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Characteristics of mentoring relationships formed by medical students and faculty

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Background: Little is known about the characteristics of mentoring relationships formed between faculty and medical students. Individual mentoring relationships of clinical medical students at Munich Medical School were characterized quantitatively and qualitatively.

Methods: All students signing up for the mentoring program responded to a questionnaire on their expectations ($n = 534$). Mentees were asked to give feedback after each of their one-on-one meetings ($n = 203$). A detailed analysis of the overall mentoring process and its characteristics was performed. For qualitative text analysis, free-text items were analyzed and categorized by two investigators. Quantitative analysis was performed using descriptive statistics and Wilcoxon-test to assess differences in grades between students with and without mentors.

Results: High-performing students were significantly more likely to participate in the mentoring program ($p < 0.001$). Topics primarily discussed include the mentee's personal goals (65.5%), career planning (59.6%), and experiences abroad (57.6%). Mentees mostly perceived their mentors as counselors (88.9%), providers of ideas (85.0%), and role models (73.3%). Mentees emphasized the positive impact of the mentoring relationship on career planning (77.2%) and research (75.0%).

Conclusions: Medical students with strong academic performance as defined by their grades are more likely to participate in formal mentoring programs. Mentoring relationships between faculty and medical students are perceived as a mutually satisfying and effective instrument for key issues in medical students' professional development.

Practical implications: Mentoring relationships are a highly effective means of enhancing the bidirectional flow of information between faculty and medical students. A mentoring program can thus establish a feedback loop enabling the educational institution to swiftly identify and address issues of medical students.

Keywords: *mentoring; mentor; mentee; medical students; faculty; one-on-one mentoring*

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Mentoring is increasingly viewed as a key factor contributing to a successful career in academic medicine (1–9). Having a mentor has been found to be vital for facilitating a young medical professional's career advancement and acquisition of clinical and research skills (3–5). In particular, career counseling by mentors leads to an earlier choice in terms of specialty and career by the juniors (10). Also, mentoring increases the odds of participating in research during medical school (11) and correlates with increased research pro-

ductivity in junior academic physicians (3). In a recent review of the literature, the role of a one-on-one mentor for students pursuing an academic career was highlighted (10). In addition, role models were identified by medical students as an important modality for learning professionalism (12). Lack of mentoring has been identified as a major obstacle hindering career advancement in medicine (13). Furthermore, mentoring and advising enhanced the performance of underrepresented minority students in medical school (14).

Despite the importance of mentoring in medical curricula, a cross-sectional study among medical schools in Germany showed that only a limited number of medical students are enrolled in formal mentoring programs and only a small percentage of those receive mentoring in a one-on-one mentoring setting (15). Also, in most other countries a lack of mentoring programs for medical students was observed (5). Due to a limited number of studies using validated questionnaires on the effects of student mentoring and the confusion about the difference between an advisor, role model, and career mentor (10), there is little understanding of the characteristics of mentoring relationships and their importance for career success.

There are very limited data about mentoring relationships involving medical students. In a review of the literature, Frei et al. identified 438 publications relating to mentoring programs, but only 25 of them met the selection criteria for structured programs and student mentoring surveys (10). A cross-sectional study at the University of California, San Francisco (UCSF; 11), found that, in the absence of a formal mentoring program, medical students form mentoring relationships through interactions on clinical clerkships and research rotations. It further showed that in the mentor–mentee relationship, the mentor’s role was to provide personal support, role modeling, and career advice. A survey among faculty members and medical students at the Makerere University College of Health Sciences revealed a lack of awareness of roles of mentors and mentees (16). Others have highlighted different mentoring strategies suitable for different stages of a student’s career: while specific, skill-based instruction might be most helpful for new medical students, the role of a more general consultant seems more appropriate to support advanced medical students (17). Many institutions have introduced formal mentoring programs to facilitate the formation of mentoring relationships among medical students (5, 18–20). Such programs provide opportunities for students to find a mentor at the outset in medical school (21).

