategy was developed using the terms: 'physicians', 'disciplinary action', 'education', 'medical', 'undergraduate' and their synonyms, subsequently applied to the electronic databases MEDLINE, Embase, Cochrane Library, LILACs and grey literature, with searches up to November 2023. The risk of bias was assessed using the Newcastle-Ottawa scale and statistical analysis was performed using the RevMan software.

Results: A total of 400 studies were found in the databases, and 15 studies were selected for full-texting reading. Four studies met the inclusion criteria and were included, bringing together a total of 3341 evaluated physicians. Three studies were included in the meta-analysis, showing a greater chance of disciplinary actions among physicians who exhibited unprofessional behaviour during medical graduation (OR: 2.54; 95%CI: 1.87–3.44; I^2: 0%; $P < 0.0001$; 3077 participants; physicians with disciplinary action: 107/323; control physicians: 222/2754).

Conclusions: There is a statistically significant association between unprofessional behaviour during medical undergraduate study and subsequent disciplinary actions by Medical Councils. The tools for periodic assessments of student behaviour during undergraduate studies can be a perspective for future studies aimed at reducing disciplinary actions among physicians.

1 | INTRODUCTION

Professionalism in medicine remains one of the most challenging issues for medical school faculty and resident training programmes.[1] Researchers in the field have concluded that there is a crisis of professionalism in the practice of medicine, although all accreditation and certification bodies include professionalism as one essential competency for physicians.[2,3] In recent decades, research related to the topic resulted in a validated instrument to characterise unprofessional behaviour in medical schools.[4]

Supervisors and assessors are reluctant to report negative behaviours, either because they have not directly observed such behaviours or because they feel personally uncomfortable or fear the confrontation that arises from making such reports.[5,6] Commonly, medical

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schools have committees to discuss the performance of academics during graduation, gathering reports on their performance, difficulties and ethical conduct.[7]

Fargen et al.[8] conducted a review of articles published between January 1980 and May 2014 with the aim of assessing the prevalence of unprofessional and dishonest behaviour among medical students or residents in medical schools in the United States of America, including 51 publications. The authors found that plagiarism, exam fraud and fraudulent publication listings about residency/grant applications were reported in 5%–15% of students and residents in the studied populations. Other behaviours, such as inaccurately reporting that a medical examination was performed on a patient or duty to falsify working hours, appear to be even more common, occurring between 40% and 50% of students and residents.[8]

There are challenges related to the assessment of academic skills and behaviour of medical students and their subsequent impact on professional performance. Considering that, the aim of the present study was to evaluate the association of disciplinary actions by regulatory councils and unprofessional behaviour during medical graduation, to answer if the professionals that received the disciplinary actions had an unprofessional behaviour during graduation and, therefore, if the behaviour of students is directly related to their skills in the professional life.

2 | METHODS

We performed a systematic review with meta-analysis following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist[9]; the research project was registered in International Prospective Register of Ongoing Systematic Reviews (PROSPERO; http://www.crd.york.ac.uk/prospero/) under the number CRD42022363233.

2.1 | Inclusion criteria

After mapped the studies in the literature that evaluated the disciplinary actions on medical board, we included articles that used tools that assessed the unprofessional behaviour during graduation. For this process, we formulated the inclusion criteria from the PECO strategy, representing an acronym for Population, Exposure, Comparison and Outcomes.[10] Therefore, this research had the following definition:

P- physicians
E- unprofessional behaviour during graduation
C- physicians without mention of unprofessional behaviour during graduation
O- disciplinary actions by the medical council
S- observational studies

We included studies that evaluated disciplinary actions by the medical board in physicians with unprofessional behaviour during undergraduate studies, excluding review studies, letters to the editor and studies that did not present a comparison group (physicians without mention of unprofessional behaviour during graduation).

2.2 | Search strategy

We developed a search strategy using the following terms: 'physicians', 'disciplinary action', 'education', 'medical', 'undergraduate' as keywords, consulted in the Medical Subject Headings (MeSH) and their respective synonyms. We used a sensitive filter by combining these different terms to identify studies through the Boolean operators 'OR' and 'AND'. Once organised, we applied the strategy in the electronic databases MEDLINE, Embase and Cochrane Library, LILACS and grey literature, being searched up to November 2023. The search was carried out without language restriction, and we hand searched the reference lists of the primary studies included for the identification of possible relevant studies.

