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Attitudes of medical students to general practice: a multinational cross-sectional survey

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Abstract

Background: A shortage of general practitioners (GPs) is common to many European countries. To counteract this, it is essential to understand the factors that encourage or discourage medical students from choosing to become a GP

Objective: To evaluate medical students' attitudes towards general practice and to identify factors that discourage them from considering a career as a GP.

Methods: In this multinational cross-sectional online survey, 29 284 students from nine German, four Austrian and two Slovenian universities were invited to answer a questionnaire consisting of 146 closed and 13 open-ended items.

Results: Of the 4486 students that responded (response rate: 15.3%), 3.6% wanted to become a GP, 48.1% were undecided and 34.6% did not want to be a GP. Significant predictors for interest in

Key Messages

- Only a small number of students want to become a general practitioner (GP).
- A high number of students are undecided.
- Decisions are influenced by modifiable factors and not only by student characteristics.
- Students should gain practical experience of general practice early on in their studies.
- A positive attitude towards the content of a GP's work is important.
- It is important to have positive experiences of organizational and practical aspects.

becoming a GP were higher age [odds ratio (OR) = 1.06; 95% confidence interval (CI) = 1.02–1.10], positive evaluation of the content of a GP's work (OR = 4.44; 95% CI = 3.26–6.06), organizational aspects (OR = 1.42; 95% CI = 1.13–1.78), practical experience of general practice (OR = 1.66; 95% CI = 1.08–2.56) and the country of the survey [Slovenian versus German students (Reference): OR = 2.19; 95% CI = 1.10–4.38; Austrian versus German students (Reference): OR = 0.50; 95% CI = 0.32–0.79].

Conclusion: Strategies to convince undecided students to opt for a career as a GP should include a positive representation of a GP's work and early and repeated experience of working in a general practice during medical school.

Key words: General practitioners, medical school, motivation, primary health care, questionnaire design, students.

Introduction

An ageing population and the associated rise in multimorbidity is increasing the importance of primary care. However, an imminent wave of general practitioners (GPs) entering retirement, the increasing number of doctors wanting to work part time and a surplus of specialists, combined with decades of neglect in encouraging young graduates to adopt the profession, as well as lower salaries compared to specialists, have led to a GP recruitment crisis (1).

Studies predicted a shortage of young GPs many years ago (2,3). The main reasons given for not pursuing a career in family medicine are relatively low salaries, often having to work alone, a heavy workload, an unfavourable work-life balance and complex tasks involving a considerable administrative burden and little time for patients (4,5). The problem is exacerbated by a lack of interest in working in non-urban locations and the resulting uneven geographical distribution of GPs.

While the number of German medical students that say they could imagine working as a GP has increased in the last 10 years (6), a significant decrease has occurred in other countries (7). Overall, the recruitment crisis in general practice is becoming increasingly severe (8). The aim of our study was to evaluate medical students' attitudes towards general practice and to identify factors encouraging and discouraging GPs from pursuing a career as a GP.

Methods

The manuscript was written in accordance with the CHERRIES guideline (9) (Supplementary material).

Study population

Fifteen universities with a medical school took part in the study (Germany: 9, Austria: 4, Slovenia: 2). Overall 29 284 medical students were invited to participate in this open survey (convenience sample). All medical students at participating universities received one invitational and one reminder e-mail. The e-mails were sent out

by the university itself or by student organizations that had a complete list of all medical students at their university.

GP curricula varied at the participating universities. While participating Austrian and Slovenian universities provided their first theoretical lectures in GP in the first year of study, German universities did this in the first, third, fourth or fifth year. The first courses providing hands-on experience of GP varied from the first to the sixth year. The amount of theoretical (0.5–12 ECTS [European Credit Transfer and Accumulation System]) and practical (1–46.5 ECTS) content differed between the participating universities.

Questionnaire

The first draft of a designated questionnaire was based on an extensive literature search. A pilot test revealed the need for items to be reworded because of ambiguity. After these results were reported at the First Congress on Primary Care at the Medical University of Graz, the Austrian Medical Chamber and several Austrian, German and Slovenian Universities showed interest in participating in the study. Some items were adapted and new topics were included to reflect differences in the participating countries. Following a second pilot test, only minor changes were necessary. The final German version was translated into Slovenian and back into German. A more detailed description of the development of the questionnaire is provided in the appendix (Supplementary Box 1).