In a preliminary study, we performed needs analysis survey among all students at the medical school to evaluate the desire for mentoring among medical students (22). The needs analysis showed that despite a high overall satisfaction with the MD program (84.9% positive responses on a 6-point Likert-scale), only 36.5% of medical students expressed satisfaction with how the faculty supported their professional development and 86.4% expressed a desire for more personal support. To meet this need for mentoring among medical students, we created a formal program at the LMU Medical Faculty to facilitate the formation of mentoring relationships (22). As aforementioned, little is known about the specific characteristics of mentoring relationships formed by medical students. The topics discussed between medical

students and faculty physicians, the role of the mentor and the impact of mentoring are likely to differ from what has been found for mentoring junior faculty or resident physicians.

Therefore, we performed a detailed analysis of the program to characterize the individual mentoring relationships of medical students. In planning our mentoring program, we found the framework by Schapira and colleagues (23) to be inspiring though it did not meet our expectations completely as we were looking for a more generic approach to mentoring. So, instead of using this specific framework, we adapted elements and further developed our own variables with respect to mentoring relationships and the perceptions of our mentoring program. We sought to find answers to the following questions: What students (gender, performance) are more likely to seek a mentoring relationship? What are the expectations of mentees from the mentoring relationships and what is mentor–mentee interaction effectively about? What is the mentor’s role as perceived by mentees? How do mentors see themselves and the outcome of their mentoring for the development of their mentees?

Methods

Setting and participants

The medical curriculum at LMU Munich consists of two preclinical years followed by four clinical years. Step 1 of the National Board Examination in medicine is taken after the preclinical years. A mentoring program was established at LMU School of Medicine and launched in May 2008 (22). Feasibility considerations regarding the large number of students at this institution resulted in a novel concept, which combines an optional one-on-one mentoring for all students in their clinical years with peer-mentoring societies that provide all students with a network comprising advanced students and physicians willing to share their advice. Participation is entirely voluntary. For the one-on-one mentoring, clinical students and physician mentors are required to complete online matching profiles consisting of 13 items using 6-point Likert-scales with regards to professional orientation, work-life priorities, and recreational interests. Based on these profiles, an automated algorithm will calculate a weighted correlation score and provide the student with 10 proposals of potential mentors matched by specialty and areas of interest (24). Mentors with three mentees will not be suggested by the matching system to ensure mentoring quality. The student can then choose a mentor from these proposals. Three hundred and eight out of 2,074 clinical students have thus been matched to personal mentors within 1 year. Students have the opportunity to evaluate and change their mentor at the end of each semester. However, the duration of

a mentoring relationship is not limited. Here, we present a detailed analysis of these one-on-one mentoring relationships.

Procedure

All students signing up for the newly created one-on-one mentoring program were required to complete the online questionnaire addressing their expectations regarding the role of their mentor, the mentoring relationship, and topics to discuss with the future mentor ($n = 534$, Table 1). In addition, mentees were asked to provide feedback after every personal meeting ($n = 203$, Table 1, two multiple choice and three free-text items). Feedback questions focused on the duration of the meeting and topics discussed during the meeting. Furthermore, a detailed evaluation of the program was performed at the end of every semester in October 2008 and April 2009 ($n = 208$ for mentees and $n = 66$ for mentors, Table 1). Here, mentees were asked to define the roles of their mentors, characterize their mentoring relationships, and judge the impact of mentoring on their academic progress. In addition, mentors were questioned about their perception of the relationships. To further characterize those students who participate in a formal mentoring program, performance at final secondary-school examinations and Step 1 of the German National Board Examination in medicine, as defined by the grades achieved, was compared between students who had chosen a mentor and those who had not. In an online questionnaire sent to all clinical year students (whether or not they had a mentor, $n = 2,074$), students were asked to

voluntarily provide their scores on final secondary-school examinations and Step 1 of the German National Board Examination. Only respondents who had provided both scores were included into the analysis ($n = 104$ with mentor and $n = 356$ without mentor, Table 1). All data collected were anonymously saved and processed.

