

The MD-PhD Program In Geneva: A 10-year Analysis Of Demographics And Outcomes

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Abstract

Background: MD-PhD programs are research-oriented degrees that empower medical doctors with in-depth scientific skills. 'Physician-scientists' graduating from these programs are expected to highly contribute to biomedical research and academic medicine, alongside clinical practice. In that respect, however, there is limited knowledge about the outcomes and careers of the MD-PhD workforce, particularly in Europe. In the present study, we surveyed the MD-PhD graduates from the University of Geneva between 2010 and 2019.

Methods: A cross-sectional survey was performed in April 2019, targeting all medical doctors who had obtained the MD-PhD degree from the University of Geneva since 2010. Features, career outcomes and opinions of MD-PhD graduates were assessed through an online anonymous questionnaire.

Results: Twenty-one questionnaires were collected from 31 MD-PhD graduates (response rate 65.5 %). Most respondents (57.1%) had performed an MD-PhD training in basic sciences; however, only 14.3% had pursued this type of research thereafter. Most of the respondents were holding a position at a University hospital (90.5%), although a significant number of them were no longer doing research in their current position (28.6%) and 85.7% were facing obstacles and challenges to combine clinical duties and research. Despite this, the majority declared that the MD-PhD degree had given them an edge during the career (85.7%).

Conclusions: The physician-scientists who graduated from the MD-PhD program in Geneva were globally satisfied with their training. However, many challenges and obstacles to combine clinical duties and research were reported by MD-PhD graduates, precluding the implementation of research activities in their current position.

Introduction

A small proportion of all medical students and graduates are enrolled in MD-PhD programs, a degree program with the purpose of training research-oriented physicians. These highly skilled physicians, who undergo supplementary education in scientific research, are also known as 'physician-scientists'. They are expected to engage in biomedical research and academic careers, with the opportunity to play a significant role in medical education, research and clinical practice.

MD-PhD programs are currently wide-spread in the United States (1), with a growing number of such programs since they were established in the 1950's. In European Universities, these degree programs were only established in the late 80's and early 90's (2–4) and they are, still at present, only available at a minority of the medical academic institutions. In Switzerland, the national MD-PhD program was created in 1992 (4).

The characteristics, career intentions and outcomes of MD-PhD graduates have been thoroughly and periodically assessed in North America (5–11). As a matter of concern, in the recent times, there have

been reports of a decreasing number of physician-scientists and funding in North America (12–15). We may assume that European physician-scientists face similar challenges than those reported in the US, but the literature on this matter is scarce (2, 4, 16–18). Additionally, the structure of many European MD-PhD programs differs from that of the US, with varied designs and candidate requirements (2). Thus, there is a lack of detailed knowledge about the outcomes of most European MD-PhD programs. In particular, the last available report on the Swiss MD-PhD program outcomes was published a decade ago (4).

The aim of the present study was to survey all physician-scientists who obtained the MD-PhD degree from the University of Geneva since 2010, using a questionnaire to assess their demographic characteristics, research activity, career choices and challenges.

Materials And Methods

Ethical statement

Prior to its application, the design and the questionnaire of the present survey were reviewed by the Scientific Officer of the Dean's office, Faculty of Medicine, University of Geneva. Voluntary participation and consent to use the collected data were requested from all respondents. Confidentiality and anonymity of participants was ensured during both data collection and analysis.

Study population

Eligible participants were defined as medical doctors who obtained the MD-PhD degree from the University of Geneva since 2010. According to the public alumni board from the University of Geneva accessed in April 2019, 32 graduates were included in the present study. One eligible participant died during the study evaluation period and was excluded from the analysis.

Study design

The present work is a descriptive cross-sectional study of characteristics and outcomes of MD-PhD graduates from the University of Geneva between 2010 and 2019. All eligible participants received an online questionnaire via the work institution e-mail addresses in April 2019. One reminder was sent in May 2019.

Questionnaire

In order to assess the study population, an anonymous 20-question online questionnaire (available in the online supplemental Table S1) was developed based on previous studies (4, 6, 11). The questionnaire was applied using a Google survey platform and entailed factual and evaluative questions. Closed-ended questions collected data regarding graduates' demographics, MD-PhD training characteristics and outcomes, publications, current career and opinions. Additionally, there was an open question allowing respondents to give comments.