The final questionnaire consisted of 146 closed and 13 open-ended items covering the following: (i) factors encouraging students to become GPs, (ii) factors discouraging students from becoming GPs, (iii) a comparison with other medical specialists, (iv) an evaluation of general practice lectures, (v) expectations of general practice lectures, (vi) the image of general practice, (vii) desired features of a medical career (e.g. rural versus urban), (viii) sources of information on what the job will involve, (ix) necessary attributes to become a GP, (x) role models in the field of medicine, (xi) an assessment of expected income as a GP and (xii) socio-demographics. The level of agreement was provided on a five-point Likert-type response scale. A graded response model (GRM) was

used to analyze model fit and the structure of the questionnaire. To analyze the influence of different wordings in the Austrian, German and Slovenian questionnaires, differential item functioning (DIF) was analyzed. In the final model, internal consistency was calculated. All psychometric analyses were performed using the statistical software R. Four independent factors ([Supplementary Table 3](#)) with an acceptable model fit were extracted. The four factors showed good internal consistency (Cronbach's $\alpha = 0.70\text{--}0.87$). The four factors were: (i) work content, (ii) image and income compared to other medical specialists, (iii) work–life balance/social prestige and (iv) organizational aspects. Factor scores (f) were estimated using the responses to all categories in combination with the parameters of the GRM for the response categories, resulting in negative factor scores ($f < 0$) for students with low individual scores and positive factor scores ($f > 0$) for students with high individual score in the underlying items.

Survey

The questionnaires were transferred to an online platform (www.surveymonkey.de). The survey was conducted from 1 November 2016 to 23 March 2017. The median time required to answer the questionnaire was 15 minutes (interquartile range = 11–22 minutes). After the survey period had ended, all data on the online platform were saved. Participating students also had the opportunity to take part in a lottery (prizes: three iPads).

Statistics

All submitted questionnaires with plausible responses were analyzed. Missing data were not imputed. Since the primary aim was to analyze associations between variables and not to present frequencies that are representative for a larger population, no statistical correction was performed to adjust for non-representative samples. Baseline characteristics are presented as mean \pm standard deviation or median (min–max). Categorical variables are given in absolute numbers and percentage. In the main analysis, predictors of the wish to become or not to become a GP were analyzed. Since factors influencing the decision of undecided students to work in general practice may differ from those influencing them to work in another field, binary logistic regression analysis was performed separately for both decisions ([Supplementary Fig. 1](#)). In the primary analysis, univariate binary logistic regression was performed on students wanting to become a GP and on undecided students. Significant variables ($P < 0.05$) were checked for multicollinearity and afterwards analyzed using a multivariate model. In the multivariate analysis, only those variables were included that were available for all three countries.

Results

The survey was answered by 4486 students (overall response rate = 15.3%, completion rate = 55.6%). The majority of students were female (61.1%) and had no children (94.5%). Of the 4486 students, 3.6% wanted to become a GP, 48.1% were undecided and 34.6% did not want to be a GP (2.4% did not answer this question and 11.2% answered ‘I don’t know’). All demographic characteristics are given in [Table 1](#). Demographic characteristics for each group (want to become a GP/undecided/do not want to become a GP/do not know or missing) are provided in [Supplementary Table 1](#).

A comparison of the socio-demographic characteristics of responding students with the characteristics of all students at German

and Austrian medical universities revealed that, in Austria and Germany, the distribution of sex and nationality of the responders was similar to the overall population of medical students. However, responding students in Austria and Germany were younger than the underlying population. Official data for Austria were only available for all students at medical universities, including PhD students, which may explain the higher age of the population compared to the responding students ([Supplementary Table 8](#)). The Statistical Office of the Republic of Slovenia reported that detailed data on students studying human medicine in the 2016–17 academic year is confidential.

