Assessment of the research education of medical students at a public university in Mexico City

Evaluación de la educación en investigación de estudiantes de medicina en una universidad pública de la Ciudad de México

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Abstract

Although it is important for all medical schools to teach investigations skills to their students, schools in developing countries may not encourage them as much as those in developed countries. In Mexico, a university adopted as a principle that research should help students build their knowledge; therefore, it should be mandatory in all careers, including medicine. To assess how research has come to be taught in this school, the present study administered an ad-hoc survey to medical students, aimed at evaluating the research education they received. The data showed that a high percentage of students did some kind of investigation, although most of their projects were literature reviews. Less than half of the students conducted clinical or experimental inquiry; these results may be related to the research experience of the professors, despite the regulations of university research. The present work found that the medical studies program at a Mexican public university, has faced several challenges in the establishment facilities of the conditions for teaching of medical research, according with international trends.

Key words: medical scientific education, medical studies, medical research, student research, medical research education.

Resumen

Aunque es importante que todas las escuelas de medicina enseñen habilidades de investigación a sus estudiantes, es posible que las escuelas de países en desarrollo no las fomenten tanto como las situadas en países desarrollados. En México, una universidad adoptó como principio que la investigación debe ayudar a los estudiantes a construir su conocimiento; por lo que la investigación debe ser obligatoria en todas las carreras, incluida la de medicina. Para evaluar cómo se ha llegado a enseñar la investigación en esta escuela, el presente estudio administró una encuesta ad-hoc a estudiantes de medicina, dirigida a evaluar la educación en investigación que recibieron. Los datos mostraron que un alto porcentaje de estudiantes realizó alguna investigación, aunque la mayoría de sus proyectos fueron revisiones bibliográficas. Menos de la mitad de los estudiantes llevaron a cabo investigaciones clínicas o experimentales; este hallazgo posiblemente se relacione con la experiencia en investigación de los profesores, a pesar de las regulaciones de la investigación universitaria. Este trabajo encontró que el programa de estudios de medicina en una universidad pública mexicana, ha enfrentado varios desafíos tratando de establecer las condiciones para la enseñanza de la investigación médica, de acuerdo con las tendencias internacionales.

Palabras clave: *educación científica médica, estudios médicos, investigación médica, investigación de estudiantes, educación en investigación médica.*

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INTRODUCTION

The importance of research education for medical students has been globally recognized, since physician-scientists translate newfound knowledge into clinical practice, making it possible to advance new diagnostic techniques and treatments that improve patient care.[1-3] However, the extent to which students are adequately trained to carry through medical research, seems to depend on the developmental stage of the country in which the university is located.[1,3-5] For this reason, investigation is often mandatory in developed countries such as Germany, where medical students must successfully carry it out to obtain their degrees; the evolution of this practice has come to demand quality standards for student research.[4,6,7] Medicine is a post-graduate course in the United States, with some schools recognized as "research-intensive public medical schools".[2,8] Norwegian medical schools introduced student investigation programs in 2002 to recruit more medical students for this program.[9] Spanish medical schools also offer research courses that typically lead to publications.[10] By contrast, in developing countries such as Peru, only 10% of students carrying out some research; most students finish their studies without doing any.[11] This seems to be standard practice in several developing countries.[1,3,12-15]

There is scant literature on this subject in Mexico, where the teaching of research methods is usually considered a relatively unimportant aspect of the health-professional training curriculum, since medical teachers prioritize patient care.[12,16] Although, in some medical schools high-achieving students are recruited into select groups, and receive research training along with their medical courses;[17-19] this selection process separates students and has led to some cases of student burnout.[20]

It is common in developing countries for medical students to receive no formal research training, even though academic authorities have recognized its importance.[21,22] Nevertheless, a public university was established in Mexico 45 years ago with the foundational mission of making research part of its educative model; each student was expected to be involved in creating his or her own knowledge. This perspective became a central and compulsory aspect of academic work, shared by teachers and students alike.[23] The problem-based educational model use knowledge of different subjects to understand and address an important problem of the field of study. Professors should guide their students to review specific topics and apply them in the research of at least an important problem of their field. According to this model, the best way for students to acquire knowledge is through investigation conducted in during modular courses under regulations that guide the professors' tutorial work.[24,25] Nonetheless, despite these teaching obligations no school records exist to prove details of the research accomplished by students, thus, a previous assessment of students' research has therefore used a survey to obtain data.[26]

Since 2006, the medical school has organized investigation congresses at the end of courses, where students present their results. A previous report[16] described some of the characteristics of research work presented by students, although fewer than 20% were presented at those congresses. Given this limitation, the present study used an *ad-hoc* questionnaire to gauge students' previous in experiences research, in order to gain a fuller view of the medical students' research training.[10,11]

The results of the present study show that a high percentage of medical students managed to fulfill the investigation protocols, although most of their investigations were bibliographic reviews; this finding may be associated with teachers' expertise.