2.3 | Screening of eligible abstracts

We independently selected, through two reviewers, the abstracts of the articles resulting from searches in the databases by the 'Rayyan' software (https://rayyan.qcri.org/). A third reviewer was responsible for resolving conflicts in the selection of included studies.

2.4 | Full-text reading of studies

After screening the abstracts, the selected studies were read in full by two reviewers, and the inclusion of the studies in the research was decided independently on the basis of the inclusion criteria. In case of disagreements in the selection of included studies, a third reviewer resolved the conflicts.

We included studies that evaluated physicians with disciplinary actions by the medical board, compared with a control group without disciplinary actions, who had behaviour assessment during medical undergraduate studies. We excluded review studies, letters to the editor or studies that did not have a comparison group (physicians without mention of unprofessional behaviour during graduation).

2.5 | Data extraction

Through two independent reviewers, we extracted the data of the studies included. For that, every study was read in full, and we tabulate the information in an Excel spreadsheet. The data that was extracted included, of each study: the author/year, country, title and objective; study design; age, sex and selection criteria for participants (medical students or residents); number of participants; number and nature of disciplinary cases and controls; time of the disciplined

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medical board; time of medical school; graduation year; number and type of assessed specialties; type of evaluation of the behaviour during the medical school; type and number of unprofessional behaviour during the medical school; and results of measures of association for statistical analysis.

2.6 | Risk of bias assessment

We assessed all included studies for their methodological quality using the Newcastle-Ottawa scale.[11] This tool is presented through a 'star system', used to evaluate each study by the selection of the study groups, the comparability of the groups and the verification of the exposure (for case–control studies) or the results (for cohort and cross-sectional studies). We consider studies with scores between seven and nine stars as high quality and low risk of bias, scores between four and six stars as high risk of bias, and studies with zero to three stars as very high risk of bias.

2.7 | Data analysis

We presented the results through tables and graphs and used the odds ratio (OR) measure of association with 95% confidence intervals for dichotomous variables. We performed the analyses using the RevMan software (version 5.4, Cochrane Collaboration, London, England), following the Cochrane Collaborations recommendations, which establish that meta-analysis is possible when the review includes at least two comparable studies presenting results from the same measure of association (for example, OR).[12]

Study heterogeneity was determined using I^2 statistics, where from 0% to 30%: may not be important; 40% to 60%: may represent moderate heterogeneity; 50% to 90%: may represent substantial heterogeneity and 75% to 100%: considerable heterogeneity. The Mantel–Haenszel random effect model was used in our analyses.[13]

3 | RESULTS

3.1 | Study selection

From the search in the databases, we found a total of 400 studies, exported to Rayyan software for reading titles and abstracts. During this step, we excluded a total of 385 studies for not meeting the inclusion criteria. We read the full text of the 15 studies selected to assess eligibility, 11 of which were excluded because they were used students' grades (performance) to associate to future behavioural problems. Finally, we included four studies that met all established criteria.[4,14–16] The selection process of included studies is presented in Figure 1.

