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# Predictors of medical students' research degree pursuit: a convenience poll pilot study

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Aim: The evidence about factors predicting the desire of medical graduates for pursuing research careers are inconsistent. Identification of factors which influence decision for pursuing research career would be important information to medical schools to improve research environment for students. For that reason, we performed an international survey of medical students to analyze the factors predicting research careers in medicine.

Methods: An international online survey of undergraduate and graduate medical students was performed, using the using the data from *Res Medica* student journal database, about their research activities, future interests and plans and desire to pursue research careers.

Results: In total, 486 students took the survey. Logistic regression revealed a single significant factor influencing medical students' desire to pursue a research degree: increased motivation for participation in research in future (R2=0.33).

Conclusion: In order to encourage students and training doctors to more readily engage in research, exposure to research and research participation could have an incremental value to existing research education in medical schools.

## Background

A career in research is one of the many paths that medical students can take during their professional life. It is estimated that 17% of first year medical students are interested in an exclusively research-oriented career [1].

Male gender, less financial concerns, having a higher degree before matriculation and perceived competitiveness of the (desired) residency programs have been described as factors related to research involvement and scientific productivity of students [1]. A recent retrospective study also showed that a person who will start a research career in medi-

cine is more likely to be male, have low debt at graduation, have strong positive attitudes towards research at graduation and have a greater social pressure towards research [2]. Senior students appear to be more interested in research compared to junior students [3]. For these reasons, it was recommended that students' exposure to research during medical school be increased [4]. However, another study claimed that the primary reasons for trainees taking up research were the desire to increase their competitiveness for a residency application and the time gained to pursue other opportunities [5]. A systematic review revealed four groups of variables associated with research career choice in medicine: personal values, gender and social factors, research interest and financial issues [6], but concluded that the true reasons that affect a student's decision for a research career remained insufficiently clarified. Finally, a recent review points out that the reasons for a research career choice may be country-specific, that more emphasis should be put on environmental factors [7], and that studies should be performed cross-culturally to compare the factors which influence one's decision to pursue a research career. The aim of this study was to conduct a pilot study to determine the common factors influencing medical trainees' self-reported desire for the pursuit of a research career using a convenience sample through online survey, using an opportunity of having contacts from a student journal.

## Methods

### *Study design and participants*

In order to examine the attitudes of medical students towards research careers, we created an online survey (**Appendix**). Most of the participants were medical undergraduate and graduate students who did yet complete their current medical degree training at the time of the survey (a complete list of countries and nationalities of the participants can be found in the **Appendix**).

### *Setting*

Medical schools in the UK identified through the authors of articles published in the *Res Medica* student journal (Journal of the Royal Medical Society, http://journals.ed.ac.uk/resmedica), which contains a list of all medical schools in the UK and international medical schools whose students published in *Res Medica*. Medical schools were contacted through their administrative offices. After obtaining e-mail addresses advertised on university websites, we sent a message to students containing a link to the online survey and invitation to participate, as well as to share the survey with their student colleagues and with relevant organizations/student groups. We used Survey Monkey (SVMK Inc, Dublin Ireland), where the IP address memorization was disabled, in order to ensure anonymity of the participants. Data collection started on 13 September 2016 and finished on 30 November 2016.

## Funding and ethical approval

The study was sponsored by the University of Split School of Medicine with the "Professionalism in Health Care" research grant funded by the Croatian Science Foundation (Grant No. IP-2014-09-7672) and approved by the Ethics Committee of the University of Split School of Medicine.

## Variables

The survey gathered students' responses to questions about the: (1) *demographic variables* (gender, age, nationality and current stage of training), (2) *medical school program and characteristics* (the country, duration and whether research is mandatory), (3) *prior research experience* (research during medical school, positivity/negativity of research experience, publications, previous degrees, and presence of a role model in research), (4) *attitudes about research in medicine* (desire of pursuing research in their career, frequency of advice-seeking about research), (5) *encouraging* and *discouraging factors* for involvement in research and (6) *possible field of interest* if they were to participate in research during their career. The questionnaire can be found in the **Appendix**.

## Data management

The participants' responses are kept at the University of Split School of Medicine. The raw data can be obtained from the authors upon request.

## Study size

The sample size was calculated using the online sample size calculator for one proportion (http://epitools.ausvet.com.au). We used previously reported data which indicated that 17% of the students were interested in research during their medical careers [1], with a 95% confidence interval and 5% precision. This resulted in a minimal sample size of 217 participants.