MATERIAL AND METHODS

Given the lack of formal records of student research, the present study designed an *ad-hoc* survey to evaluate: a) each student's attitude respect medical research, b) each student's research experience in the last course they completed, and c) the teachers' tutorial work. The survey was based on a review of previous research[10,11,27,28] and consisted on data concerning the age and sex of the participant, stage and name of the professor of the course recently finished; followed by 26 questions, 4 referring to the attitude of the student toward medical research; 20 about of details of their research experience, and 2 on their knowledge about the research activities of their professor. An initial survey was tested using a pilot sample of 30 students, where Cronbach's alpha reliability test led to the elimination of 5 questions; the alpha value of the final survey was 0.8110.

The survey was applied to a sample of medical students at various stages of their courses. A social service intern took the printed survey to the classrooms to avoid possible students' coercion by teachers. The students responded to questions about the recently completed course. The survey was anonymous; its aims were explained to the students, and they were informed that voluntary completion of the questionnaire would imply their consent to publish their results. The application of the survey was during October and November 2019.

To determine the sample size, the population of students enrolled in the program (N = 1085) was considered; to achieve 90% confidence with an error of 5%, a sample of 216 students was needed. The data were analyzed using descriptive statistics. The possible influence of the professors over the type of research done by the students was analyzed using Chi Square. During the data analysis, contradictory statements made by students about the same professor cancelled each other out (2 surveys); such data were eliminated from the final analysis.

The survey was performed as a transversal study; however, due to care was taken to have at least one

regular group of students from each trimester course, it was possible to assess research experience throughout the degree using multi-stage cluster sampling.[29]

RESULTS

A sample of 228 medical students was surveyed, corresponding to 21.5% of the total population. More than half were women (59%, n = 135).

a) Research attitude

When asked for their thoughts about medical research, the majority of the students (74.6%) felt that it was acceptable for physicians to use their patients to perform it; 14% estimated this practice undesirable. 88% of the students considered it feasible to carry out research as part of medical practice; only 3.9% felt that physicians should not carry it out. When asked whether physicians in Mexico should performed medical research, 78.9% of participants considered it desirable, while 11% undesirable.

b) Research experience

Most medical students (78.1%) considered that research protocols should be carried out along with their medical training ***(table 1)***. A similar percentage (75.4%) reported having carried out some investigation in a previous course; almost the same proportion of students (74.1%) reported that their research had some impact on their qualifications ***(table 1)***. Most students who carried out research had a professor who set aside one day a week for students to work on the protocols (63.6%). Slightly more than half of the student sample (57%) felt that research achievements had an impact on their learning as physicians.

Less than a quarter of the students (23.7%) who carried out research presented their results at a congress ***(table 2)*** and only one tenth of the surveyed sought to continue their research. The majority of students (7.9%) did not expect to publish their research results.

Only 48.7% felt that their research was important for medicine (independent of their findings), while 34.2% that their topics irrelevant.

c) Teachers from the student's perspective

More than half of the students (54.4%) said that their professors conducted research; the percentage of professors (44.3%) who published their research was even lower ***(table 3)***.

In this survey students expressed their opinions about their medical professors (n = 56), indicating that 80% of teachers asked them to carry out research inquiries, while 20% omitted this requirement; 61% of professors asked for bibliographic research, while 39% assigned clinical or experimental research.

Analysis of student research using a multi-stage cluster evaluation

A multistage cluster evaluation allowed exploring student's research along their studies progression. The ***figure 1*** shows that students accomplished investigation

Table 1. Students' research experience.

