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Research Involvement, Specialty Choice, and Emigration Preferences of Final Year Medical Students in Croatia

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Aim To explore involvement in scientific research, choice of specialty, and readiness to emigrate among graduating medical students in Croatia.

Methods A total of 312 out of 408 (76%) final year medical students of all Croatian Medical Schools (Zagreb, Rijeka, Osijek, and Split) graduating in 2004 answered a questionnaire designed for this study, including questions on scientific involvement, desired specialty, and emigration preferences.

Results During undergraduate study, 71 (23%) students have been involved in scientific projects. However, only 27 of them (38%) succeeded in publishing their results. Students identified poor project management as the most common reason for publication failure. Specialty choice varied among the four medical schools in Croatia but internal medicine, pediatrics, and surgery were usually highly preferred in all schools. If they failed to get the desired specialty, 104 (33%) students would consider emigration.

Conclusion There is a clear need for improvement in the management of students' research projects in Croatia, enabling enthusiastic medical students to publish the results of their work and retain their interest in science. The analysis of change of the desired specialties throughout the undergraduate study suggests an increased interest in the "controllable lifestyle" specialties. Failure to get the desired specialty would result in emigration for many students.

Interest in science among students in the field of biomedicine is decreasing, and strategies to reverse this decline will soon be needed (1,2). There are still doubts whether medical students should complete a research project as a requirement for graduation (3), although some studies indicated that a mandatory course in scientific methodology and communication has positive and encouraging effects on education in research methodology and writing (4). Students' contribution to scientific work and benefits for professional career development were identified in a number of studies (5-7). Medical students had more positive attitude towards science and less positive attitude towards alternative medicine than students of economics and business or electrical engineering, indicating a positive curricular impact on medical students' attitudes towards science (8).

A turning point in every student's and young doctor's life is a decision about her or his future specialty. Choosing a specialty is not an easy decision, and it can be influenced by many factors. Most students tend to make the decision early in their education (9,10), which impairs the development of a realistic view of their needs, challenges, and opportunities of a chosen profession (11,12). Dissatisfaction with the chosen specialty some-

times induces a wish for specialty change. As much as a third of young doctors change their original specialty choice (13,14) due to a number of reasons (15), usually within 5 years of complete training (16). Perception of controllable lifestyle accounts for most of the variability in recent changing patterns in the specialty choices of graduating US medical students (17). For example, the interest in surgery is decreasing (18-21), and is varying in family practice (22-24), whereas a group of specialities known as controllable lifestyle specialities are generally drawing increased interest (17,25-27). This group involves specialities such as radiology, dermatology, neurology, ophthalmology, pathology, and psychiatry (28). The impact of decreased interest in choosing such a demanding specialty as surgery has reached alarming proportions, reducing competitiveness and creating a basis for potential shortage of surgical residents in the USA by 2005 (29).

As emigration of young people with academic degree ("brain-drain") used to be a major issue in Croatia during the post-war period, in this study we attempt to show to which extent emigration willingness is present among contemporary graduating students.

The aims of this study were to show research involvement, specialty choice, and emigration preferences among final year medical students graduating from the four medical schools in Croatia in 2004.

Subjects and Methods

Subjects

For the purpose of this study, we surveyed final year medical students of the four medical schools in Croatia, in Zagreb, Rijeka, Osijek, and Split, whose basic descriptors are given in Table 1. The questionnaire was filled out at all four medical schools during October 2003 – January 2004.

Questionnaire

Questionnaire consisted of 22 questions with three major question groups: research involvement, specialty choice, and emigration preferences. Students were asked about their age, gender, enrollment year, grade point average, and if they had repeated any year(s) during medical education.

The part of the questionnaire dealing with research involvement consisted of questions on students' scientific activities during medical studies, departments where they worked, papers they published, and possible reasons for publication failure. Students were also asked if they planned to be involved in scientific research during their professional career.

Questions on specialty choice aimed at defining which specialties were desired most among students. Reasons for the desired specialty choice were recorded in the form of open ended response, and later divided into five categories and analyzed. Special interest was paid to the fraction of students who had some specialty in view upon entering medical school, but changed their wish during the course of their studies.