## Statistical analysis

We used frequencies and percentages to describe the demographic characteristics and responses, and medians with 95% confidence intervals (CI) for continuous variables. Due to the large number of comparisons, the level of significance was decreased to P=0.005, in order to avoid Type I error. The chi-square test was used for testing the differences between categorical variables and the Mann-Whitney U test for the differences between ordinal variables and non-normally distributed variables. We posed the question, "Do you intend to pursue a further research degree at some point in your career?", which was answered as a binary outcome in order to differentiate the characteristics that signified a greater commitment to research. Logistic regression was used to examine the significant differences in answers between the groups who intended to pursue a post-graduate research degree and who did not, where all variables with significant differences were entered in the regression model and assessed for possible prediction. The size of the predictors was expressed as odds ratios (OR) with 95% CI and the proportion of explained variance of the

criteria was expressed with McFadden $R^2$. SPSS 18 (IBM Corp., released 2010, IBM SPSS Statistics for Windows, Version 19.0, Armonk, NY, USA) was used for all statistical analysis.

## Results

In total, 486 participants took the survey. The sample structure was predominantly female (n=343, 67.1%) and the majority of participants were in the 21-25 age group (n=326, 64.8).

More than half of the respondents who provided an answer to the question about the intention to pursue a research career stated that they intended to pursue a postgraduate research degree, and around one-third of them had already published a paper (**Table 1**). Although most of the participants had exposure to research at some point in their education (**Table 1**). However, most of those who had research as a compulsory part of their education reported that the exposure had increased their interest in research (**Table 1**). The respondents who reported that they were more likely to pursue a research degree sought advice and attended seminars about research more often than those who were less likely (**Table 2**). Those who planned to pursue a research degree and those who did not differed significantly in background characteristics (**Table 2**) and attitudes toward medical research (**Table 3**).

Table 1. Research education characteristics of the sample (N=486)

| Characteristics | n (%) | | Df | $\chi^2$ | P |
|---|---|---|---|---|---|
| How many times did you attend seminars on research? | | | | | |
| 0 times | 160 (31.3) | | | | |
| 1-3 times | 258 (50.3) | | | | |
| 4-6 times | 44 (8.6) | | 4 | 485.15 | **<0.001** |
| 7-9 times | 10 (2.0) | | | | |
| More than 10 times | 14 (2.7) | | | | |
| | Yes | No | | | |
| Involved in research | 349 (71.8) | 137 (28.1) | 1 | 92.48 | **<0.001** |
| Research increased interest* | 207 (59.3) | 142 (41.7) | 1 | 12.01 | **<0.001** |
| Research was a compulsory part of education | 213 (43.8) | 273 (56.2) | 1 | 7.41 | **<0.001** |
| Published a paper | 172 (35.4) | 314 (64.6) | 1 | 41.49 | **<0.001** |
| Pursued a research degree | 163 (33.5) | 323 (66.5) | 1 | 52.68 | **<0.001** |
| Intend to pursue a research degree† | 167 (61.9) | 103 (38.1) | 1 | 39.64 | **<0.001** |

$\chi^2$ – chi squared; Df – degrees of freedom
*Chi-square was calculated only for the students who were involved in research (N=349). Significant differences are in bold.
†The option "not sure" was removed from the analysis, leaving 270 participants in the sample.

The students intending to pursue a research degree were more likely to agree with the statements that it is important to have a role model in their academic career, that research should be a compulsory part of medical education, that research is one of doctors' princi-

Table 2. Comparison of students who do not (n=103) and do (n=167) intend to pursue a research degree on role model preference, encouraging and discouraging factors for pursuing a research career and research area preferences