Comparison between those wanting to become a GP and undecided students

In the multivariate model, the likelihood of wishing to become a GP increased with age [odds ratio (OR) = 1.06, 95% confidence interval (CI) = 1.02–1.10], a positive evaluation of the content of a GP's work (OR = 4.44, 95% CI = 3.26–6.06) and organizational aspects (OR = 1.42, 95% CI = 1.13–1.78). The chance was higher in students with practical experience of general practice (OR = 1.66, 95% CI = 1.08–2.56) and higher in Slovenian than German students (OR = 2.19, 95% CI = 1.10–4.38; reference group: German students) and in German than Austrian students (OR = 0.50, 95% CI = 0.32–0.79; reference group: German students; [Fig. 1](#); univariate results: [Supplementary Table 2](#)).

Comparison of those that do not want to become a GP with undecided students

In the multivariate model, the chance of not wanting to become a GP decreased with age ([Fig. 2](#); OR = 0.95, 95% CI = 0.93–0.98), parental status (OR = 0.45, 95% CI = 0.26–0.80, reference: no children), a positive evaluation of the content of a GP's work (OR = 0.25, 95% CI = 0.22–0.28) and work–life balance/social prestige (OR = 0.62, 95% CI = 0.55–0.69) and increased with increasing size of the town of origin (univariate results: [Supplementary Table 3](#)).

Comparison of those that do not want to become a GP with those that do

In the multivariate model, the chance of wanting to become a GP compared with not wanting to increased depending on parental status (OR = 12.33, 95% CI = 3.93–38.71, reference: no children), a positive evaluation of the content of a GP's work (OR = 17.48, 95% CI = 11.25–27.16) and the importance attached to work–life balance/social prestige (OR = 1.61, 95% CI = 1.15–2.25) and decreased with increasing size of the town of origin. This trend was more marked in Slovenian than in German students (OR = 2.88, 95% CI = 1.16–7.10; reference group: German students) and more marked in German than Austrian students (OR = 0.32, 95% CI = 0.17–0.58; reference group: German students; univariate results: [Supplementary Table 4](#); multivariate results: [Supplementary Fig. 2](#)).

Discussion

This survey revealed that far more German and Slovenian students want to become a GP than Austrian students. However, approximately half the students were still considering a career in general practice. As a result of methodological differences, these numbers differ from Germany-wide surveys, which found that around 9% of

Table 1. Socio-demographic parameters for students that want to become a GP, undecided students and students that do not

		All students	GP <i>n</i> = 163	Undecided students <i>n</i> = 2157	Not GP <i>n</i> = 1554
Sex	Female	2743	120 (4.4%)	1353 (49.3%)	896 (32.7%)
	Male	1731	43 (2.5%)	802 (46.3%)	657 (38.0%)
Age	Median (range)	23 (17–53)	25 (18–53)	23 (17–51)	23 (17–46)
Children	Yes	174	23 (13.2%)	104 (59.8%)	31 (17.8%)
	No	4238	140 (3.3%)	2052 (48.4%)	1523 (35.9%)
Size of town of origin	>500 000	802	24 (3.0%)	337 (42.0%)	331 (41.3%)
	>100 000–500 000	634	18 (2.8%)	280 (44.2%)	254 (40.1%)
	>50 000–100 000	262	6 (2.3%)	112 (42.7%)	103 (39.3%)
	>10 000–50 000	793	31 (3.9%)	384 (48.4%)	291 (36.7%)
	>5000–10 000	588	30 (5.1%)	309 (52.6%)	189 (32.1%)
	≤5000	1150	50 (4.3%)	666 (57.9%)	319 (27.7%)
	Different towns	160	4 (2.5%)	64 (40.0%)	63 (39.4%)
Nationality ^a	German	2489	109 (4.4%)	1200 (48.2%)	851 (34.2%)
	Austrian	1283	26 (2.0%)	648 (50.5%)	447 (24.8%)
	Slovenian	400	21 (5.3%)	180 (45.0%)	142 (35.5%)
	EU (except Germany, Austria and Slovenia)	188	4 (2.1%)	89 (47.3%)	63 (33.5%)
	Others	108	2 (1.9%)	37 (34.2%)	48 (44.4%)
GP in family	Yes	549	25 (4.6%)	308 (56.1%)	154 (28.1%)
	No	3842	137 (3.6%)	1848 (48.1%)	1400 (36.4%)
Country of survey	Austria	1688	34 (2.0%)	840 (49.8%)	595 (35.2%)
	Germany	2392	108 (4.5%)	1135 (47.4%)	817 (34.2%)
	Slovenia	406	21 (5.2%)	182 (44.8%)	142 (35.0%)
Medical curriculum (only Germany)	Regular medical curriculum	1804	92 (5.1%)	870 (48.2%)	593 (32.9%)
	Revised medical curriculum	557	15 (2.7%)	256 (46.0%)	213 (38.2%)
Year of study	First year	790	24 (3.0%)	370 (46.8%)	245 (31.0%)
	Second year	670	20 (3.0%)	309 (46.1%)	222 (33.1%)
	Third year	697	13 (1.9%)	337 (48.4%)	256 (36.7%)
	Fourth year	705	22 (3.1%)	362 (51.3%)	259 (36.7%)
	Fifth year	773	28 (3.6%)	397 (51.4%)	284 (36.7%)
	>Fifth year	749	49 (6.5%)	371 (49.5%)	279 (37.2%)
Phase of the study	Pre-clinical	1473	48 (3.3%)	693 (47.0%)	460 (31.2%)
	Clinical	2019	60 (3.0%)	1022 (50.6%)	739 (36.6%)
	Final year of medical school	525	34 (6.5%)	250 (47.6%)	203 (38.7%)