Data collection and analysis

The study population did not require any sampling method because all eligible MD-PhD graduates were included. Response rate was calculated as the ratio between the number of respondents and the study population. Only completed questionnaires were assumed valid and included in the analyses. Data collected from respondents was summarised using descriptive statistics. Non-parametric tests were used for statistical inference, particularly the Mann-Whitney test when comparing two independent groups or Kruskal-Wallis test for higher number of groups. Associations between categorical variables were examined through Fisher's exact test. Statistical analysis was performed in the R environment. All statistical tests were two-sided with a level of statistical significance of 0.05.

Results

Out of the 31 medical doctors included in the current survey, 21 replied to the questionnaire (response rate of 65.5%). Demographic characteristics at enrolment in the survey are summarized in Table 1. The male gender represented 67% of survey respondents (14 out of 21), comparable to the overall population of MD-PhD graduates from the University of Geneva during the same period (71.9%, 23 out of 32). Regarding the nationality, only 57.1% of the MD-PhD graduates from the University of Geneva were Swiss citizens. Only 71.4% were still working in Switzerland by the time of the survey.

Concerning the characteristics of MD-PhD training (Table 2), students had a relatively wide span of age by the time of their graduation (27 to 46 years) and their MD-PhD training lasted three to five years. Students from the Geneva MD-PhD program published a median of four original articles during their degree training. Remarkably, there was evidence for a significant difference in the number of publications between the fields of research (basic science, translational research and clinical research. Figure 1, $p=0.03$). Students who followed a clinical research training program, published a median of 7.5 original papers during MD-PhD training, whereas their peers in basic and translational research published a median of four and two original papers, respectively. There was no evidence for a significant difference in training length, graduation age, gender or funding concerning the three types of research (Table S2).

The respondents had obtained the MD-PhD degree from the University of Geneva between one and nine years prior to the survey (Table 3). During this time lapse, 57.1% of the respondents had already finished a medical specialty training, whereas 28.6% were still following a residency program. Since the MD-PhD graduation, the respondents had published a median of 1 (0 to 4.2) original articles per year. When considering only those who had reported carrying out research activities at the time of the survey (71.4%), the publication rate was a median of two articles / year.

Overall, 28.6% of the physician-scientists who had graduated from the University of Geneva were not involved in any research activity in their current work position. Despite this, by the time of the survey, most of the respondents were holding a position at a University hospital (90.5%), while only two were practising in either private care or at a peripheral hospital (Table 3). Furthermore, although most MD-PhD graduates had done their scientific training in basic sciences (12 out of 21), only three had pursued this type of

research in their current position (Figure 2). Finally, all four graduates who had undergone MD-PhD training in clinical research still had time dedicated to clinical research in their current positions.

Data were also analyzed per gender (Table S3). The training duration, field of research and number of publications during the MD-PhD program were not significantly different between genders. However, the number of original publications per year after the MD-PhD graduation was significantly lower in female than in male respondents (0.3 vs 1.9, $p=0.022$). This difference between females and males remained statistically significant in the subgroup of physician-scientists who reported having research-dedicated time (1.0 vs 2.1, $p=0.032$).

While examining the perspectives and opinions of MD-PhD graduates (Table 4), 85.7% considered that their degree had given them an edge during your career, granting better clinical, academic or research positions, as well as better post-doc funding. However, the exact same 85.7% reported obstacles and challenges to combine clinical duties and research activities. The most prominent challenges seemed to be the lack of dedicated time for research (61.1% of the respondents), lack of mentoring (33.3%), under-compensation (27.8%), lack of funding (33.3%) and difficulties balancing family and work responsibilities (38.9%). Despite this, the MD-PhD graduates were globally satisfied with their training during the program at the University of Geneva and they would strongly recommend the MD-PhD programme to a colleague who is interested in research.

Discussion

The current survey shows that MD-PhD graduates from the University of Geneva who obtained their degree in the decade 2010-2019 have very heterogeneous characteristics and outcomes. In agreement with similar surveys of other physician-scientists' populations (5), we observed a multinational profile amongst graduates. Considering the wide span of ages by the time of MD-PhD graduation, it is also noticeable that physician-scientists in Geneva enrol this training program in different stages of their professional and personal career. Nevertheless, we also identified common aspects, challenges and career choices between the respondents.