Item	Percentage (n = frequency)		
	Yes	No	I don't know
It is mandatory for students to carry out research at this medical school	78.1%(179)	17.5%(40)	4.4%(10)
I carried out a research inquiry	75.4%(172)	24.6%(56)	0% (0)
The research was reflected in my grade	74.1%(169)	25% (57)	0.9%(2)
I drew up an informed-consent request document	29.8%(68)	69.7%(159)	0.4%(1)
The professor assigned a specific day of the week for research	63.6%(145)	36.4%(83)	0% (0)
My research achievements had an impact on my medical learning	57% (130)	39% (89)	3.9%(9)

Table 2. Socialization and follow-up on student investigations.

Item	Percentage (n = frequency)		
	Yes	No	I don't know
The results were presented at a congress	23.7%(54)	75.4%(172)	0.9%(2)
Subsequent courses continued to follow-up on the research	10.1%(23)	89.5%(204)	0.4%(1)
The results may be published	7.9%(18)	89.5%(204)	2.6%(6)

in a proportion over 70% along their modular courses, with the exception of the 11th modular course and the medical internship. Nevertheless, when the experimental and clinical research accomplished by each modular course is considered, the graph shows that the clinical or experimental research is over 50% just along the five first modular courses, which could be considered as preclinical courses. In most of the clinical courses, which are those from the 6th to the 12th modular courses, the clinical or experimental research have a percentage below 50%, with modules such as 9th and 11th where the investigation projects accomplished by the students were just bibliographical reviews. The only clinical course where clinical research was over 50% was the 8th modular course.

At the medical internship the research activities depend of the hospital regulations, but the survey indicates that less than 20% of interns carry on any research.

DISCUSSION

The present study provides insights into the way in which a medical school in a developing country, is striving to set appropriate conditions for teaching research skills to medical students. In Mexico, scientific research training remains precarious from early schooling to university-level training. Most students conduct little, if any research, a state of affairs that continues in medical schools, where most teachers also lack experience in investigation.[30-33]

One possible barrier that could slow the development of optimal research conditions in the country may be a negative attitude towards research,[34] since some people believing that medical research should be done in laboratories, rather than at health services.[27] A previous article[16] has argued that the investigation activities of medical students require careful administration.

The first part of the survey assessed the students' attitude toward research, concerning the extent to which they may fail to carry out research because of their beliefs. The data showed that a majority of students considered it desirable to learn research techniques throughout their medical careers; also, that it was appropriate to carry out these projects in the national medical services. The proportion of Mexican students with a favorable attitude toward medical research is similar to that of students who favor research it in the U.S.,[4,35,36] England,[37] Germany,[4,6] and Spain.[10] Nonetheless, the high proportion of students who consider research to be a desirable aspect of medicine may reflect the positive public image of scientific research in Western countries, rather than the personal attitude of the student. By contrast, only 43.9% of undergraduate medical students in Saudi Arabia have a positive attitude towards research.[38] Dadipoor *et al,*[3] have shown that 70% of Iranian medical students are unwilling to carry through investigation because of existing barriers and challenges. Interestingly, only 10% of the Mexican students felt that doctors in Mexico should not carry out any research, although another 15% did not have a defined answer to this question.

Only 8% of students thought that their results might be published. In this respect, the results of Latin American medical schools are very different from those of medical schools in developed countries, where a much larger percentage of students publish their investigations.[4,8,12,21,37,39] As an example, the University of Pittsburg School of Medicine's Scholarly Research Program increased student publications from 27.3% in 2006 to 54.5% in 2012.[8] In Sweden, approximately one third of the students authored papers.[39] In Peru, only 10% of students coauthored published work.[11] In all countries are advised to create disclosure mechanisms to release students' research results.[8,11,39]

Some issues encountered in this study were: 40% of the surveyed students felt that their research, which was mainly bibliographical, was unimportant for medical science. A quarter that their research had no impact on their course final qualifications; while just a quarter presented their research results at a congress. 40% of students reported that their research results did not contribute to their own medical learning, and 90% did not continue their research at subsequent modular courses.

At the Mexican university assessed in this study, the problematic lack of clinical and experimental research done by medical students may reflect the fact that, from the student's perspective, just slightly more than half of the professors could be considered as researchers, although the number of professors who published their research was even lower. Most students carried out bibliographic reviews; this pattern was found in other Mexican medical schools.[27] Bibliographic research may be an easy way for teachers to comply with university research requirements.

Table 3. Teachers as research tutors.