| Variable | No. (%) of students who intend to pursue a research degree (N=270) Yes (%) | Df | $\chi^2$ | P |
|---|---|---|---|---|
| Gender | | | | |
| Male | 66 (39.5) | 1 | 4.27 | 0.039 |
| Female | 101 (60.5) | | | |
| Age group | | | | |
| 15 to 20 | 33 (19.8) | 5 | 18.27 | **0.003** |
| 21 to 25 | 110 (65.9) | | | |
| 26 to 30 | 19 (11.4) | | | |
| 31 to 40 | 2 (1.2) | | | |
| 41 to 50 | 2 (1.2) | | | |
| 51 and older | 1 (0.6) | | | |
| How many times did you attend seminars on research? | | | | |
| 0 times | 27 (16.2) | 4 | 45.33 | **<0.001** |
| 1-3 times | 96 (57.5) | | | |
| 4-6 times | 26 (15.6) | | | |
| 7-9 times | 7 (4.2) | | | |
| More than 10 times | 11 (6.6) | | | |
| Research was a compulsory part of education | 73 (43.7) | 1 | 0.10 | 0.758 |
| Published a paper | 77 (46.1) | 1 | 2.71 | 0.100 |
| Involved in research | 124 (74.3) | 1 | 0.01 | 0.932 |
| Research increased interest | 21 (12.6) | 1 | 51.48 | **<0.001** |
| Pursued a research degree | 72 (43.1) | 1 | 4.58 | 0.032 |
| Role model*: | | | | |
| Professor | 62 (37.1) | 1 | 8.38 | **<0.001** |
| Clinical tutor | 31 (18.6) | 1 | 6.01 | 0.014 |
| Another student | 12 (7.2) | 1 | 3.56 | 0.059 |
| Medical figure | 10 (6.0) | 1 | 0.57 | 0.449 |
| Encouraging factors to pursue a research career*: | | | | |
| Protected time for research while doing clinical work | 142 (85.0) | 1 | 22.74 | **<0.001** |
| More prestige given to medical academics | 41 (24.6) | 1 | 5.67 | 0.017 |
| Opportunities to travel overseas (short term or long term) | 96 (57.5) | 1 | 7.12 | 0.008 |
| Funding | 136 (81.4) | 1 | 12.36 | **<0.001** |
| Interest in research area | 135 (80.8) | 1 | 0.94 | 0.333 |
| Improved career opportunity | 115 (68.9) | 1 | 6.53 | 0.011 |
| Being part of research groups/initiative teams | 80 (47.9) | 1 | 17.66 | **<0.001** |
| Discouraging factors to pursue an academic career*: | | | | |
| Limited time/ other priorities | 132 (79.0) | 1 | 0.81 | 0.367 |
| Lack of prestige given to medical academics | 20 (12.0) | 1 | 0.03 | 0.875 |
| Limited opportunities in your place of training/practice | 100 (59.9) | 1 | 4.54 | 0.033 |
| Lack of funding | 136 (81.4) | 1 | 5.56 | 0.018 |
| Lack of research groups/initiative teams | 53 (31.7) | 1 | 1.29 | 0.255 |
| Lack of interest in research | 85 (50.9) | 1 | 15.11 | **<0.001** |
| If you were an academic researcher, what would be your research area?* | | | | |
| Basic sciences (e.g. genetics, microbiology, immunology) | 73 (43.7) | 1 | 16.65 | **<0.001** |
| Primary care/ general practice | 40 (24.0) | 1 | 8.53 | **0.003** |
| Tertiary care | 59 (35.3) | 1 | 11.16 | **0.001** |

Table 2. Continued

| Variable | No. (%) of students who intend to pursue a research degree (N=270) Yes (%) | Df | $\chi^2$ | P |
|---|---|---|---|---|
| Medical technology | 36 (21.6) | 1 | 1.03 | 0.310 |
| Patient safety | 28 (16.8) | 1 | 0.01 | 0.955 |
| Treatment efficacy and development | 81 (48.5) | 1 | 3.48 | 0.062 |
| Public health | 54 (32.3) | 1 | 0.19 | 0.658 |
| Medical education | 55 (32.9) | 1 | 0.25 | 0.615 |

$\chi^2$ – chi squared; Df – degrees of freedom
*Chi-square was calculated only for the students who were involved in research (N=349). Significant differences are in bold.
†More than one answer was possible.

pal responsibilities, along with patient care and teaching, that research improves patient care and that it is important to be treated by a doctor experienced in research (**Table 2**).

In the analysis on the sample of 270 respondents who provided clear (they stated either YES or NO and did not choose the option "Not sure") answer to the question about the research degree pursuit, the only significant predictor of the desire to pursue research degrees was the self-reported desire to participate in research in the future (OR=10.99, 95% CI 6.19 to 19.49), explaining around one-third of the variance of the criteria (McFadden $R^2$=0.33, $P$<0.005).