Instruments

As part of the registration for the mentoring program, students had to complete a web-based survey investigating opinions about the potential mentor's role and topics to be discussed with the mentor, as well as expectations regarding frequency, duration, and mode of mentoring. The categories for mentors' roles and topics discussed were derived from the qualitative analysis of preliminary focus groups. This survey comprised 34 items with 6-level Likert scales, three multiple choice questions as well as eight free-text items.

To further characterize the quality and effectiveness of the mentoring relationships, we used a modified version of the Mentorship Profile Questionnaire and Mentorship Effectiveness Scale developed by the John Hopkins University School of Nursing (25). Since some outcome measures proposed in this questionnaire were not applicable for medical students (e.g., grant writing, job promotion), we developed outcome measures suitable for the characteristic situation of medical students. These include positive effects on career planning, research activities, clinical electives, experiences abroad, extra-curricular activities, work-life balance, and preparation for exams. A 6-level bipolar anchor scale was applied for all Likert-rating scales, ranging from 1 = not at all to 6 = very much. Thus, no neutral position was provided to avoid loss of information by central tendency bias (26). No single item was mandatory as a 'not applicable' option was available to the rater. In addition, we used multiple-choice and free-text items where appropriate. We did not assess reliability or validity of newly created or modified instruments.

Bias

Acquiescence bias, halo effect, and social desirability response bias may also potentially limit the validity of the results obtained in the analysis. There are no means to entirely exclude acquiescence bias (the tendency to agree with presented statements) and halo effect (e.g., rating a specific item positive because of an overall positive impression). These biases are not common with Likert scales (27). However, they should be taken into account when drawing conclusions from the data. To minimize the risk of social desirability bias, it was communicated very clearly to respondents that all data would be analyzed anonymously. All data were stored and analyzed using encoded responder IDs. Thus, neither mentors and mentees nor the investigators themselves

Table 1. Study population

	Number
Registration survey	534
Feedback during the semester	203
End of semester evaluation:	
Mentees	208
Mentors	66
Online survey:	
Students with mentor	104
Students without mentor	356

Note: Completion of an electronic survey with Likert scale and free-text items was mandatory for all students wishing to create matching profiles for the one-on-one mentoring program (Registration survey). Mentees were asked to give a feedback after every personal meeting with their mentor (Feedback during the semester). At the end of every semester, mentees were asked to provide an evaluation of their mentoring relationship (End of semester evaluation). In an online questionnaire sent to all clinical year students, students were asked to voluntarily provide their scores on final secondary-school examinations and Step 1 of the German National Board Examination (Online survey).

had access to an individual's assessment of his or her mentoring relationship.

Ethics approval and data privacy

The LMU's ethics committee approved the study. All data were collected and stored anonymously using encoded responder IDs. Thus, neither mentors and mentees nor the investigators had access to an individual's assessment of his or her mentoring relationship. To maintain strict confidentiality while dealing with performance in final secondary-school examinations and Step 1 of the German National Board Examination, an independent faculty official not involved in the administration of the mentoring program related students' exam performance with whether or not they had chosen a mentor.

Data analysis

For qualitative text analysis, free-text items were analyzed and categorized by two investigators independently. Representative quotations were translated into English. Quantitative analysis was performed using Microsoft Excel 2003 and SPSS 15.0. For items scored using Likert scales, mean values and standard deviations were calculated. For a simplified summary, percentages of responses were aggregated and dichotomized as overall negative (Likert scale 1–3) and overall positive responses (Likert scale 4–6). Wilcoxon-test was used to assess differences in grades as marker for academic performance between students with and without mentor. $p < 0.05$ was considered statistically significant.