The distribution of further socio-demographic parameters is provided in [Supplementary Table 1](#), as is the number of missing values (multinational study on 4486 medical students, time of survey: 2016–2017).

^aIf more than one country was indicated, the first was chosen.

students definitely wanted to become a GP and 29–35% were considering a career in general practice (6,10,11).

Comparison with existing literature

Socio-demographic factors

Similar to other studies, factors associated with considering a career as a GP were a rural background, higher age and having children (12–14). Students with an interest in general practice were more likely to attach importance to a family-friendly profession (6) than students aiming to pursue a career as a specialist. Furthermore, the percentage of female medical students (who tend to attach greater importance to achieving an acceptable work–life balance and working part time) is rising overall (15). In line with these results, more female than male students were willing to work part time for family reasons (16). Geographically remote areas with a poor infrastructure have particular difficulty attracting GPs (17). The availability of adequate accommodation, age, relationship status, childcare, employment opportunities for the spouse, community-based practices and tailored training programs involving clinical

internships are associated with greater readiness to work in a rural region (18–21).

Scope of work in general practice

A positive evaluation of work content is a major predictor of interest in becoming a GP. GP-specific work content, such as long-standing doctor–patient relationships, continuity of care and diversity in the reasons for consulting a GP have been reported to increase the attractiveness of working in the profession in many countries (22)

Image/attitudes towards general practice

In our study, only a small proportion of medical students believed that GPs are highly regarded by political decision makers, whereby differences between countries were significant. Working as a GP is commonly perceived to be less prestigious than working as a hospital specialist (7), and this significantly influences preferences (18,23,24). German students perceive the reputation of GPs to be lower still among the general population than among medical students and doctors (10).