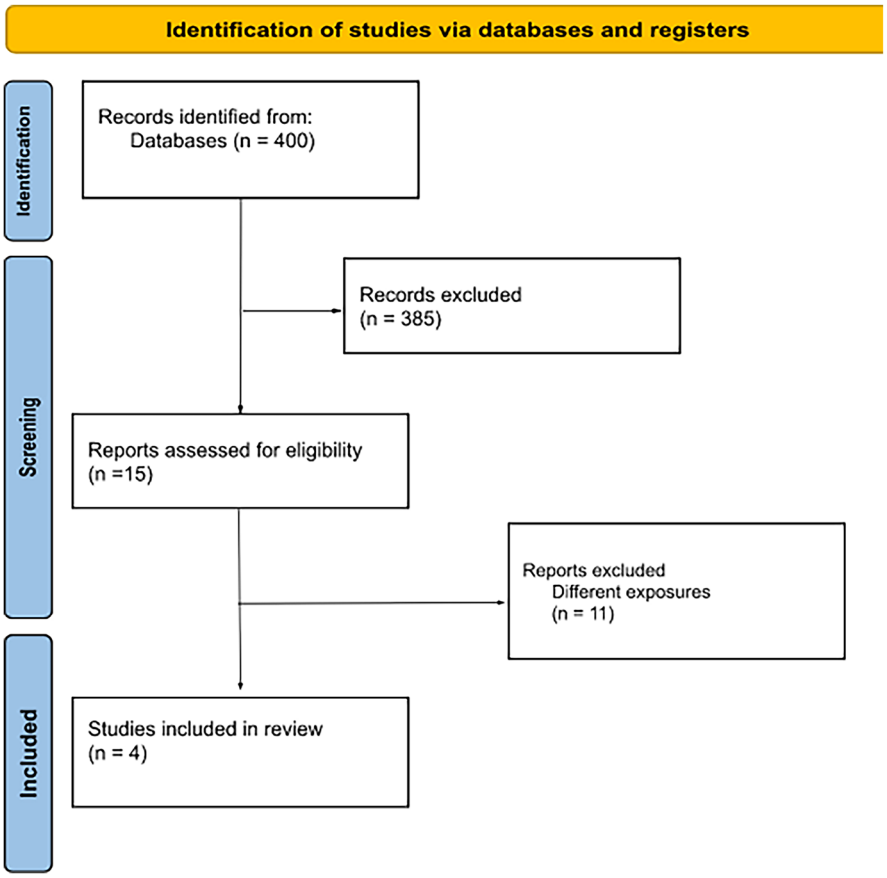

FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart for identification and inclusion of studies in the systematic review. Caption: the flowchart shows the number (*n*) of studies founded in the searched databases and the *n* of studies excluded during the process of title and abstract reading and after full-text reading, with the final *n* of included studies.

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3.2 | Studies characteristics

The included studies were published between 2004 and 2010, bringing together a total of 3341 physicians, with three case–control studies[4,14,16] and one cohort study.[15] Data on unprofessional behaviour were extracted from documents of internal evaluations of the medical course and disciplinary actions in the databases of the respective boards. The characteristics of the population, the type of disciplinary action and the number of disciplinary actions evaluated in each study are presented in Tables 1–3, respectively.

3.3 | Evaluation of applied disciplinary actions

Three of the four studies included[14–16] carried out the evaluation of the OR between the group of physicians who had or did not have disciplinary actions in the medical councils after undergraduate studies with unprofessional behaviour during undergraduate studies. The OR assessment implies that there is an association between the exposure, which is the unprofessional behaviour during medical school in this study, and the outcome, which the disciplinary action. Using a random model for the meta-analysis, we found a significant statistical difference between the groups (OR: 2.54; 95%CI: 1.87–3.44; I^2: 0%; $P < 0.0001$), indicating that the students with unprofessional behaviour during medical school are 2.54 more likely to receive a disciplinary action by a medical council when compared to students that did not have unprofessional behaviour. There were 3077 participants, of which of the 323 physicians who had disciplinary actions, 107 had unprofessional behaviour during undergraduate studies, while of the 2754 control physicians (without disciplinary actions), 222 had unprofessional behaviour during undergraduate studies. No heterogeneity was found between the studies evaluated (0%), which did not present relevant methodological differences to imply the I^2 values, indicating that the results presented in the meta-analysis are reliable. The forest plot with the meta-analysis of this association is presented in Figure 2.

The case–control study conducted by Papadakis et al.,[4] which was not included in the meta-analysis, revealed a prevalence of 38% for concern/problem/extreme excerpts in the cases and 19% in the control group. Employing logistic regression analysis, the authors established that physicians with disciplinary actions were more likely to have concern/problem/extreme excerpts in their medical school files (OR: 2.15; 95%CI: 1.15–4.02). The study concluded that problematic behaviour in medical school is associated with subsequent disciplinary action, while other variables did not show a significant association with disciplinary action.

3.4 | Risk of bias of included studies

We assessed the methodological quality of the included studies based on the Newcastle-Ottawa scale, which evaluates studies up to nine stars. The case–control studies[4,14,16] were evaluated regarding the selection of participants, method of comparability between groups and exposure (disciplinary action). Because they describe in their methodology the data needed to understand all stages of the research and how the analyses were conducted, as well as follow-up data on study participants, the studies completed a total of nine out of nine stars, representing high methodological quality and low risk of bias. The cohort study[15] was evaluated for selection, comparability and outcome (disciplinary action) and, like the case–control studies, also scored 9/9 points. The risk of bias analysis using the Newcastle-Ottawa scale is shown in Table 4.

4 | DISCUSSION AND CONCLUSION

4.1 | Discussion

Our study found a statistically significant association between unprofessional behaviour during medical undergraduate study and subsequent disciplinary actions (OR: 2.54; 95%CI: 1.87–3.44). This means that undergraduate students with unprofessional behaviour are 2.54 times more likely to be disciplined by medical boards.

