Tidsskriftet
DEN NORSKE LEGEFORENING

Are participants in the Medical Student Research Programme continuing to engage in research?

ORIGINAL ARTICLE

ANNA THERESE BJERKREIM

E-mail: anna.bjerkreim@gmail.com
Department of Clinical Medicine
University of Bergen
She has contributed to the idea, design, data collection, analysis and interpretation, and preparation, revision and submission of the manuscript.
Anna Therese Bjerkreim, doctor and research fellow in the Bergen Stroke Research Group.
The author has completed the ICMJE form and declares no conflicts of interest.

INGEBORG ESKERUD

Department of Clinical Science
University of Bergen
She has contributed to the design, data collection and interpretation and revision of the manuscript, and has approved the submitted manuscript version.
Ingeborg Eskerud, doctor and research fellow in the Hypertension and Cardiac Dynamics research group.
The author has completed the ICMJE form and declares no conflicts of interest.

ANNE BERIT GUTTORMSEN

Department of Clinical Medicine
University of Bergen
and
Surgical Clinic
Haukeland University Hospital
She has contributed to the design, data interpretation and revision of the manuscript, and has approved the submitted manuscript version.
Anne Berit Guttormsen, professor and head of the Medical Student Research Programme at the University of Bergen and senior consultant in intensive-care medicine.
The author has completed the ICMJE form and declares no conflicts of interest.

KARL ERIK MÜLLER

Department of Clinical Science
University of Bergen
and
Institute of Bioscience
University of São Paulo, Brazil
and
Medical Department

Drammen Hospital
He has contributed to the idea, design, data collection and interpretation and preparation and revision of the manuscript, and has approved the submitted manuscript version.
Karl Erik Müller, research fellow in the Gade Research Group for Infection and Immunity at the University of Bergen and the University of São Paulo, and doctor at Drammen Hospital.
The author has completed the ICMJE form and declares no conflicts of interest.

BACKGROUND

The medical student research programmes were established in 2002 to recruit medical students to research. We aimed to study how many of the former students in the research programme continued to engage in research, and to identify factors that were associated with continued research activity.

MATERIAL AND METHOD

All students enrolled in the Medical Student Research Programme at the University of Bergen since its launch in 2002 who graduated before June 2017 were contacted by email for participation in an online survey. Participants were asked whether they were engaged in or had completed a doctoral degree, the number of articles they had published, academic teaching and supervision, and if they were employed by a university or university college.

RESULTS

102 of 148 (69 %) respondents completed the questionnaire, 68 % of whom had continued to a doctoral degree, 38 % were involved in academic teaching or supervision, and 29 % were employed in an academic position. The median number of published articles was four. Women had a higher likelihood than men of continuing to a doctoral degree. This also applied to those who had published at least one article before completing their medical degree and to those who had not received regular supervision as a student in the research programme. There was no correlation between completing the research programme and continuing to a doctoral degree.

INTERPRETATION

Many medical students who have completed the Medical Student Research Programme at the University of Bergen continue to engage in research after graduation. This also applies to those withdrew from the programme.

MAIN MESSAGE

Two out of three former students in the Medical Student Research Programme at the University of Bergen had started or completed a doctoral degree in the time since the launch of the programme in 2002 until the autumn of 2017.

The median age of PhD graduates was 32 years, and more than half of the candidates graduated earlier than the nominal time of study.

More female than male students in the research programme continued to a doctoral degree.

Those who did *not* complete the research programme continued to engage in research to the same extent as those who did complete the programme.

Medical student research programmes were established at all four Norwegian medical faculties in 2002 in order to increase recruitment of medical students and young doctors to research (1). Prior to this time, the Research Council of Norway had funded numerous

student projects in medicine, several of which leading to a doctoral degree. However, a declining number of medical students engaged in research (2).

The research programmes are organised through the Research Council of Norway, and the faculties have a lot of latitude in their ways of organising the programme. At the University of Bergen, up to 10 % of the medical students are admitted to the Medical Student Research Programme. These students accumulate 120 credits, which include one year of full-time research and two years of part-time research parallel to their medical studies. The programme is approved if the student has completed training and dissemination activities equal to the training component of the PhD programme (30 credits) and published or written a manuscript for a peer-reviewed original article.

In 2007, Hunskår et al. conducted an evaluation of the research programmes at the medical faculties in Norway and found that an increasing number of students had actively participated in research. Their data provided no basis for concluding whether the scheme helped increase the number of doctoral degrees, or whether the students in the programme chose a research profession (3). In May 2018, Jacobsen and colleagues published a study showing that students in the research programme complete a doctoral degree more often than students who have not completed the programme, and they graduate earlier after completing their medical degree (4). They also found that students in the research programme more often had published at least one article, when compared to medical students who had not attended the programme.