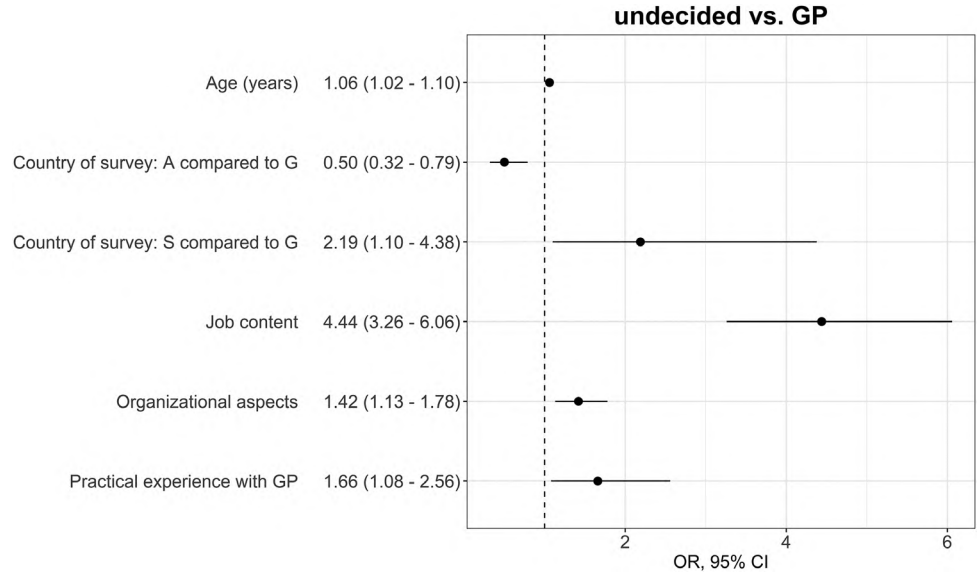


Figure 1. Multivariate predictors of only wanting to become a GP compared to undecided students. Circles represent ORs with values <1 favouring becoming a GP. Lines represent 95% CIs (multinational study of 4486 medical students, time of survey: 2016–2017).

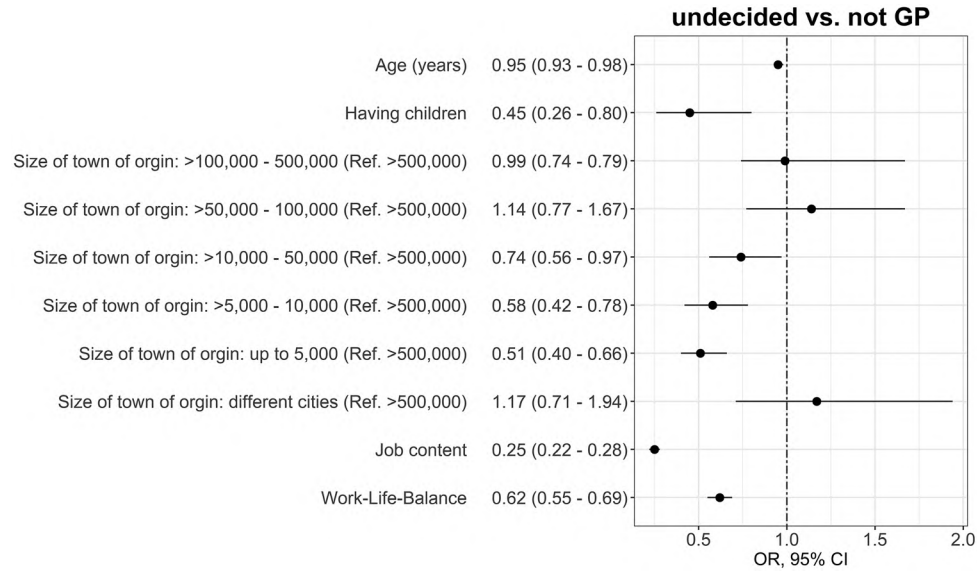


Figure 2. Multivariate predictors of not wanting to become a GP compared to undecided students. Circles represent ORs with values <1 favouring becoming a GP. Lines represent 95% CIs (multinational study of 4486 medical students, time of survey: 2016–2017).

Organizational aspects

In a Germany-wide survey, Jacob *et al.* (10) found that the reconciliation of work and family is important to medical students and to even more of those considering a career in GP. (25). However, we were able to show that income and social prestige are also important.

Our study demonstrated that a positive evaluation of such organizational aspects has a large impact on students' decisions regarding medical specialty. The demands of being on call, lack of collegial support, perceived job dissatisfaction and insufficient time for patients deter students from choosing general practice (1). Cooperation networks and financial support when setting up in private practice may promote the exchange of information and reduce individual workloads (26,27). While, in Austria, the remuneration gap between

GPs and most specialists remains considerable, it is declining to some extent in Germany (28).

Practical experience

Along with others, our study demonstrated that high-quality practical experience increases interest in becoming a GP (24,29). Compulsory internships in Germany, Canada and Australia have already had a positive effect on attitudes towards general practice (18,30), and a recent systematic review on GP recruitment has revealed early experience of primary care to be one of the most important determinants (1).