This means that undergraduate students with unprofessional behaviour are 2.54 times more likely to be disciplined by medical boards.

Papadakis et al. specifically targeted the domain of unprofessional behaviour during graduation, employing a validated instrument consisting of eight categories of unprofessional behaviour: (1) irresponsibility; (2) diminished capacity for self-improvement; (3) immaturity; (4) poor initiative; (5) impaired relationships with students, residents or faculty; (6) impaired relationship with the nurses; (7) impaired relationships with patients and family; and (8) unprofessional behaviour associated with anxiety, insecurity or nervousness.[14] Applying these domains in the previous study, Papadakis et al.[4] identified that three domains of unprofessional behaviour among medical students were associated with subsequent disciplinary action: poor reliability and responsibility; lack of self-improvement and adaptability; and lack of initiative and motivation.

In this review, the majority of professionals assessed, ranging from 66% to 98%, did not receive any disciplinary action during graduation. However, a significant association was observed during statistical analysis between those who received disciplinary action at graduation and subsequent professional behaviour.

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TABLE 1 Characteristics of the population evaluated in the included studies.

Study	Total	Population (*n*)		Age, mean (SD)	Sex	Graduation		Specialties evaluated
		Cases with disciplinary action	Control without disciplinary action			Year of graduation		
						Cases	Controls	
Papadakis et al., 2004	Physicians n = 264	n = 68	n = 196	Age during disciplinary action 54 (12)	Male DA group: 60 (88%) Control group: 159 (81%)	1944–88	1943–89	Emergency medicine, family medicine, internal medicine, obstetrics and gynaecology, ophthalmology, paediatrics, psychiatry, surgery, and others
Papadakis et al., 2005	Physicians n = 704	n = 235	n = 469	Age during disciplinary action 44.1 (6.9)	Male Group DA: 123 (52.3%) Control group: 242 (51.6%)	1970–99	1970–99	Internal medicine, family medicine, paediatrics, surgery, obstetrics and gynaecology, anaesthesia, emergency medicine, radiology, orthopaedic surgery, urology, ophthalmology, otorhinolaryngology, and others
Santen et al., 2014	Physicians n = 2078	n = 29	-	Not informed	Not informed	1980–2000	-	Not informed
Yates and James, 2010	Physicians n = 295	n = 59	n = 236	Not informed	Male DA group: 54 (91.5%) Control group: 155 (65.7%)	1958–97	1958–97	Not informed

Abbreviation: DA, disciplinary action.

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TABLE 2 Characteristics of disciplinary action and evaluation methods.

Study	Study objectives	Form of evaluating the actions of students/ professionals	Evaluated categories	Control group	Data acquisition	Data analysis by the authors
Papadakis et al., 2004	Determine whether medical students who demonstrate unprofessional behaviour in medical school are more likely to subsequently have disciplinary action by the state board of medicine.	Undergraduate grade point average (GPA) Punctuation at the Medical College Admission Test (MCAT) Grades in the evaluations of the medical course and internships First Attempt Part 1 Score for National Board of Medical Examiners (NBME)	Unprofessional behaviour: negligence, inappropriate prescribing, unlicensed activity, sexual misconduct, acts that endanger patients through the physician's use of drugs or alcohol, fraud, criminal conviction, and unprofessional conduct.	University of California San Francisco (UCSF) graduate physicians chosen from a random sample stratified by year of graduation (within 1 year) and medical specialty	Graduate academic files at the UCSF School of Medicine's Office of Student Affairs, containing information about the student's medical school application, all course evaluation narratives, grades, correspondence administrative duties while in medical school and letter of recommendation from the dean for residency programmes	Negative excerpts about students' professional and personal attributes were abstracted from course evaluations, including narratives, dean's letter of recommendation for residency programmes, narratives in student admission interviews, or any other documents in student files dated prior to graduation
Papadakis et al., 2005	Determine whether the findings of the previous study can be generalised to all medical students and state boards of medicine	Disciplinary action by state boards Undergraduate grade point average (GPA) Punctuation at the Medical College Admission Test (MCAT) Grades in the evaluations of the medical course and internships First Attempt Part 1 Score for National Board of Medical Examiners (NBME)	Unprofessional behaviour, incompetence and violation of undetermined category	Each disciplined physician was matched with two control physicians who graduated within 1 year of the disciplined physician and for whom no disciplinary action was recorded in the Federation of State Medical Boards databases.	Academic files of physicians identified in the Federation of State Medical Boards database, containing application information for admission, course grades, course evaluation narratives, licensure exam grades, administrative correspondence, and the dean's letter of recommendation for programmes of residence.	Negative excerpts about professional behaviour were extracted from admission interview reports, course evaluations, the dean's letter of recommendation for residency programmes, and any documents in the student's files dated prior to graduation.
Santen et al., 2014	Determine whether student identification by promotion committees during college is associated with disciplinary actions by state boards in medical practice.	Remediation recommendation, completing course requirements, repeating course, repeating year, academic internship, or academic discharge	Academic issues: marginalised passing, incomplete grades, and academic failures Behavioural problems: disorganisation, problems in student skills, psychological issues, and unprofessional behaviour	-	Analysis of students enrolled between 1976 and 1996 and graduated between 1980 and 2000 in the medical school at Vanderbilt University Evaluation of sanctions recommendations against students who exhibit academic difficulties or	Collection of data from students' academic files for information on gender, narrative description of the problem, number of failing or marginal grades, action recommended by the promotions committee, and the medical school