So far, no study has investigated the factors that cause medical students in the research programme to continue engaging in research after graduation. We therefore aimed to investigate continued research activity among former students from the Medical Student Research Programme at the University of Bergen, and identify the factors that were associated with continuing engagement in research after graduation. Research activity was measured by four pre-defined indicators: (i) doctoral degree, (ii) number of articles published and the time that had passed since the last publication, (iii) academic teaching and supervision of students (project work, master's degree, doctoral degree) and (iv) present position in an academic institution (university or university college).

Material and method

We conducted a survey among all medical students who had been enrolled in the Medical Student Research Programme at the University of Bergen since the launch in 2002 and who had completed their medical degree course by June 2017 (n = 149). The study was undertaken in the autumn of 2017 with the aid of SurveyXact (Rambøll). It was distributed by email on 14 November 2017 with weekly reminders until the survey closed on 12 December 2017. Email addresses had been previously registered by the programme administration or traced by way of publicly available contact information or the internal email system of Western Norway Health Authority. We established contact with 148 of the 149 possible participants.

The questionnaire included 64 questions, whereof 17 were add-ons to a preceding question (see the Appendix). Forty questions were simple multiple-choice questions, 15 were multiple-choice questions with a free-text field for comments, and nine questions had only a free-text comments field. The questions encompassed information on background, the period in the programme, PhD work, number of articles published, teaching, supervision and academic ambitions. Before distribution, the questionnaire was tested on a pilot group for revision and linguistic specificity.

The data analyses were undertaken with STATA version 15.0 (College Station, Texas, USA). Categorical data are presented as numbers (%), while continuous data are presented as medians (upper and lower quartile). For the indicator 'published within the last two years',

we excluded participants who had graduated within the two previous years to increase the likelihood that the publication did not encompass the assignment in the research programme.

The participants were informed about the purpose of the study, and that a submitted response was regarded as consent to publish the data. The study was anonymous and the data material was stored on a server with restricted access at the University of Bergen. The study was approved by the Norwegian Centre for Research Data (project no. 56400).

Results

The questionnaire was completed by 102 of the 148 participants with whom we could establish contact (69 %). Of these, 53 (52 %) were women. The median age at the time of the survey was 33 years (30–36), and a median number of five years (2–8) had elapsed since the participants had completed their medical degree. Forty-nine (49 %) had been linked to a laboratory-based project, 25 (25 %) to an epidemiological/community medicine project and 25 (25 %) to a clinical project as part of the research programme.

A total of 69 (68 %) respondents were working on or had completed a doctoral degree after graduation from the medical degree course (Table 1). Of these, 51 (74 %) had extended their project from the research programme into a doctoral degree. Of the 69 who proceeded to the PhD degree, 44 (64 %) took up a PhD fellowship position immediately after completing their medical degree course, and 33 (75 %) of these took up fellowship positions earmarked for students from the medical student research programme. All those who started working on their doctoral degree immediately after graduation had passed the research programme. The three most common reasons for not applying for a PhD fellowship were a preference for clinical work (n = 25), loss of interest in the project (n = 14) and lack of motivation for further research (n = 14).

Table 1

Factors associated with the research programme and proceeding to a PhD degree among former students in the Medical Student Research Programme at the University of Bergen. Number (%), unless otherwise specified.

	Working on/completed a PhD degree		**P-value**
	Yes n = 69	**No n = 33**	
Gender			0.029
Woman	41 (59)	12 (36)	
Man	28 (41)	21 (64)	
Age, years, median (lower and upper quartile)	34 (30, 36)	32 (30, 35)	0.213
Classification of the research project[1]			0.352
Epidemiological	14 (21)	11 (33)	0.152
Clinical	19 (29)	6 (18)	0.304
Laboratory-based	33 (50)	16 (48)	0.950
Published ≥ 1 article before completing the medical degree course			0.005

	Working on/completed a PhD degree		P-value
	Yes n = 69	No n = 33	
Yes	51 (74)	15 (45)	
No	18 (26)	18 (55)	
Satisfaction with the supervision provided			0.947
Satisfied	44 (64)	20 (61)	0.757
Partly satisfied	20 (29)	10 (30)	0.891
Not satisfied	5 (7)	3 (9)	0.711
Regular supervision			0.028
Yes	30 (43)	22 (67)	
No	39 (57)	11 (33)	
Involved in other work within the research group as a research programme student			0.368
Yes	40 (58)	16 (48)	
No	29 (42)	17 (52)	
Was happy to have attended the medical student research programme			0.117
Yes	54 (78)	21 (64)	
No or partly	15 (22)	12 (36)	
Completed the medical student research programme			0.766
Yes	60 (87)	28 (85)	
No	9 (13)	5 (15)	
Years since completing the medical degree course, median (lower and upper quartile)	6 (3, 8)	2 (1, 6)	0.008