Country of survey

Recent efforts to strengthen general practice in Germany, such as internships in family medicine (31), voluntary support programs in

selected rural areas (32), the compulsory 1- to 4-week GP placement for German medical students (33) and support for postgraduates (34) may explain why German students consider a career in general practice significantly more often than students in Slovenia and Austria. In addition, German students view their health system as more GP-friendly than students in other countries, which the Masterplan for medical studies 2020 (35) is likely to enhance further. As expected, the increasing attraction of working in the German health system has, over the last 10 years, led to a fall in the number of German students wanting to work abroad (6,10) and, according to our study, is now significantly lower than in Austria and Slovenia.

Moreover, Slovenia and Austria differ from Germany in other ways. In Slovenia, more than 80% of GPs work as salaried doctors in state-run interdisciplinary primary care centres. Although the number of medical graduates in Slovenia has been rising for years, the number of GPs is increasing considerably more slowly (36). In contrast to most other European countries, Austrian GPs are not medical specialists, which promotes feelings of dissatisfaction.

Strengths and limitation

Since this is a cross-sectional survey, temporal changes, such as the influence of students' increasing experience over time, could not be analyzed. In order to obtain information on these effects, longitudinal analyses are necessary. Although Jacobs *et al.* conducted a study that involved three nationwide surveys over 8 years (6,10,11) and investigated changes in the preferences of medical students, it focused on all medical specialties, whereas ours focused on general practice.

As the health and medical education systems in the three countries differ considerably, a planned separate analysis of data from the individual countries may yield different results. Furthermore, our survey covered more topics than could be presented in one manuscript (e.g. Austrian doctors in the foundation program). These topics will be highlighted in further studies.

A main limitation is also the response rate (15.3%). Overall response rates in medical students range from 4% to 71% (37). Comparable response rate to ours have also been observed in career expectation studies among German medical students (6,10,11). Furthermore, it is possible that a response bias existed and that the selection process was not random. Response rates also differed between universities (2.5% to 33.0%), raising the possibility of institutional bias. According to our results, responding students have similar characteristics in some respects but may differ from the underlying population in others. These biases may have exaggerated the number of students with positive attitudes toward general practice. Since the primary aim of this study was to identify factors that may influence attitudes towards general practice, a higher number of students with positive attitudes should not have had an impact on investigated associations.

One further limitation is that student populations only permit the intention to become a GP to be studied. When studying doctors, key aspects in their decision are influenceable factors, such as interest developed during undergraduate training and early postgraduate experience, work-life balance, scope of work (enjoy the wide scope of practice/being a generalist/interesting variety of work), organizational aspects (loneliness of working) and personal factors like sex, age, doctor in the family and personality (38–41). Since similar aspects are important in students' career decisions, they can be expected to be stable over time.

Conclusion

The low number of young medical doctors wanting to become GPs is exacerbating the shortage of GPs. Strategies to convince undecided students to pursue a career as a GP should include a positive representation of general practice work and an improvement in their basic working conditions (including appropriate remuneration), as well as their image among policymakers; it is also essential that students gain positive experience of organizational and practical aspects. Medical school curricula should include high-quality longitudinal placements. A positive attitude towards the content of a GP's work and a positive experience of organizational and practical aspects are major predictors of the decision to pursue a career as a GP.

Supplementary material

Supplementary material is available at *Family Practice* online.

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Declaration

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Ethical approval: according to national laws, ethical approval was not necessary as completion of the survey implied consent.

Conflicts of interest: the following authors declared competing interests: AB: non-material conflict of interest because she is the vice dean of Marburg University, a member of the German College of General Practitioners and Family Physicians (DEGAM) and a GP. AS has received funding to carry out clinical studies related to this topic. HB received assistance in drafting the present manuscript and working on similar topics. MH has received payments and travel/accommodation expenses from his university to participate in Congresses and is a member of the DEGAM. SGB has a non-material conflict of interest in relation to this topic because she is a member of the DEGAM and a GP. AS and SP: Their institute received funding from the OeAeK.

Data availability

Data will be shared upon reasonable request to the corresponding author.