Students were further asked whether they believed that they would get the desired specialty in Croatia and whether they would be ready to emigrate and work elsewhere if they did not get it. The targeted countries, as well as reasons for potential emigration were recorded.

Table 1. Basic descriptors of final year medical students from Croatia, graduating in 2004

	Medical school				
Descriptor	Zagreb	Rijeka	Osijek	Split	Total
Total number of students*	193	43	38	38	312
Response rate (%)	85	46	88	84	76
Gender:					
No. of female students	133	25	23	25	206
No. of male students	60	18	15	13	106
F/M ratio	2.2	1.4	1.5	1.9	1.94
Age (median, range):					
female students	25 (24-29)	25 (23-32)	25 (24-28)	25 (24-27)	25 (23-32)
male students	25 (24-30)	25 (24-26)	26 (24-28)	25 (24-29)	25 (24-30)
Grade point average (mean±SD):†					
female students	3.96±0.45	3.78±0.39	3.68±0.36	3.79±0.37	3.88±0.43
male students	3.94±0.47	3.96±0.44	3.61±0.43	3.85±0.46	3.89±0.47
total	3.95±0.53	3.86±0.50	3.65±0.54	3.80±0.59	3.89±0.54
Percent of students failing a year	29.5	20.9	52.6	26.3	30.8

*One questionnaire from the Zagreb Medical School and 8 from the Rijeka Medical School were excluded because of missing, uninformative, or misleading answers.
†Scale from 2 – satisfactory to 5 – excellent

Statistical Analysis

Several questions had open ended response, and the first two authors coded the answers independently. First, all answers were read in order to make a comprehensive answer list. The list was later coded into appropriate categories and open ended answers were then coded on the basis of the list. Differences in the coded answers were re-evaluated, resulting in a uniform coding. A small number of answers (n = 7) were not informative and could not be coded, and these were excluded from the study.

A total of 9 surveys were completely excluded from the analysis, due to clearly uninformative or intentionally misleading answers.

Statistical analysis for categorical data was performed with the χ^2 test. T-test was used for grade point average analysis. Probability of nil-hypothesis lower than 0.05 was considered statistically significant. Statistical analysis was performed with SPSS 10.0.1 (SPSS Inc., Chicago, IL).

Results

Subjects

The final sample consisted of 312 students, which represents 76% of all final year medical students from Croatia (n = 408), in the 2003/2004 academic year. Comparison of students that did not repeat any year of study (non-failed) with the ones that did (failed), indicated significant differences in grade point average, scientific project involvement ($\chi^2_1 = 5.17$, $P = 0.023$), and the number of published scientific papers ($\chi^2_1 = 13.78$, $P < 0.001$) (Table 2).

Research Involvement

During undergraduate study, a total of 71 (23%) students reported some form of research involvement. The number of students involved in scientific work varied significantly between the four medical schools ($\chi^2_3 = 10.62$, $P = 0.014$) (Table 3).

A total of 27 students involved in the scientific research reported authorship of 69 papers. Only 9 of the surveyed final year medical students from Croatia (2.9%) published a total of 10 papers cited in journals indexed in bibliographic databases of the Institute for Scientific Information, such as *Web of Science* and *Current Contents*. When publication success was examined, the lowest percentage of published results was recorded among students from the Zagreb Medical School (Table 3). "Poor project management" was the most frequent reason for publication failure (Table 3).

Table 2. Comparison of non-failed and failed final year medical students from Croatia, graduating in 2004

Characteristics	Regular students	Students failed at least a year
No. (%) of students	216 (69)	96 (31)
Average mark score (mean±SD)	4.05±0.41	3.49±0.34*
Students involved in a scientific project (No., %)	58 (82)	13 (18)†
Total number of published papers (No., %)	62 (90)	7 (10)‡
Don't think they will get wanted specialty in Croatia (No., %)	91 (42)	46 (48)
Willingness for emigration if they would not get desired specialty in Croatia (No., %)	68 (75)	36 (78)
Specialty choice (No., %):		
family medicine	7 (3)	8 (8.3)
internal medicine	36 (17)	10 (10)
pediatrics	26 (12)	9 (9.4)
surgery	13 (6)	6 (6.3)
obstetrics and gynecology	13 (6)	4 (4.2)
other§	75 (35)	36 (37.5)
doesn't know yet	13 (6)	6 (6)
none stated	33 (15)	17 (18)

*t=3.49, P<0.001.
†χ^2_1=5.17, P=0.023.
‡χ^2_1=13.78, P<0.001.
§Other: anesthesiology, psychiatry, radiology, oncology, pathology, dermatology, physical medicine, infectology, orthopedics, neurology, ear-nose-throat, ophthalmology, sports medicine.