For a better understanding of this study findings, it is important to note that, differently from North America, a medical diploma is required to enrol in the MD-PhD program in Geneva. Therefore, the MD-PhD program in Geneva is a 3- to 5-year post-graduate scientific training, intended to empower medical doctors with research skills, but is not designed for undergraduate medical students.

MD-PhD students can follow varied types of research projects during the degree. Our data shows that 57.1% followed a scientific training in fundamental sciences, however, only 14.3% pursued this type of research in the current position. Considering our results, MD-PhD tracks in clinical research seem to be of ease to manage post-graduate research activities and were also associated with a higher number of original publications during MD-PhD training. These aspects may be important to candidates, mentors and policy makers, in order to better shape the education conveyed in MD-PhD programs and to help career planing. Likewise, funding and institutional strategies may be required to allow physician-

scientists who received highly specialized training in fundamental sciences to dedicate time to research after graduation from an MD-PhD program.

It is important to note that 28.6% of the MD-PhD graduates complained not having protected time to be devoted to research in their current position. While in most cases young physician-scientists with full-time clinical duties did not have research time during residency, there were also graduates who left the University to pursue a career in private care and peripheral hospital. Similarly, studies from the United States have found that 14–16% of MD-PhD graduates do not pursue research careers (5, 10). Taking into consideration that the lack of protected time for research was the main obstacle acknowledged by our respondents, it could be of great interest for hospital policy makers to accord research protected-time to physician-scientists, in order to avoid high attrition rates amongst the MD-PhD workforce.

In addition to the lack of protected time for research, a complain of 61.1% of respondents, about a third of MD-PhD graduates also faced lack of mentoring, under-compensation, lack of funding and difficulties balancing family and work responsibilities. Suboptimal supervision and mentoring were already reported in a Swiss survey analysing MD-PhD program outcomes between 1992 and 2007 (4). Despite these different challenges, almost all graduates (85.7%) consider that this degree gave an edge in their career and they were globally satisfied with the program in Geneva. In result, graduates highly recommend this programme for future newcomers and 95.2% reply that they would do it again.

This 10-year survey revealed that the female gender represented only 28.9% of the MD-PhD graduates from the University of Geneva. Accordingly, a Swiss survey analysing MD-PhD program outcomes between 1992 and 2007 reported 23% of women (4). Additionally, in our study, female physician-scientists had a lower rate of publications per year after the MD-PhD degree compared to their male counterparts. Noteworthy, somewhat similar findings are reported in the United States (19) and Canada (7), where female physician-scientists were less likely to be funded and had lesser sustained research involvement. Although these discrepancies are currently under improvement (20), it is important to encourage equal opportunities in the MD-PhD career.

We did not assess in depth the scientific impact of the MD-PhD programme by collecting data on the impact factors and/or the number of the respective quotations from the published articles. Thus, the number of original papers is an estimation of the scientific output of the surveyed physician-scientists.

The main limitation of this study is the small sample size. For this 10-year single-centre survey, there were 31 eligible physician-scientists. Despite this, we obtained a response rate of two-thirds of the surveyed population. Moreover, the respondents have a wide distribution in terms of age and they have the same distribution by gender than the total surveyed population. These aspects should limit the risks of biased conclusions based on the obtained responses. Thus, we expect our data to accurately represent the reality amongst all the MD-PhD graduates from the University of Geneva. Also due to the small sample size, we did not perform regression analysis to adjust for potential confounders and the statistical tests are of limited power. Hence, generalizations to other physician-scientists populations based on our dataset should be cautious.

Although concerning a small sample size, this 10-year survey brings up-to-date information in a field of scarce literature. As shown by previous studies (21), the assessment of individual MD-PhD program outcomes and its graduates' challenges may favour future improvements and help policy makers.

Conclusion

Among the MD-PhD graduates of the University of Geneva, we identified a global satisfaction and mostly successful scientific career; however, there are gender discrepancies and career challenges to combine research with clinical duties in the MD-PhD workforce in Geneva.