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TABLE 2 (Continued)

Study	Study objectives	Form of evaluating the actions of students/ professionals	Evaluated categories	Control group	Data acquisition	Data analysis by the authors
					professional behaviour problems by the university's promotions committee Evaluation of the academic files of each student of the university's Medicine course Evaluation of the database of the Federation of State Medical Councils	year in which the problem occurred Review of information from students identified by promotion committees to verify if they subsequently experienced disciplinary action by state medical boards
Yates and James, 2010	Determine whether there are any factors in a physician's medical school record that are associated with an increased risk of subsequent professional misconduct	Negative comments on student records	● Failure in exams at the beginning of the course; subjects repeated at the beginning of the course; relative performance at the beginning of the course (high, medium, below average, no information); failure in exams at the end of the course; subjects repeated at the end of the course; performance relative to the end of the course; interleaved degree; slow progress (delayed graduation); adverse comments found ● Dishonesty; dishonesty/ criminality; dysfunctional conduct; sexual harassment or indecency; substandard clinical practice and care; treatment	Each physician was matched with four physician controls with no negative records.	Assessment of students' records of academic ability and suitability for medicine, held by the Central Board of Universities Admissions for the University of Nottingham (England)	Negative comments in student records, written by the principal teacher, being tabulated by 'no negative comments', 'minor negative comments', 'moderate negative comments' and 'big negative comments' and subsequently catalogued by behaviour.

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TABLE 3 Disciplinary actions applied to physicians during the follow-up period of the included studies.

Study	Follow-up period	Number of disciplinary actions, *n* (%)			
		Total	By category	By year or year of the course in which it was applied	By behaviour
Papadakis et al., 2004	1990–2000	68 (~1%)	-	-	Negligence: 26 (38%) Use of drugs or alcohol: 9 (13%) Unprofessional conduct: 8 (12%) Inappropriate prescription: 8 (12%) Sexual misconduct: 7 (10%) Conviction for crime: 3 (4%) Fraud: 3 (4%) Unlicensed activity: 1 (1%)
Papadakis et al., 2005	1990–2003	Unprofessional behaviour Cases: 92 (39.1%) Control: 90 (19.2%)	MCAT Mean (SD) Cases: 0.6 (0.6) Controls: 0.8 (0.6) NBME Cases: 0.2 (0.9) Controls: 0.4 (0.9) GPA Cases: 3.3 (0.5) Controls: 3.5 (0.5)	-	Irresponsibility One to two search terms per student Cases: 49 (20.9%) Control: 76 (16.2%) Three or more search terms per student Cases: 20 (8.5%) Control: 4 (0.9%) Decreased capacity for self-improvement One to two search terms per student Cases: 57 (24.3%) Control: 85 (18.1%) Three or more search terms per student Cases: 20 (8.5%) Control: 12 (2.6%) Immaturity One to two search terms per student Cases: 26 (11.1%) Control: 41 (8.7%) Three or more search terms per student Cases: 2 (0.9%) Control: 2 (0.4%) Poor initiative One to two search terms per student Cases: 63 (26.8%) Control: 100 (21.3%) Three or more search terms per student Cases: 20 (8.5%) Control: 16 (3.4%) Poor relationship with resident or undergraduates One to two search terms per student Cases: 36 (15.3%) Control: 43 (9.2%) Three or more search terms per student Cases: 6 (2.6%) Control: 3 (0.6%) Poor relationship with nurses