The enquiry into students' readiness to participate in scientific research during their professional career showed that 6 (1.9%) students reported a wish for an exclusively science-oriented career, 244 (78%) students reported their wish for a clinical career supplemented by scientific work, whereas 62 (20%) students reported no interest at all in future scientific work.

Grade point average of students involved in scientific research was higher than of students without such experience (4.11 ± 0.41 vs 3.81 ± 0.46; t = 3.49, $P < 0.001$). No evidence of a gender gap in scientific involvement was observed ($P = 0.490$, $\chi^2_1 = 2.42$).

Specialty Choices

Upon entering medical school, a total of 99 (32%) students from the four medical schools already had a desired specialty, and there was no significant difference among the four medical schools ($\chi^2_3 = 0.47$, $P = 0.926$). During the course of medical education, a total of 53 students (54%) changed their originally desired specialty. Three categories of changes were recorded: 1) a change from non-controllable lifestyle to controllable lifestyle specialty; 2) a change from controllable lifestyle to non-controllable lifestyle specialty; 3) a change within the same specialty group. Signifi-

Table 3. Scientific involvement, publishing results, motivation for desired specialty choice and readiness to emigrate among Croatian final year medical students graduatimg in 2004

	No. (%) of students in				
Medical School	Zagreb	Rijeka	Osijek	Split	Total
Total number of students	193	43	38	38	312
Scientific involvement	57 (30)	4 (9.3)	4 (10.5)	6 (16)	71 (23)
Research activity in study year:					
1	1 (1.8)	0	0	0	1 (1.4)
2	10 (18)	1 (25)	1 (25)	0	12 (17)
3	18 (32)	3 (75)	0	1 (17)	22 (31)
4	16 (28)	0	0	2 (33)	18 (25)
5	6 (10.5)	0	1 (25)	2 (33)	9 (13)
6	6 (10.5)	0	2 (50)	1 (17)	9 (13)
Research field:					
basic sciences	23 (40)	3 (75)	2 (50)	5 (83)	33 (47)
clinical sciences	25 (44)	1 (25)	0	0	26 (37)
public health	1 (1.8)	0	0	0	1 (1.4)
multiple	8 (14)	0	2 (50)	1 (17)	11 (14)
Outcomes of research activity:					
No. of students that managed to publish their paper	17 (30)	3 (75)	3 (75)	4 (67)	27 (38)
No. of papers published in which type of publication:					
total number	50	6	7	6	69
journals indexed in ISI*	9	1	0	0	10
other indexed journals	2	0	1	0	3
symposia and meetings	37	5	2	6	50
other	2	0	4	0	6
Reasons for publishing failure:					
poor project management	21	0	3	5	29
poor mentor guidance	11	1	0	0	12
other	3	0	0	0	3
Motivation for specialty choice:					
ambition	42 (22)	10 (23)	12 (32)	4 (10)	68 (22)
compassion	19 (9.8)	3 (7)	4 (10)	6 (16)	32 (10)
quality of life	30 (15)	0	9 (24)	5 (13)	44 (14)
resignation	17 (8.8)	7 (16)	2 (5.3)	10 (26)	36 (12)
confusion	28 (15)	3 (7)	2 (5.3)	4 (10)	37 (12)
no answer	57 (30)	20 (47)	9 (24)	9 (24)	95 (30)
Students opinion on getting the desired specialty in Croatia:					
will not get desired specialty	80 (41)	19 (44)	11 (29)	27 (71)	137 (44)
ready to emigrate	60 (75)	18 (95)	9 (82)	17 (63)	104 (76)

*Institute for Scientific Information, *Current Contents* database.

cant differences were observed among the three groups ($\chi^2_2 = 16.45$, $P < 0.001$), with non-controllable lifestyle to controllable lifestyle change determining the trend in the changed group ($\chi^2_2 = 8.16$, $P = 0.004$).