References

1. Marchand C, Peckham S. Addressing the crisis of GP recruitment and retention: a systematic review. *Br J Gen Pract* 2017; 67(657): e227–37.
2. Bundesärztekammer. *Gehen dem deutschen Gesundheitswesen die Ärzte aus?* <https://www.bundesaerztekammer.de/ueber-uns/aerztestatistik/aerztestatistik-der-vorjahre/aerztestatistik-2001/gehen-dem-deutschen-gesundheitswesen-die-aerzte-aus/> (accessed on 29 July 2019).
3. Whitcomb ME, Cohen JJ. The future of primary care medicine. *N Engl J Med* 2004; 351(7): 710–2.
4. Abelsen B, Olsen JA. Does an activity based remuneration system attract young doctors to general practice? *BMC Health Serv Res* 2012; 12: 68.
5. Deutsch T, Lippmann S, Heitzer M, Frese T, Sandholzer H. Choosing to become a general practitioner—what attracts and what deters? An analysis of German medical graduates' motives. *J Family Med Prim Care* 2016; 5(1): 34–41.
6. Jacob R, Kopp J, Fellingner P. *Berufsmonitoring Medizinstudierende 2018—Ergebnisse einer Bundesweiten Befragung*. Bericht der Universität Trier, Germany: Kassenärztliche Bundesvereinigung, 2018.