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TABLE 3 (Continued)

Study	Follow-up period	Number of disciplinary actions, *n* (%)			
		Total	By category	By year or year of the course in which it was applied	By behaviour
					One to two search terms per student Cases: 16 (6.8%) Control: 12 (2.6%) Three or more search terms per student Cases: 0 Control: 0 Poor relationship with patients and family members One to two search terms per student Cases: 21 (8.9%) Control: 25 (5.3%) Three or more search terms per student Cases: 0 Control: 0 Unprofessional behaviour associated with anxiety, insecurity, or nervousness One to two search terms per student Cases: 38 (16.2%) Control: 67 (14.3%) Three or more search terms per student Cases: 7 (3.0%) Control: 4 (0.9%)
Santen et al., 2014	1976–2000	-	-	Students identified by the Promotions Committees 1st year: 92 (4.4%) 2nd year: 56 (2.7%) 3rd year: 20 (1%) 4th year: 4 (0.2%) Academic difficulties 1st year: 92 (100%) 2nd year: 53 (94.6%) 3rd year: 15 (75%) 4th year: 1 (25%) Failure in one or more courses 1st year: 58 (63%) 2nd year: 36 (64.3%) 3rd year: 4 (20%) 4th year: 1 (25%) Behavioural issues 1st year: 14 (15%) 2nd year: 14 (25%) 3rd year: 10 (50%) 4th year: 4 (100%)	-
Yates and James, 2010	1999–2004	-	Failing exams at the beginning of the course No: cases, 20 (33.9%); control, 134 (56.8%);	-	Dishonesty: 7 (12%) Dishonesty/criminality: 14 (24%) Dysfunctional behaviour: 6 (10%) Sexual harassment or indecency: 3 (5%)

(Continues)

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TABLE 3 (Continued)

Study	Follow-up period	Number of disciplinary actions, *n* (%)			
		Total	By category	By year or year of the course in which it was applied	By behaviour
			Yes: cases, 32 (54.2%); control, 70 (29.7%) No information: cases, 7 (11.9%); control, 32 (13.6%) Subjects repeated at the beginning of the course No: cases, 40 (67.8%); control, 192 (81.4%) Yes: cases, 12 (20.3%); control, 12 (5.1%) No information: cases, 7 (11.9%); control, 32 (13.6%) Relative performance at the beginning of the course High: cases, 2 (13.4%); control, 22 (9.3%) Medium: cases, 27 (45.8%); control, 143 (60.6%) Below average: cases, 23 (39.0%); control, 43 (18.2%) No information: cases, 7 (11.8%); control, 28 (11.9%) Failure in exams at the end of the course No: cases, 40 (67.8%); control, 176 (74.6%) Yes: cases, 19 (32.2%); control, 55 (23.3%) No information: cases, 0 (0%); control, 5 (2.1%) Subjects repeated at the end of the course No: cases, 48 (81.4%); control, 208 (88.1%) Yes: cases, 11 (18.6%); control, 21 (8.9%) No information: cases, 0 (0%); control, 7 (3.0%) Performance relative to the end of the course High: cases, 7 (11.9%); control, 24 (10.2%) Medium: cases, 37 (62.7%); control, 178 (75.4%) Below average: cases, 15 (25.4%); control, 32 (13.6%) No information: cases, 0 (0%); control, 2 (0.9%) Intercalated degree No: cases, 52 (88.1%); control, 211 (89.4%) Yes: cases, 7 (11.9%); control, 25 (10.6%)		Substandard clinical practice and care: 16 (27%) Treatment: 7 (12%) Others: 6 (10%)

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TABLE 3 (Continued)

Study	Follow-up period	Number of disciplinary actions, *n* (%)			
		Total	By category	By year or year of the course in which it was applied	By behaviour
			Slow progress (delayed graduation) No: cases, 43 (72.9%); control, 214 (90.7%) Yes: cases, 16 (27.1%); control, 21 (8.9%) Adverse comments found No: cases, 48 (81.4%); control, 208 (88.1%) Yes: cases, 11 (18.6%); control, 28 (11.9%)		

Abbreviations: GPA, grade point average; MCAT, Medical College Admission Test; NBME, National Board of Medical Examiners.