Results

Participants in the one-on-one mentoring program

One year after launching the program, 308 out of 2,074 students in their clinical years (14.9%) were experiencing one-on-one mentoring by 137 physicians and scientists. Of these 308 students, 205 (66.6%) were female and 103 (33.4%) were male students (corresponding to an eligible student population of 62.7% female at the time). Female mentees chose to be mentored by female mentors in 75 of 205 cases (36.6%) as opposed to 130 cases (63.4%) where they preferred male mentors. Similarly, male students chose male mentors in 84 out of 103 cases (81.6%) and female mentors in 19 cases (18.4%).

To further characterize students participating in the individual mentoring program, we compared participants to non-participating students regarding their performance in final secondary-school examinations and Step 1 of the German National Board Examination. Students who choose a mentor had a better grade at both their final secondary-school examinations ($p < 0.001$) and Step 1 of the German National Board Examination ($p < 0.001$; Fig. 1). Also, 22.5% of the students in their first clinical year had chosen a personal mentor as compared to 5.4% in the final year (Table 2). After 1 year, the program had enough mentors with completed profiles to offer one-on-one mentoring to 24.7% of all clinical students.

Role of mentors

Prior to choosing a mentor, future mentees were asked to define what they hoped to be the role of their mentor ($n = 534$, Table 3). Strongest approval was found for the roles of a counselor (mean 5.5 ± 0.7), agent for contacts

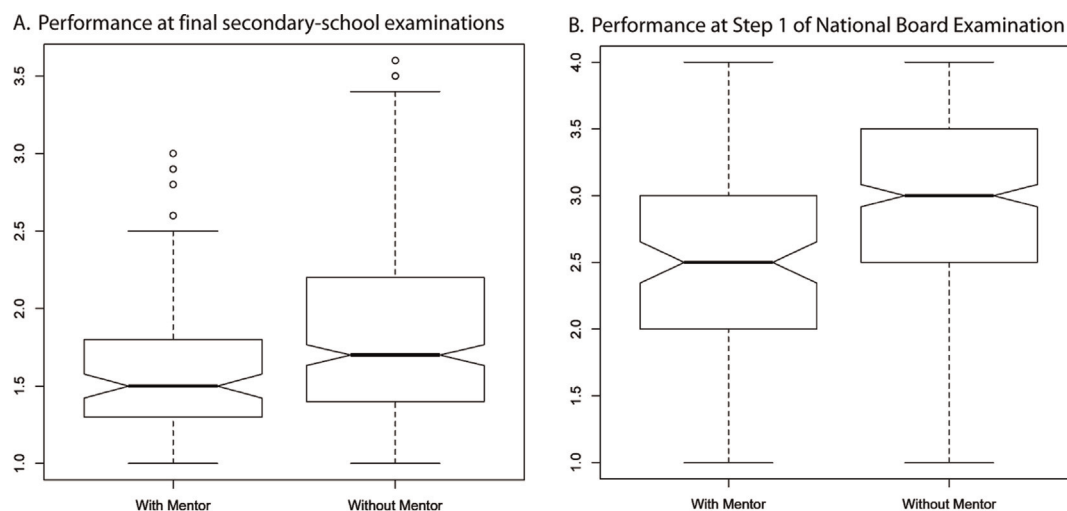


Fig. 1. Correlation of exam performance and participating in a mentoring program.

Note: Students' grades on final secondary-school examinations (A) and Step 1 of the National Board Examination (B) are shown ranging from the best possible score of 1.0 to the minimum passing score of 4.0. Mean values, quartiles, 95% confidence intervals, and outliers are shown as box plots ($n = 104$ for students with mentor and $n = 356$ for students without mentor).