[1]The alternative 'other' with 3 answers deleted

A total of 40 (39 %) of the participants had completed the PhD, 38 of whom had completed the medical student research programme and two had not. Twenty-two of the 40 participants who had defended their doctoral thesis had done so within the nominal time. Median age upon completion of the doctoral programme was 32 years (29–34). For those who had completed the degree, a median number of three years (1–5) had elapsed since the doctoral examination.

Table 1 shows various factors in the research programme and their effect on the participants' likelihood of proceeding to a doctoral degree. More women than men had proceeded to a doctoral degree. Participants who had published at least one article prior to completing their medical degree course were more likely to proceed to a PhD degree. Those who had received supervision at regular intervals whilst in the research programme were

less likely to proceed to a PhD degree. Whether the participants had completed the research programme had no impact on their likelihood of proceeding to a PhD degree. Among those who had proceeded to a PhD degree, a longer period of time had elapsed since completion of their medical degree course for those who had not completed the research programme than for those who had completed it (median seven years (6–9) versus median five years (3–8), p = 0.057.

The median number of original articles published per participant was four (2–7), and the median number of lead authorships was two (1–3). Six of the participants were listed as the last author in at least one of their publications. At least two years had passed since completion of the medical degree course for 84 of the participants, whereof 55 (65 %) had published an article during the last two years (Table 2). Thirty-one (78 %) of those who had completed a doctoral degree had published during the last two years, and a median number of two years (1–4) had passed since they had defended their doctoral thesis. Those who had completed the doctoral degree had published a median number of seven (4–10) articles, with a median number of four (3–5) lead authorships. More women than men had published articles during the last two years (Table 2).

Table 2

Current research activity among former students in the Medical Student Research Programme at the University of Bergen: publication activity during the last two years. Number (%) unless otherwise specified.

	Has published an academic article during the last two years[1]		**P-value**
	Yes (n = 55)	**No (n = 29)**	
Doctoral degree[2]	49 (89)	11 (38)	< 0.001
Gender			0.054
Female	33 (60)	11 (38)	
Male	22 (40)	18 (62)	
Completed the medical student research programme	47 (85)	24 (83)	0.759
Involved in other work within the research group as research programme student	32 (58)	15 (52)	0.571
Published articles before completing the medical degree course	38 (69)	15 (52)	0.117
Years since completing the medical degree course, median (lower and upper quartile)	6 (3, 8)	6 (5, 9)	0.250

[1]Excluding 18 participants who completed their medical degree course less than two years before the time of the survey

[2]Working on or has completed the doctoral degree

Thirty-one (30 %) of the participants were involved in teaching of students, and 26 (25 %) had supervised master's degree students or medical students (student project). Among those 39 (38 %) who were involved in at least one of these activities, 34 (87 %) had continued

to a doctoral degree. Those who had published at least one article before completing their medical degree course and those who had completed the research programme were more often involved in teaching and supervision (Table 3). There was a tendency for more men than women to be involved in academic teaching or supervision, and those who had been involved in other activities within the research group whilst in the research programme were also more frequently involved in academic teaching or supervision (Table 3).

Table 3

Current research activity among former students in the Medical Student Research Programme at the University of Bergen: academic teaching or supervision. Number (%) unless otherwise specified.

	Academic teaching or supervision		**P-value**
	Yes (n = 39)	**No (n = 63)**	
Doctoral degree[1]	34 (87)	35 (56)	0.001
Gender			0.183
Female	17 (44)	36 (57)	
Male	22 (56)	27 (43)	
Completed the medical student research programme	37 (95)	51 (81)	0.047
Involved in other work within the research group as research programme student	26 (67)	30 (48)	0.060
Published articles before completing the medical degree course	33 (85)	33 (52)	0.001
Years since completing the medical degree course, median (lower and upper quartile)	5 (2, 8)	5 (2, 7)	0.871

[1]Working on or has completed the doctoral degree

Among the participants, 29 (29 %) were employed at a university or university college (Table 4). Of these, 14 were employed in full-time research positions, all of whom as PhD candidates. Six (15 %) of those who had completed a doctoral degree held a part-time position in an academic institution, and a median number of nine years (7–11) had passed since they completed their medical degree course. Those who had not completed the research programme were more likely to be employed in academic positions (Table 4). Of the seven who did not complete the research programme and were employed in an academic position, six were working on their doctoral degree.