Item	Percentage (n = frequency)		
	Yes	No	I don't know
The professor is a researcher	54.4%(124)	32%(73)	13.6%(31)
The professor publishes his/her own research	44.3%(101)	32%(73)	23.7%(54)

The multistage cluster evaluation provides the perspective of student's research activities along their studies progression. Their activities tended to decrease as courses progressed ***(figure 1)***. At the clinical stages research projects were mainly bibliographical, possibly because the teachers covering various medical specialties had little research training or were not interested in teaching research skills to students. This is a form of negative educational reinforcement that makes possible that investigation deficits pass from one generation to the next. Medical professors should discuss this issue and reach agreements on ways to improve students' research training.[35] A Brazilian group of researchers found that more advanced medical students had little interest in investigation activities,[40] this aspect must be explored further in posterior studies.

Limitations of the study: the survey used has not been fully validated yet, although its reliability has been taken care of. In addition, the sampling of the students was not random, so it is possible that the willingness to answer the survey biases the results in some way. Furthermore, it is a cross-sectional study that only reflects the state of the art during the period in which the survey was applied. Despite these drawbacks, given that there are no previous reports evaluating research courses at medical schools in Mexico, the results of this research seem to be a starting point in this aspect of medical training.

The present study confirms that it is not enough for medical schools to support or set standards to encourage research teaching. They must also reinforce the importance of research in the medical profession, and create mechanisms to ensure that all students receive adequate research training as an integral part of their medical studies.

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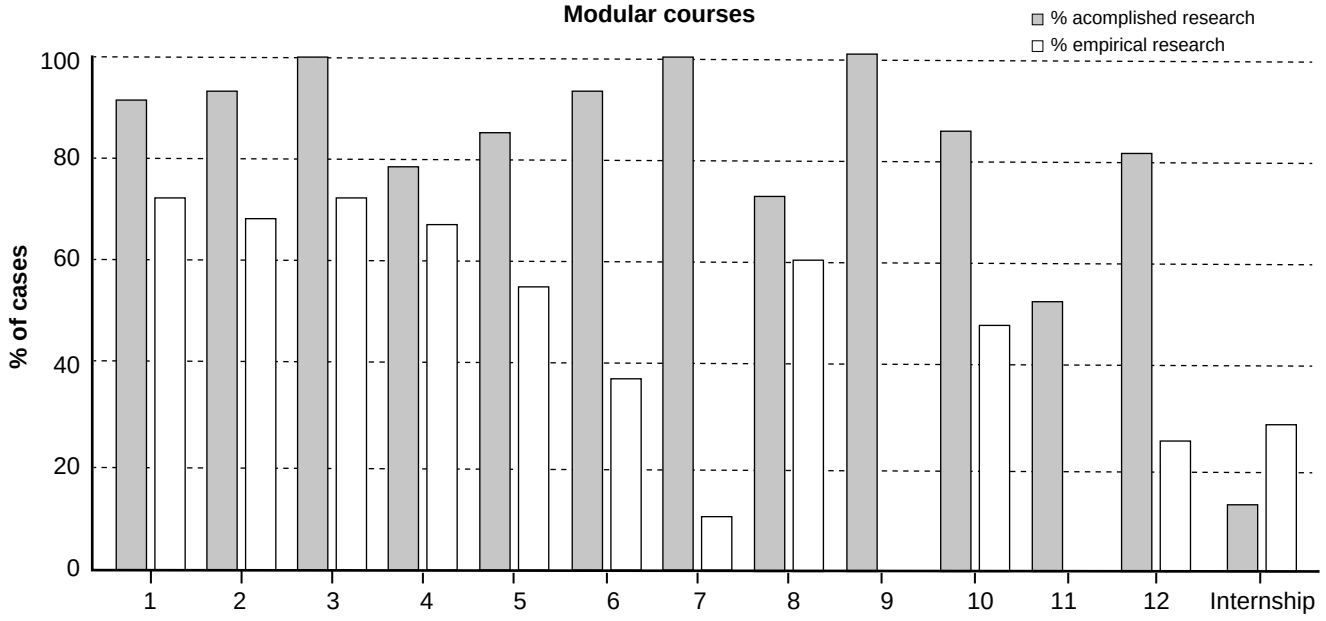

Figura 1. Medical students research quantity and quality, displayed by multi-stage clusters ordered accordingly to their temporal sequence. The bars on the left side show the percentage of research projects accomplished by the students at each modular stage; while the bars on the right show the percentage of clinical and experimental research carried out by students at each module, considering as 100% the total amount or research projects consigned in the survey.

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