Table 2. Participants in the one-on-one mentoring program (as per May 15, 2009)

	Number	% of eligible group
Mentees: clinical students matched to mentors	308	14.9
Clinical year I	100	22.5
Clinical year II	112	24.2
Clinical year III	62	13.1
Final year	34	5.4
Physicians and scientists registered as mentors	201	N/a
Mentors matched to mentees	141	N/a
Overall capacity (number of potential mentees)*	542	24.7

Note: The one-on-one mentoring was launched in May 2008. The numbers of participants (total number and percentage of eligible group) are shown in the table. The total number of potential mentors cannot be clearly defined because of the large number of LMU-associated hospitals and research institutions. Therefore, percentage of eligible group is not applicable (n/a) for mentors. *Number of mentees that could be mentored by the number of registered mentors.

(mean 5.1 ± 0.9), and provider of ideas (mean 4.9 ± 1.0). This is in line with what mentees actually perceived as the role of their mentor in the end-of-semester evaluation. Here, most students stated that their mentor had acted as a counselor (mean 4.9 ± 1.2), provider of ideas (mean 4.6 ± 1.4), and role model (mean 4.1 ± 1.3). Least com-

Table 3. Roles of mentors in their mentees' perception

Roles	Roles students wished their future mentors to adopt (n = 534)		Mentors' roles actually perceived by mentees (n = 208)	
	mean (\pm SD)	% overall positive	mean (\pm SD)	% overall positive
Counselor	5.5 (\pm 0.7)	98.7	4.9 (\pm 1.2)	88.9
Provider of ideas	4.9 (\pm 1.0)	91.1	4.6 (\pm 1.4)	85.0
Role model	4.4 (\pm 1.1)	82.4	4.1 (\pm 1.3)	73.3
Advisor	4.5 (\pm 1.1)	84.4	3.9 (\pm 1.5)	63.5
Agent for contacts	5.1 (\pm 0.9)	95.5	3.9 (\pm 1.7)	63.1
Confidant	4.5 (\pm 1.1)	85.2	3.8 (\pm 1.5)	60.4
Facilitator	4.4 (\pm 1.1)	82.2	3.6 (\pm 1.5)	59.4
Psychological parent	4.3 (\pm 1.2)	79.3	3.4 (\pm 1.4)	47.8

Note: Completion of an electronic survey with Likert scale and free-text items was mandatory for all students wishing to create matching profiles for the one-on-one mentoring program. (n = 534). Students were asked to answer the question 'Which roles do you want your future mentor to adopt?' on 6-level Likert scales ranging from 1 = 'not at all' to 6 = 'very much'. Mean values and standard deviations as well as the frequency of overall positive answers (4–6) are shown. At the end of every semester, mentees were asked to provide an evaluation of their mentoring relationship. Here, students were asked to define 'What has been the role of your mentor?' on 6-level Likert scales ranging from 1 = 'not at all' to 6 = 'very much'. Mean values and standard deviations as well as the frequency of overall positive answers (4–6) are shown.

monly, the mentor's role was described as a facilitator (mean 3.6 ± 1.5) or psychological parent (mean 3.4 ± 1.4). Free-text analysis confirms these aspects: 'My mentor was very competent and helpful in every issue I raised. She even offered me a research opportunity in her team.' Many mentors illustrated their roles by examples like 'I offered to arrange a clinical elective at Dartmouth Medical School for my mentee.' The relationship also seemed to influence students' attitude toward medical school as several mentees reported that mentors 'increased [their] motivation for better academic achievements'.

Topics discussed in mentoring relationships

When signing up for the individual mentoring, students were asked to define which topics they would like to discuss with their future mentors (n = 534, Table 4). Most mentees hoped to discuss personal goals with their mentors (mean 5.2 ± 1.0). A similarly large number of students expected to speak about research/MD thesis (mean 5.2 ± 1.2) and final year electives (mean 5.3 ± 1.1). To evaluate which other topics were discussed in mentoring relationships, we asked mentees to give feedback after every personal meeting with their mentor (n = 203). Here, mentees were found to most frequently seek advice from their mentors about research, including MD thesis (65.5%), career planning (59.6%), and experiences abroad (57.6%).