Table 3. Comparison of attitudes towards medical research among students who do (n=167) and do not (n=103) want to pursue a research degree*

| | Md (95% CI) | | |
|---|---|---|---|
| Survey question | Do not intend to pursue research degree (n=103) | Intend to pursue research degree (n=167) | P† |
| How likely are you to participate in medical research at some point in the future? | 3.0 (2.0 to 3.0) | 4.0 (3.0 to 4.0) | **<0.001** |
| It is important to have a role model in order to pursue an academic career. | 4.0 (4.0 to 4.0) | 4.0 (4.0 to 5.0) | 0.002 |
| Research should be a compulsory part of medical education. | 3.0 (3.0 to 4.0) | 4.0 (4.0 to 5.0) | **<0.001** |
| Research should be one of the doctors' principal responsibilities, along with patient care and teaching. | 2.0 (2.0 to 3.0) | 4.0 (3.0 to 4.0) | **<0.001** |
| Medical research improves patient care. | 4.0 (4.0 to 4.0) | 4.0 (4.0 to 5.0) | **<0.001** |
| Medical research compromises patient care. | 2.0 (2.0 to 2.0) | 2.0 (2.0 to 2.0) | 0.308 |
| Patients consider it is important to be treated by a doctor with experience in medical research. | 2.0 (2.0 to 2.0) | 2.0 (2.0 to 3.0) | **<0.001** |

Md – median; CI – confidence interval
*A higher point indicates greater agreement with the statement.
†Mann Whitney nonparametric test for independent samples. Significant differences are in bold.

## Discussion

Our study identified a single predictor of students' wish to choose a career in medical research – increased self-reported desire for participation in research in the future.

This result should be interpreted in view of several limitations. There is a potential for selection bias as the study respondents were recruited on a voluntary basis: students who

are already quite interested in research are more likely to have answered the questionnaire that had the title 'Medical Student Research Survey'. For the same reason, we were not able to obtain an accurate response rate. The baseline characteristics were widely variable, so it is difficult to gauge how representative our population is from the rest of the medical students in the countries participating in the survey. Future research should repeat this study in a larger sample with a more systematic sampling procedure to determine whether there are any other environmental factors which contribute to the deisre to pursue a research fegree. We did not perform any follow-up, so we cannot answer whether the students who intended to pursue research or a research degree in fact eventually did. For a closer understanding of the predictors which influence medical students' research career decisions, a cohort study would be more suitable. Furthermore, we used a structured online questionnaire, with little space for free-text answers. There may have been other factors that significantly affected students but which we did not address, but through logistic regression analysis we identified a single factor which predicted the decision and that single factor accounted for one third of the variation of the criteria. We did not ask for information on respondents' financial status, personality traits or academic performances, which could all influence the association to one's decision to pursue post-graduate research. Future research should focus on elucidating how many students with genuine interests in research are turned away due to the common deterrents identified in our survey: lack of motivation, time, funding or opportunities.

Contrary to previous studies that emphasized that the decision to pursue a research career is influenced by many different environmental factors, our study identified interest for research as the only predictor of the wish for a research career. The students who stated that they are likely to participate in research also said that they are likely to pursue a full-time academic post-graduate degree in the future. However, a significant minority reported having an interest in research without an interest in pursuing a full-time degree. For many such cases, exclusive time for research whilst carrying out clinical duties emerged as an important determinant of whether they were going to participate in research [6]. The majority of the participants reported that they have been involved in research as a medical student. Of these students, many of them reported that their interest was boosted during the previous exposure to research. This is in line with previous findings that suggest that research participation during medical school can increase the likelihood of pursuing a research career and boost academic productivity [7-9].

The potential implication of the results of this preliminary study would be the emphasis on the importance of the integration of research into the undergraduate medical curriculum. It is postulated that if a student is exposed to more research opportunities earlier in the medical curriculum, it is more likely that he/she will feel confident to initiate research without being pressured by mentors or professors. However, in order to successfully engage students in research during the early years of medical school, allocated research time must be flexible and cover the area of students' interests [9]. A possible solution could be the inclusion of journal editors in standard education, which could possibly have an effect on the further academic development of medical professionals [10] or adoption of existing strategies in the curriculum [11].

## Conclusion

Based on the findings of this study, motivational factor was defined as the single factor which predicted the decision for pursuing a research career. Therefore, the recommendation for medical education institutions would be to increase the exposure of students to research activities and to provide them an opportunity to become familiar with the research aspects of the medical profession. In this way, research exposure would motivate a greater number of students for further education in that area.

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