7. Chellappah M, Garnham L. Medical students' attitudes towards general practice and factors affecting career choice: a questionnaire study. *London J Prim Care (Abingdon)* 2014; 6(6): 117–23.
8. Jones R. GP recruitment and medical education: part of the solution? *Educ Prim Care* 2017; 28(6): 304–6.
9. Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res* 2004; 6(3): e34.
10. Jacob R, Kopp J, Schultz S. *Berufsmonitoring Medizinstudenten 2014 Ergebnisse einer Bundesweiten Befragung*. Trier, Germany: Bericht der KBV, 2014.
11. Gibis B, Heinz A, Jacob R, Müller CH. The career expectations of medical students: findings of a nationwide survey in Germany. *Dtsch Arztebl Int* 2012; 109(18): 327–32.
12. Scherz N, Markun S, Aemissegger V, Rosemann T, Tandjung R. Internists' career choice towards primary care: a cross-sectional survey. *BMC Fam Pract* 2017; 18: 52.
13. Kost A, Cawse-Lucas J, Evans DV *et al*. Medical student participation in family medicine department extracurricular experiences and choosing to become a family physician. *Fam Med* 2015; 47(10): 763–9.
14. Deutsch T, Lippmann S, Frese T, Sandholzer H. Who wants to become a general practitioner? Student and curriculum factors associated with choosing a GP career—a multivariable analysis with particular consideration of practice-orientated GP courses. *Scand J Prim Health Care* 2015; 33(1): 47–53.
15. Hedden L, Barer ML, Cardiff K *et al*. The implications of the feminization of the primary care physician workforce on service supply: a systematic review. *Hum Resour Health* 2014; 12: 32.
16. Hartmannbund—Verband der Ärzte Deutschlands. “Wie Sehen Sie Ihre Zukunft als Arzt oder Ärztin?”—Umfrage unter den Medizinstudierenden. https://www.hartmannbund.de/fileadmin/user_upload/Downloads/Umfragen/2012_Umfrage-Medizinstudierende.pdf (accessed on 7 October 2019).
17. McGrail MR, Wingrove PM, Petterson SM *et al*. Measuring the attractiveness of rural communities in accounting for differences of rural primary care workforce supply. *Rural Remote Health* 2017; 17(2): 3925.
18. Larkins S, Tarun Sen G. Recruitment and retention of general practitioners in rural Canada and Australia: a review of the literature. *Can J Rural Med* 2013; 18: 13–23.
19. Mitra G, Gowans M, Wright B, Brenneis F, Scott I. Predictors of rural family medicine practice in Canada. *Can Fam Physician* 2018; 64(8): 588–96.
20. Chauban TS, Jong M, Buske L. Recruitment trumps retention: results of the 2008/09 CMA Rural Practice Survey. *Can J Rural Med* 2010; 15: 101–7.
21. Tani K, Okura Y, Tabata R *et al*. Characteristics of medical students who would like to be a generalist physician and contribute to remote area medicine. *J Med Invest* 2017; 64(3.4): 210–6.
22. Petek Šter M, Švab I, Šter B. Prediction of intended career choice in family medicine using artificial neural networks. *Eur J Gen Pract* 2015; 21(1): 63–9.
23. Barber S, Brettell R, Perera-Salazar R, Greenhalgh T, Harrington R. UK medical students' attitudes towards their future careers and general practice: a cross-sectional survey and qualitative analysis of an Oxford cohort. *BMC Med Educ* 2018; 18(1): 160.
24. Dale J, Russell R, Scott E, Owen K. Factors influencing career intentions on completion of general practice vocational training in England: a cross-sectional study. *BMJ Open* 2017; 7(8): e017143.
25. Kiolbassa K, Mijsch A, Hermann K *et al*. Becoming a general practitioner—which factors have most impact on career choice of medical students? *BMC Fam Pract* 2011; 12: 25.
26. Erler A, Beyer M, Welbers G, Gerlach FM. Zusammenschluss von hausarztpraxen zum SCHAAZ—auswirkungen auf arbeitszufriedenheit und burnout-risiko. *ZFA* 2012; 88: 303–12.
27. Langer A, Ewert T, Holleederer A, Geuter G. Literaturüberblick über niederlassungsfördernde und-hemmende faktoren bei ärzten in Deutschland und daraus abgeleitete handlungsoptionen für kommunen. *Gesundheitsökonomie Qualitätsmanagement* 2015; 20: 11–8.
28. Scharer S, Freitag A. Physicians' exodus: why medical graduates leave Austria or do not work in clinical practice. *Wien Klin Wochenschr* 2015; 127(9–10): 323–9.
29. Deutsch T, Lippmann S, Frese T, Sandholzer H. [Recruitment for general practice—relationship between practice-based curriculum and career choice]. *Gesundheitswesen* 2014; 76(1): 26–31.
30. Deutsch T, Hönigschmid P, Frese T, Sandholzer H. Early community-based family practice elective positively influences medical students' career considerations—a pre-post-comparison. *BMC Fam Pract* 2013; 14: 24.
31. Koné I, Paulitsch M, Ravens-Taeuber G. Internship in family medicine: which experiences are important for students? *ZFA* 2016; 92: 357–62.
32. Schäfer H, Mangold B, Paulitsch M, Gerlach F. The Fulda rural project – encouraging young doctors to work in rural areas. *ZFA* 2015; 91: 260–3.
33. Gottlob K, Joos S, Haumann H. The teaching and learning environment of a primary care medical student clinical attachment ('Famulatur')—a qualitative study on experiences of students and primary care physicians in Germany. *GMS J Med Educ* 2019; 36(3): Doc28.
34. Ingendae F, Steinhäuser J, Blank W, Chenot J. Postgraduate training in family medicine? A decisional aid 2.0. *ZFA* 2018; 94: 86–90.
35. Bundesministerium für Bildung und Forschung. *Masterplan Medizinstudium* 2020. https://www.bmbf.de/files/2017-03-31_Masterplan%20Beschlusstext.pdf (accessed on 14 October 2019).
36. Korsatko S. Österreich hat ein “Schwachere” Primärversorgungssystem. Was Macht Europa Anders? Teil 3: Primärversorgung bei Unserer Nachbarn Deutschland, Schweiz und Slowenien. <https://primaerversorgung.org/2017/03/13/oesterreichs-hat-ein-schwaches-primaerversorgungssystem-was-macht-europa-anders/> (accessed on 14 October 2019).
37. Blissett S, Law C, Morra D, Ginsburg S. The relative influence of available resources during the residency match: a national survey of canadian medical students. *J Grad Med Educ* 2011; 3(4): 497–502.
38. Harris M, Wainwright D, Wainwright E. What influences young doctors in their decision-making about general practice as a possible career? A qualitative study. *Educ Prim Care* 2020; 31(1): 15–23.
39. Woolley T, Larkins S, Sen Gupta T. Career choices of the first seven cohorts of JCU MBBS graduates: producing generalists for regional, rural and remote northern Australia. *Rural Remote Health* 2019; 19(2): 4438.
40. Eley DS, Laurence C, Cloninger CR, Walters L. Who attracts whom to rural general practice? Variation in temperament and character profiles of GP registrars across different vocational training pathways. *Rural Remote Health* 2015; 15(4): 3426.
41. Ward AM, Kamien M, Lopez DG. Medical career choice and practice location: early factors predicting course completion, career choice and practice location. *Med Educ* 2004; 38(3): 239–48.