Communication between mentees and mentors

While the majority of mentees prior to their matching estimated that two (30.4%) or three (32.6%) meetings

Table 4. Topics discussed between mentees and mentors

Topics	Topics students wished to discuss with their future mentors (<i>n</i> = 534)		Topics students actually discussed with mentors (<i>n</i> = 203)
	mean (\pm SD)	% overall positive	% of mentees
Personal goals	5.2 (\pm 1.0)	94.6	100.0*
Research and MD thesis	5.2 (\pm 1.2)	91.3	65.5
Career planning	4.8 (\pm 1.2)	87.0	59.6
Experiences abroad	4.9 (\pm 1.3)	85.9	57.6
Final year electives	5.3 (\pm 1.1)	93.0	37.9
Clinical electives	4.6 (\pm 1.6)	79.4	30.5
Work-life-balance	4.0 (\pm 1.5)	62.6	21.2
Medical issues	4.4 (\pm 1.3)	76.7	10.8
Other	—	—	30.5

Note: Completion of an electronic survey with Likert scale and free-text items was mandatory for all students wishing to create matching profiles for the one-on-one mentoring program. (*n* = 534). Students were asked to answer the question 'Which topics do you wish to discuss with your future mentor?' on 6-level Likert scales ranging from 1 = 'not at all' to 6 = 'very much'. Mean values and standard deviations as well as the frequency of overall positive answers (4–6) are shown. Mentees were asked to give a feedback after every personal meeting with their mentor. Here, students were asked to report topics discussed in their meeting. The percentage of mentees who reported discussing a certain topic with their mentor in one semester is shown.

*Discussing personal goals for the mentee was defined as indispensable by the program's guidelines.

with their mentor would be desirable, in reality most mentees met their mentors once (51.4%) or twice (22.6%) in one semester. On average, these meetings lasted 66 ± 44 min. In addition, mentees contacted their mentors twice (24.4%), three to five times (41.3%) or more than five times (18.8%) by email. The telephone was used as a means of contacting their mentor by 31.6% of mentees.

Satisfaction of mentors

In the evaluation of the program, we further investigated how mentors perceived the mentoring relationships (*n* = 66, Table 5). Mentors almost unanimously felt that they had been able to help their mentees (mean 4.6 ± 0.8) and answer their questions (mean 5.1 ± 0.9). Most of them concluded that they had made a difference for their mentees' careers (mean 4.1 ± 1.1). Moreover, analysis of mentors' free-text answers uncovered that next to social factors like the 'enriching acquaintance with very likeable and motivated students' the mentor–mentee relationship can also provide faculty with helpful feedback and insight into a medical student's development 'by reflection of students' problems especially regarding the choice of a research project and critical discussion of potential weaknesses in supervision and education of students'. Interestingly, only two mentors (3.0%) stated that their mentoring had demanded a disproportionate dedication of time (mean 1.8 ± 0.8).

Outcomes of the mentoring relationships

Finally, we assessed the self-perceived impact of the one-on-one mentoring on mentees' development (*n* = 208,

Table 6). Mentees stated that their mentor had most facilitated their development in the areas of career planning (mean 4.2 ± 1.4) and research (mean 4.3 ± 1.5). Also, mentees credited their mentors with a positive influence on arrangements for clinical electives (mean 4.0 ± 1.7), final year electives (mean 3.8 ± 1.5) and experiences abroad (mean 3.9 ± 1.6). Free texts demonstrate concrete results of the relationships like 'My mentor helped me find my MD thesis research project' or 'My mentor arranged a clinical elective in radiology for me'.