The continuous assessment and improvement of MD-PhD programs is of paramount importance. Physician-scientists are a valuable resource in biomedical research, as their training should provide the clinical understanding and the skills to develop cutting edge research. Therefore, the scope of activity of a physician-scientists should be ideal to translate biomedical knowledge from the bench to the bedside.

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The design and the questionnaire of the present survey were reviewed by the Scientific Officer of the Dean's office, Faculty of Medicine, University of Geneva. Respondents consented the use of the data collected through the anonymous questionnaire.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets used during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare that no competing interests exist.

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The authors received no specific funding for this work.

AUTHORS' CONTRIBUTIONS

Conceptualization: ADSR and FN. Data collection: ADSR. Data analysis: ADSR, CC and FN. Writing – original draft: ADSR and FN. Writing – review & editing: ADSR, CC and FN.

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Tables

Due to technical limitations, Tables 1 - 4 are only available for download from the Supplementary Files section.

Figures

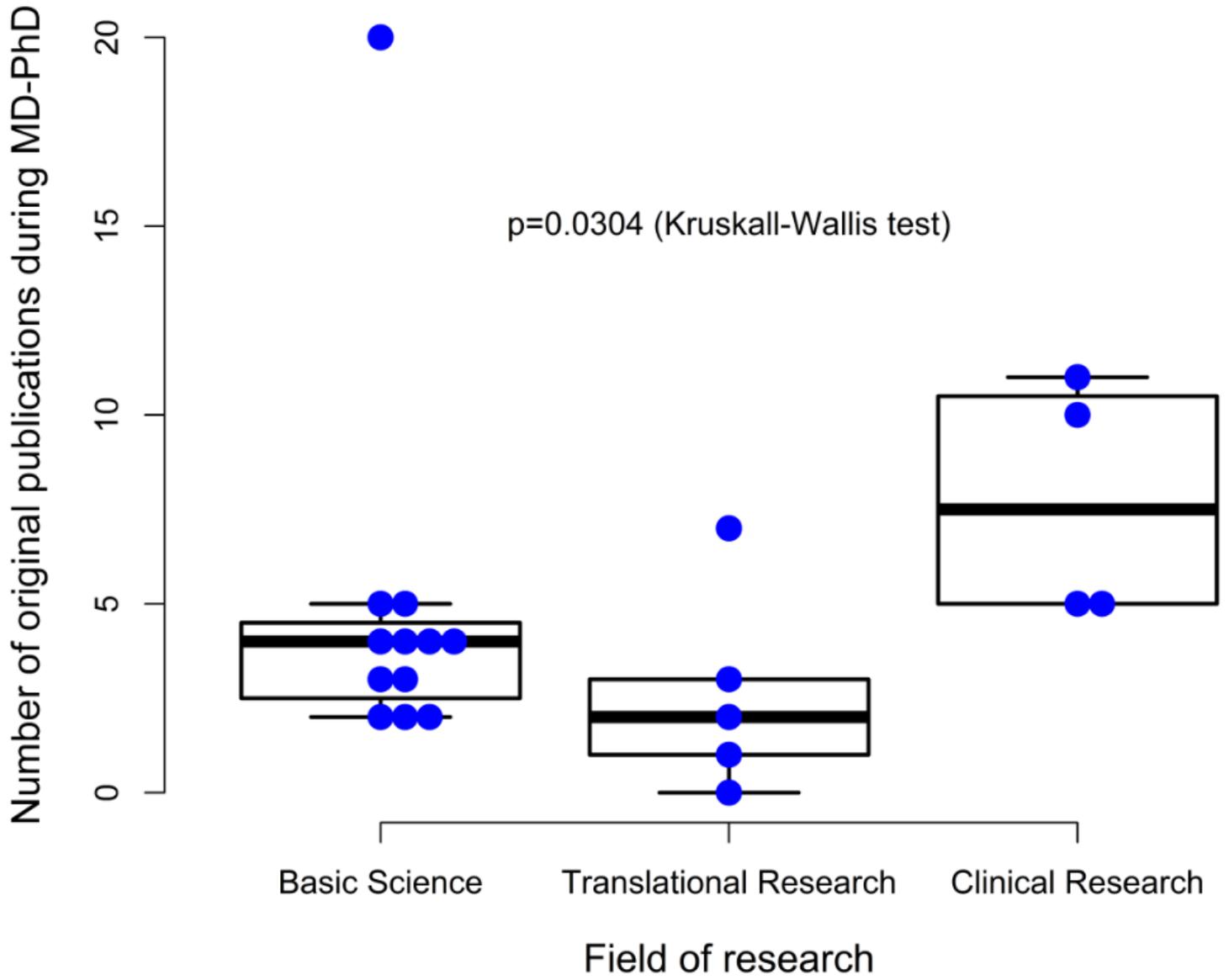


Figure 1

Number of original publications during the MD-PhD training, according to the type of research performed (basic, translational, clinical research).