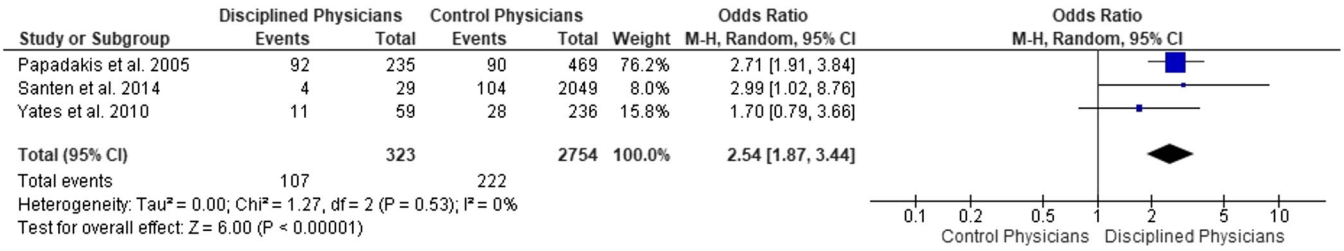

FIGURE 2 Meta-analysis of the evaluation of disciplinary actions by odds ratio. Caption: the figure represents the meta-analysis of three of the included studies, that presented the OR values for the statistics analysis. Abbreviations: CI, confidence interval; M-H, Mantel–Haenszel; OR, odds ratio.

TABLE 4 Newcastle-Ottawa risk of bias tool. Average score: 9.

	Selection				Comparability	Exposure/outcome			
	1	2	3	4		1	2	3	Total
Papadakis, 2004	*	*	*	*	**	*	*	*	9
Papadakis, 2005	*	*	*	*	**	*	*	*	9
Santen, 2014	*	*	*	*	**	*	*	*	9
Yates and 2010	*	*	*	*	**	*	*	*	9

Note: Each category of the Newcastle-Ottawa risk of bias tool (Selection, Comparability and Exposure/outcome) presents assessments regarding the methodology of the included studies. The evaluation is presented through a 'star system' (asterisks), indicating the score for each assessment. Papadakis, 2004; Papadakis, 2005; and Yates and James, 2010—Scale case control studies: selection: (1) is the case definition adequate? (a) yes, with independent validation☐; (2) representativeness of the cases: (a) consecutive or obviously representative series of cases☐; (3) Selection of controls: (a) community controls☐; (4) Definition of controls a) no history of disease (endpoint)☐; Comparability: (1) comparability of cases and controls on the basis of the design or analysis (a) study controls☐, (b) study controls for any additional factor☐ Exposure: (1) Ascertainment of exposure☐: (a) secure record*; (2) Same method of ascertainment for cases and controls (a) yes☐; (3) Non-Response rate (a) same rate for both groups☐.
Santem, 2014—Scale cohort studies: selection: (1) representativeness of the exposed cohort (b) somewhat representative of the average community; (2) Selection of the non-exposed cohort (a) drawn from the same community as the exposed cohort☐; (3) Ascertainment of exposure☐ (a) secure records; (4) Demonstration that outcome of interest was not present at start of study (a) yes☐; Comparability: (1) Comparability of cohorts on the basis of the design or analysis (a) study controls for most important factor☐, (b) study controls for any additional factor☐; Outcome: (1) Assessment of outcome (b) record linkage*; (2) Was follow-up long enough for outcomes to occur a) yes☐, (3) Adequacy of follow up of cohorts☐ (a) complete follow up—all subjects accounted for; (b) subjects lost to follow up unlikely to introduce bias—small number lost.

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A significant association was observed during statistical analysis between those who received disciplinary action at graduation and subsequent professional behaviour.

Colliver et al.[17] discussed this result in practical application as employability, because disciplinary actions occur in 350 physicians out of 150,000 licenced in the state of California, which would give a prevalence of 0.3%.