Table 5. Satisfaction of mentors (*n* = 66)

Perception of mentors	Mean (\pm SD)	% overall positive
My mentees were a good match.	5.0 (\pm 0.9)	93.9
Being a mentor has demanded excessive time investment.	1.8 (\pm 0.8)	3.0
I was able to answer my mentees' questions.	5.1 (\pm 0.9)	95.5
I was able to help my mentees.	4.6 (\pm 0.8)	95.5
I have had a positive impact on my mentees' careers.	4.1 (\pm 1.1)	78.8

Note: Mentors were asked to evaluate their perception of the mentoring relationship in a detailed end-of-semester evaluation. Mentors were asked how strongly they agreed with the statements shown in the table on a 6-level Likert scales ranging from 1 = 'not at all' to 6 = 'very much'. Mean values and standard deviations as well as the frequency of overall positive answers (4–6) are shown.

Table 6. Impact of mentoring ($n = 208$)

My mentor has facilitated my ...	Mean (\pm SD)	% overall positive
career planning	4.2 (\pm 1.4)	77.2
research	4.3 (\pm 1.5)	75.0
clinical electives	4.0 (\pm 1.7)	66.5
final year electives	3.8 (\pm 1.5)	65.7
experiences abroad	3.9 (\pm 1.6)	65.0
extra-curricular activities	3.3 (\pm 1.6)	48.0
work-life-balance	3.2 (\pm 1.6)	42.6
preparation for exams	3.0 (\pm 1.6)	40.7

Note: At the end of every semester, mentees were asked to provide an evaluation of their mentoring relationship. To assess the effectiveness of mentoring, mentees were questioned how much their mentors had facilitated their development in the areas shown in the table rated on 6-level Likert scales ranging from 1 = 'not at all' to 6 = 'very much'. Mean values and standard deviations as well as the frequency of overall positive answers (4–6) are shown.

Discussion

Mentoring is a key factor for professional success in medicine. While intense research has been performed on mentoring programs for junior faculty physicians and scientists, there is only limited data about mentoring relationships formed between faculty and medical students. We here shortly present a new established formal mentoring program with its main characteristics: a novel, computerized algorithm that proposes mentors to mentees based on online matching profiles, with the final choice being made by the student; participation being voluntary both for mentors and mentees and latitude concerning topics of discussion, amount of meetings and duration of the mentoring relationship. More importantly, we present a detailed characterization of the mentoring relationships formed by medical students within a formal mentoring program.

Participation in this voluntary mentoring program varied greatly with students' progress in the curriculum. While in the first clinical semesters around one in four students participated in the program, this number was only around one in twenty of final year students during the first year of the program. This may indicate that the demand for mentoring decreases with the amount of experience and acquaintances a student has made in hospitals during their clinical years of study (i.e., mentoring is taking place outside of the program's registry). However, as mentoring relationships usually are longitudinal and long lasting, it is to be expected that younger students will continue their relationships with their mentors and their networks throughout their studies. Registered participation in the program would therefore start being higher for later semesters over time.

Interestingly, despite there being close to equal numbers of female and male mentors to choose from in online matching, only about one in five male mentees chose a female mentor. Female students showed no such discernible bias toward their mentors' gender. Our data clearly show that despite the program being offered to all students equally, academically higher-performing students were more likely to participate.

In his article about mentoring medical students in academic emergency medicine, Garmel described main topics for mentors. The most important ones among them were career choice, clinical issues, including interpersonal skills, dealing with difficult situations, research, career satisfaction and life balance (28). In a previous study of group mentoring for medical students in Germany, the main topics discussed were questions concerning the curriculum and career planning (29). Ninety-eight per cent of mentors at UCSF discussed career planning with their mentees and 60% gave personal advice to them (7). In line to these studies, in our one-on-one mentoring setting, we have identified personal goals, career planning and experiences abroad as the topics most frequently discussed. One additional topic that seems to be very important for our students is research/MD thesis. Of note, participating in research is a prerequisite for obtaining an MD degree (but not to be licensed as a physician) in Germany. In an online survey conducted in October 2009, 99% of medical students at our faculty have already performed research or are planning to engage in research projects during medical school (unpublished data). Therefore, the prominent role of research as a topic in medical students' mentoring relationships might be due to this distinctive feature of medical education in Germany. Based on this data and a review of the literature on definitions of mentoring (22), our program's guidelines defined discussing and establishing short- and long-term goals for the mentee as an essential component of mentoring relationships.