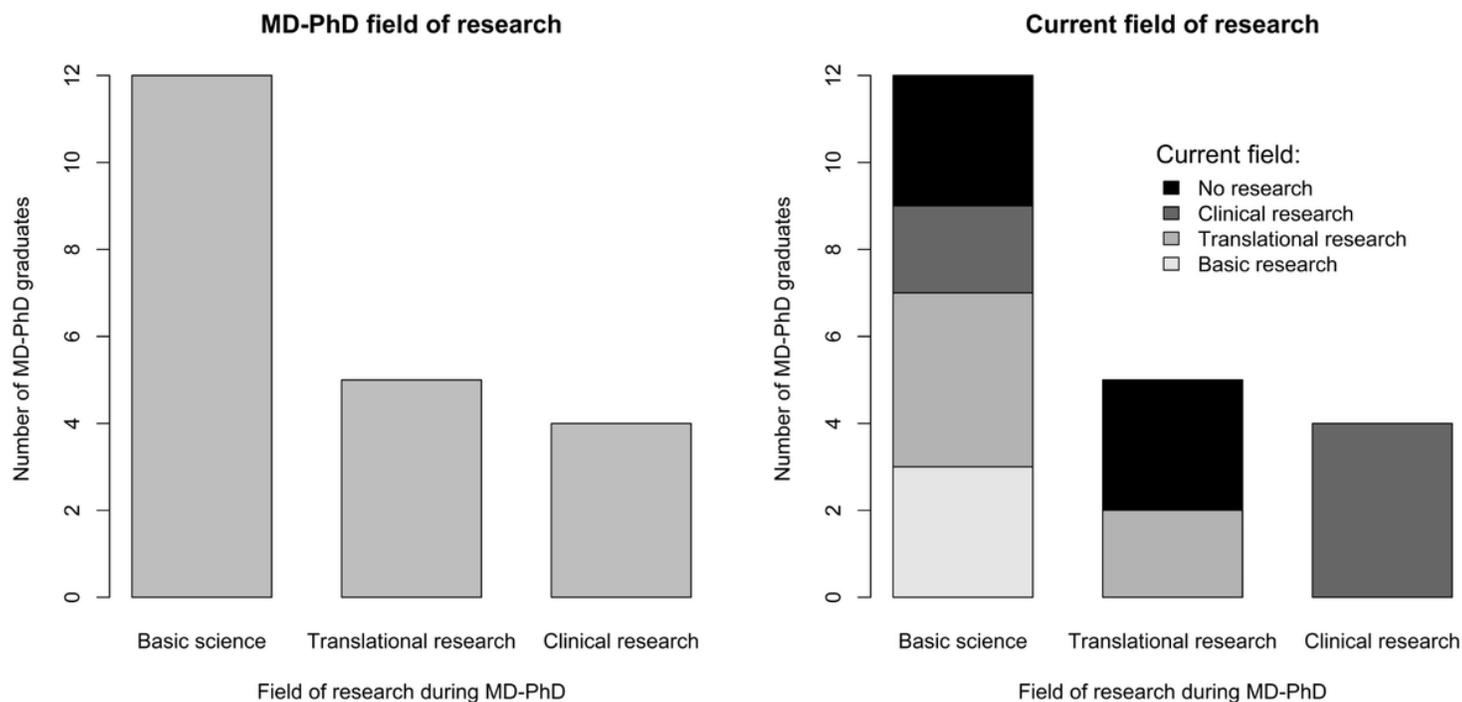


Figure 2

Field of research during MD-PhD training (left panel). Field of research in the current situation (right panel), represented in relation to the field of research during MD-PhD training.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table3.docx](#)
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