The cohort study by Santen et al.[15] included 2049 controls for 29 physicians identified on promotion committees during college to assess their association with subsequent disciplinary action by state boards of medicine. The authors reported that poor academic performance was the main reason for the identification of students by the committees, which was later associated with actions by the state medical council. However, when analysing all the disciplinary actions carried out by the council in isolation, most of the sanctioned students were not identified during graduation.[15]

Some studies compare performance scores such as a retrospective cohort study with the aim of verifying the association between academic performance on a medical school situational judgement test (SJT) and the Educational Achievement Measure (EAM), and the risk of receiving disciplinary action in the first 5 years of UK professional practice included 34,865 UK doctors between 2014 and 2018.[18] The overall rate of disciplinary action was low (65/34,865, 0.19%), and the mean time to discipline was 810 days (standard deviation, SD = 440). Multivariate survival analysis demonstrated that a score increase of 1 SD (~7.6 percentage points) on the EPM reduced the risk of disciplinary action by ~50% (HR: 0.51; 95%CI: 0.38–0.69; $P < 0.001$). There was no significant association between SJT score and risk of disciplinary action (HR: 0.84; 95%CI: 0.62–1.13; $P = 0.24$).[18]

A systematic review and meta-analysis performed by Unwin et al.[19] showed that male physicians were almost 2.5 times more likely (pooled OR: 2.45; 95% CI: 2.05–2.93) to undergo a medico-legal action compared to female physicians. In the studies that were included in our review, the male population was also more present among the group that received disciplinary actions.

McDonald et al.[20] performed a cohort study with a population of internists certified in internal medicine, but not a subspecialty, from 1990 to 2003 ($n = 45,400$), evaluating the time for disciplinary action in association with the physician's passing the ABIM IM MOC (American Board of Internal Medicine Instituted Initial Certification and Maintenance of Certification) within 10 years of initial certification, adjusted for training, certification, demographic and regulatory variables, including state medical board continuing medical education (CME). Discipline risk among physicians who failed the IM MOC exam within the 10-year requirement window was more than twice that of those who passed the exam (adjusted HR: 2.09; 95% CI: 1.83–2.39). Disciplinary actions did not vary by state CME requirements (adjusted HR: 1.02; 95% CI: 0.94–1.16), but decreased with increasing MOC exam scores (tau-b coefficient of Kendall: −0.98 for trend; $p < 0.001$). Among disciplined physicians, actions were less severe among those who passed the IM MOC exam within the 10-year requirement window than those who failed the exam, evidencing that performing and passing a periodic assessment of medical knowledge is associated with a decrease in disciplinary actions by the state medical council, an important quality result of relevance for patients and the profession.[20]

The limitations of our study stem from the restricted number of available publications that can be compared to evaluate the studied outcome. This limitation arises due to variations in criteria and result presentation, with many studies exclusively comparing with specific tests or relying on country-specific or institutional assessments. Despite the scarcity of studies addressing the topic, the meta-analysis underscores the imperative for investigations focusing on strategies during undergraduate education, particularly when identifying behaviours evaluated in this study, with the aim of mitigating future penalties. Additionally, conducting similar studies in diverse countries would enhance the global analysis of the subject.

Conducting similar studies in diverse countries would enhance the global analysis of the subject. … The meta-analysis underscores the imperative for investigations focusing on strategies during undergraduate education.

4.2 | Conclusion

There is a statistically significant association between unprofessional behaviour during medical undergraduate study and subsequent disciplinary actions by medical councils.

4.3 | Practice implications

Given the results presented in the literature and relating to the results of our systematic review, the tools for periodic assessments

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of student behaviour during undergraduate studies can be a perspective for future studies aimed at reducing disciplinary actions among physicians. Given these considerations, addressing this topic during medical education becomes crucial. This approach aims to facilitate the identification of unprofessional behaviour among students, enabling timely correction and guidance by their supervisors. Ultimately, this proactive approach has the potential to contribute to the development of better professional conduct in clinical practice.

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AUTHOR CONTRIBUTIONS

Conceptualization: Maria Inês da Rosa, Luciane Bisognin Ceretta and Milton Arruda Martins. *Data curation*: Maria Inês da Rosa, Laura Colonetti. *Formal analysis*: Maria Inês da Rosa, Tamy Colonetti, Antonio Jose Grande. *Investigation*: Maria Inês da Rosa and Luciane Bisognin Ceretta. *Methodology*: Maria Inês da Rosa, Luciane Bisognin Ceretta and Milton Arruda Martins. *Project administration*: Milton Arruda Martins, Patricia Tempski. *Supervision*: Milton Arruda Martins, Patricia Tempski. *Roles/writing—original draft*: Maria Inês da Rosa, Luciane Bisognin Ceretta, Tamy Colonetti, Antonio Jose Grande. *Writing—review and editing*: Laura Colonetti.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

We informed that the manuscript is original, all the authors were active participants, and everyone agrees with the content of this manuscript. As this is a review study, submission for evaluation by an ethics committee was not necessary.

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