In a US study by Aagaard and Hauer, the most common functions of mentors were personal support, role modeling, and career advising (11). This corresponds well with our data that mentees most commonly described the role of their mentor as a counselor, provider of ideas, and role model. In a randomized controlled study at the UCLA college program, students enrolled were more satisfied in terms of career planning and opportunities (30). Aagaard and Hauer have emphasized the impact of mentoring on specialty and residency choice (11). We have demonstrated that medical students perceive a particularly strong positive impact of their mentoring relationships on their career planning, research, clinical electives, and experiences abroad.

Different definitions of mentoring in formal mentoring programs and a big variety in targeted students, goals of the programs, duration, matching systems, and programs'

structure in literature make a general characterization of ‘the’ mentoring relationship between medical students and faculty difficult. It has been hypothesized that mentoring relationships formed via organized programs are qualitatively different from spontaneous mentoring in intensity, commitment, duration, and structure (17, 19). Indeed, we cannot exclude the possibility that participating in a formal mentoring program influences the shape of the mentoring relationships formed within that program. However, it is likely that this influence is not strong in programs which are voluntary for both mentors and mentees, where mentees are free to choose their mentors and meet them as often as they need. We therefore believe that the results presented here are largely valid even for mentoring relationships formed by medical students outside formal mentoring programs or other institutions with different curricula or size. Moreover, our formal mentoring program approach seems to be suitable for medical faculties with a very large number of students. A longer-term evaluation will provide clarity.

Limitations

Our statistical analysis shows that there is a strong selection bias: students participating in the one-on-one mentoring program had performed significantly better than their non-participating fellows both in their final secondary-school examinations and their Step 1 of the German Medical Board Examination. We conclude that high-performance medical students are more motivated to participate in a formal mentoring program. The reasons for this are unclear: these students might have more time for ‘extra-curricular’ involvement, such as investing time in a mentoring relationship because of better time management skills or simply less time needed for studying. Good performance may also lead to prioritizing more on career advancement and therefore actively seeking to contact faculty through a formal mentoring program. Although the initial goal of the program was to offer mentoring to all medical students, any program that is based on voluntary participation is likely to over represent students who share specific characteristics, including high academic performance and an aspiration for a career in academic medicine. This is in line with previous reports that having a mentor strongly correlated with interest in research and academic medicine (11). Though inevitable, this selection bias together with low response rates among students not participating in the program limits the generalizations of our findings to the entire population of medical students. Further studies are planned to assess other reasons for not participating in the mentoring program.

Practical implications

Mentoring relationships are a highly effective means of enhancing the bidirectional flow of information between

faculty and medical students. Analyzing the issues discussed in mentoring relationships can provide the faculty with an excellent picture of the questions and challenges students encounter during their time in medical school. Educational institutions can easily use this information to identify and address issues underserved by the current curriculum. For example, the prominent role of MD thesis research in mentoring relationships has prompted our faculty to set up a novel research fair for medical students. A mentoring program could in the future be used as a part of institutional learning to contribute to a feedback loop enabling the faculty to adjust or amend their curriculum according to the needs of medical students.

Conclusion

The presented data demonstrate the feasibility of a large-scale one-on-one mentoring program providing hundreds of medical students with suitable mentors. There is some evidence that students with strong academic performance are significantly more likely to choose a personal mentor. However, there is need for investigation into reasons of students not to participate in mentoring or matching with a mentor.

The role of the mentor identified by survey data is that of counselor, agent for contacts, and provider of ideas helping mentees to gain insight and advance in MD thesis, career planning, and experiences abroad. The key outcomes of mentoring relationships as perceived by medical students are facilitation in their development in the areas of career planning and research and having a close connection to a faculty member who may act as ‘enabler’ in terms of clinical electives and experiences abroad.

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