At graduation, a total of 276 (89%) students from the four medical schools had at least one specialty choice. The greatest proportion was recorded in Zagreb (93%) and the lowest in Rijeka (72%). The most desired specialties were internal medicine in Zagreb (18%), pediatrics and gynecology in Rijeka (13%), pediatrics in Osijek (16%), and surgery in Split (11%) (Fig. 1). A total of 18 students from Zagreb (9.3%) reported that they would like to work in the pharmaceutical industry, whereas 7 (3.6%) of these indicated pharmaceutical industry as the only desired professional orientation.

We found significant differences in the motivation for the desired specialty choice among the four examined medical schools ($\chi^2_3 = 33.26$, $P = 0.004$). However, the most common reason for specialty choice was "ambition," followed by the "quality of life" (Table 3).

Specialty preferences according to gender were analyzed for the whole sample. Significant differences were identified for four specialties. Male students preferred surgery ($\chi^2_1 = 6.25$, $P = 0.012$) and orthopedic surgery ($\chi^2_1 = 4.26$, $P = 0.038$), whereas female students preferred obstetrics and gynecology ($\chi^2_1 = 14.23$, $P < 0.001$) and pediatrics ($\chi^2_1 = 21.45$, $P < 0.001$). There was no gender preference in the choice of internal medicine and family medicine, whereas sample sizes were too small for the analysis of differences in other specialties.

When the desired specialty was correlated to the department in which students conducted scientific research, only 13 out of 71 students (18%) worked in the department that was ei-

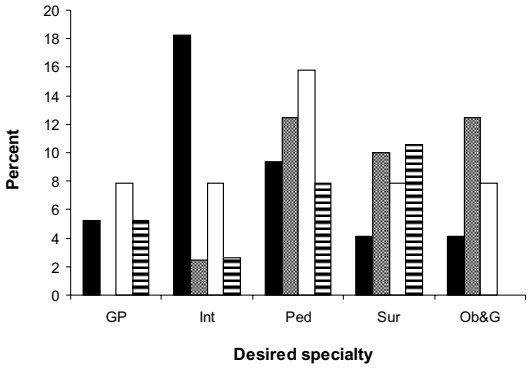

Figure 1. The most desired specialties among final year medical students from the four medical schools in Croatia, graduating in 2004. Closed bars – Zagreb; grey bars – Rijeka; open bars – Osijek; horizontal lines – Split. GP – General Practice; Int – Internal Medicine; Ped – Pediatrics; Sur – Surgery; Ob&G – Obstetrics and Gynecology.

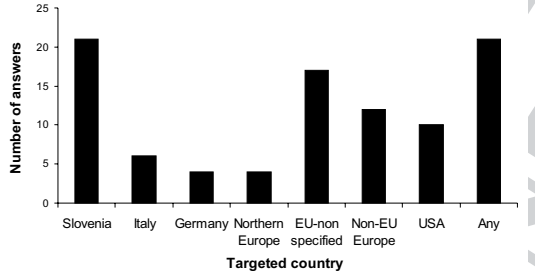

Figure 2. Targeted emigration countries by Croatian final year medical students, graduating in 2004 (n=312).

ther the same or closely related to their desired specialty.

Emigration Preferences

The enquiry into the students' opinion on getting the desired specialty in Croatia revealed a significant difference among the four medical schools ($\chi^2_3 = 18.51$, $P < 0.001$), with relatively similar percent of students from Zagreb and Rijeka thinking they would get the desired specialty (53% and 54%, respectively). Students from Osijek were most optimistic about getting the desired specialty (71%), whereas those from Split were least optimistic (21%). A total of 137 students (44%) did not expect to get the desired specialty in Croatia. They were further asked if they would consider emigration. There were no differences among the four medical schools, ($\chi^2_3 = 2.94$, $P = 0.401$), with a total of 76% (104/137) of the students who would consider emigration if they failed in pursuing the desired specialty in Croatia (Table 3).

The target group of countries (for 95 students who reported it) was European Union (59%), with Slovenia at the top of the list (Fig. 2). The most frequent reasons for emigration involved "better earnings" (47%) and "getting a job" (27%). Other reasons involved "better organization of the health system" (14%), "better opportunities for career advancement" (7.6%), and "more respect for medical profession in the society" (4.4%).

Further analysis of emigration yielded no significant differences in grade point average between students willing to emigrate and those wishing to stay (3.86 ± 0.48 and 3.86 ± 0.44, respectively; $t = -0.065$, $P = 0.948$). There was no evidence of gender differences in emigration preferences, either in the entire sample or in medical school sub-samples ($\chi^2_3 = 2.42$, $P = 0.490$). There were no differences in emigration preferences between regular students and those failing any academic year ($\chi^2_1 = 0.72$, $P = 0.396$) (Table 2).

Discussion

Research involvement of medical students from Croatia reflects their previously reported positive attitude towards science (30,31). Interestingly, as much as 82% of students were appointed to the scientific post that was not indicated as their desired specialty. Besides that, not all students who started scientific projects published their results. As poor project management was the most frequently reported reason for publishing failure, faculty offices should pay special attention to enhancing students' chances of producing and publishing the results of their work in the form of a scientific paper. A possible solution could be starting a students' journal club or special medical school task group charged with the introduction of elective subject oriented towards facilitating publication of students' papers.

The analysis of students' publications indicated that only 2.9% of medical students in Croatia published a paper in major international journal. Most students' publications come from symposia and meetings. Considering the importance of publishing the scientific paper for scientific and professional career advancement, special attention should be paid to increasing medical students' attendance on different scientific symposia

and meetings. This could be achieved either through more successful promotional campaign of students' happenings, e.g. student congresses (32), or through structured guidance by medical school staff.

Desired specialty preferences show variation through time, and those identified by this study were different from the studies carried out in other medical schools (22,33,34). High percent of students who changed the initially desired specialty during undergraduate medical education is not a new phenomenon (10), and could hypothetically be considered as a positive trend; students' pre-medical wishes and visions are usually based on skewed image of their idealistic beliefs, rather than realistic professional challenges and opportunities necessary for rational specialty choice (11).

Our study shows an increasing interest in the controllable lifestyle specialties among Croatian students who changed their original specialty during undergraduate study. However, the size of the study sample was not large enough for any substantial conclusions. When motivation for desired specialty choice was examined, a relatively high level of confusion and resignation was observed among all students. Whereas a certain percent of medical doctors leaving medicine is always expected, a high level of dissatisfied graduating students indicates negative overall attitude towards entering the Croatia's health system. The trend is even more reinforced with relatively large number (9.3%) of students from Zagreb Medical School considering non-medical careers (such as pharmaceutical industry). The probable causes, as indicated by students, were uncertainty of finding a job, poor interpersonal relationships among colleagues, high responsibilities and low salaries, a constant pressure of financial constraints, and diminishing respect for the profession in contemporary Croatian society.

Gender differences in specialty choice were expected, and have been reported before (18,33,35-38). However, research from other countries found much lower overall proportion of female students than in our sample (37,39,40), whereas other studies (41,42) and the present study indicate higher percentage of female medical students at the Zagreb Medical School.

The importance of grade point average as a good predictor of a successful academic career has been described previously (43). In the present study, it was difficult to establish if a higher grade point average was the reason for starting a scientific project, or the scientific project caused the increase in grade point average or these two occurred independently. With long term increase in grade point average (44), it remains for future analyses to establish a link between grade point average and scientific projects in more detail.

A global problem of migration of medical professionals from developing countries has become major concern (45), as well as emigration from eastern into western EU countries, as seen in the case of the Czech Republic (46). A country which loses its medical professionals should examine the social relationships within the profession and should investigate whether the opportunities for deriving professional satisfaction from everyday work exist or these have been thwarted by the hierarchy, conservatism, cronyism, and a general lack of comprehension of what good medical care is about (47). Readiness to emigrate remains a hot topic among medical students in Croatia, too. Without previous data, any comparison is impossible but high percent of graduating medical students identified in this study still consider emigration as an alternative to failure in getting the desired specialty in Croatia. With recent changes in the European Union political scheme, high proportion of students aiming at Slovenia will be forced to reconsider their options, as Slovenia now, as a member of the European Union, is bound by EU legislative, making it more difficult for non-EU members to get a job.

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