Table 4

Current research activity among former students in the Medical Student Research Programme at the University of Bergen: current academic position. Number (%) unless otherwise specified.

	Current position[1]		P-value
	Academic[2] (n = 29)	Clinical (n = 71)	
Doctoral degree[3]	27 (93)	41 (58)	0.001
Gender			0.972
Female	15 (52)	37 (48)	
Male	14 (52)	34 (48)	
Completed the medical student research programme	22 (76)	64 (90)	0.062
Involved in other work within the research group as research programme student	14 (48)	40 (56)	0.463
Published articles before completing the medical degree course	20 (69)	41 (62)	0.509
Years since completing the medical degree course, median (lower and upper quartile)	6 (1, 7)	5 (2, 8)	0.982

[1]Response missing from two participants

[2]Full time or part time

[3]Working on or has completed the doctoral degree

Discussion

In this study we sought to find out whether students from the Medical Student Research Programme at the University of Bergen continued to engage in research after completing their medical degree course and to identify the factors that caused the participants to proceed with a doctoral degree, to have published articles within the last two years, to engage in academic teaching or supervision or to be employed in an academic position in a university or university college, respectively. We found that 68 % either had completed or were working on a doctoral degree. In comparison, 18.4 % of all Norwegian specialists had a PhD degree in 2016 (5). The median age at completion of the doctoral degree among the participants in our study was 32 years, while the median age at the time of defending their doctoral thesis in medical and health sciences in Norway was 39 years in 2016 (6). Jacobsen et al. have shown that medical students from the research programmes more often take a doctoral degree and complete their degree earlier than medical students who have not attended such programmes (4). When considering that no more than a median number of five years had passed since the participants had graduated from the medical degree course, it seems that many students from the Medical Student Research Programme at the University of Bergen start their academic career early.

We also found that the majority of those who entered PhD candidate positions did so before starting their period as a junior doctor/LIS1 doctor, and that many of them took up PhD candidate positions earmarked for research programme students. Furthermore, we found that students who had not completed the research programme continued to a PhD to the same extent, but they did so at a later time in their career than those who had

completed the programme. A doctoral degree is a prerequisite for an academic career. Early recruitment of research programme students can therefore be regarded as an important factor for an early academic career.

The proportion of women who take a doctoral degree in medicine and health sciences has significantly increased since 1980, and in the years 2010–2016 more women than men followed a doctoral programme (6). While the majority of the medical students in Norway are women, our study included equal proportions of men and women. This finding may indicate that a lower proportion of women choose research during their student years, while female students in the research programme more frequently continue to a doctoral degree. Furthermore, we found some indications that men more frequently were involved in academic teaching and supervision. This is a key component of an academic career following a doctoral degree. All students in the research programme, and women in particular, ought to take the initiative and be encouraged to engage in teaching and supervision activities.

In our cohort, regular supervision led to a higher proportion completing the research programme (7), but paradoxically, we found that those who had been provided with such regular supervision had a lower likelihood of proceeding to a doctoral degree. It is crucial that the supervisor is present to provide follow-up at the early stages of a researcher's career, and gradually leaves more latitude for the student to become an independent researcher.

Jacobsen et al. showed that former students in the medical student research programmes more frequently had published at least one article as lead author as compared to medical students who had not attended the research programme (4). In our study, each participant had published a median number of four articles in total, and two as the lead author. The number of articles was higher among those who had completed the doctoral degree, and three in four of these had published articles within the last two years. This may indicate that they continued to engage in research after completing the doctoral degree. However, a median of two years had passed since these had completed the doctoral degree, and these publications may thus include the doctoral thesis. Because of the short follow-up time, we do not know whether the majority of those participants who had completed the doctoral degree continued to engage in research upon completion.

Those who had completed the research programme were more often engaged in academic supervision or teaching than those who had not completed the programme. We assume that this is due to the fact that students who do not complete the programme tend to have a later start to their academic career, and that supervision and teaching thus come at a later stage in their research career. Even with the relatively short follow-up time in our study, those who have completed the research programme will have had a longer research career and thus a higher likelihood of engaging in supervision and teaching activities.

Only 15 % of those who had completed a doctoral degree held a current position in an academic institution. All these participants were working in part-time positions, and a median number of nine years had passed since they had completed their medical degree course. The observation that no more than a median number of three years had passed since the doctoral examination and that many had taken the doctoral degree before becoming junior doctors may explain why so few of the participants with a doctoral degree were working in academic institutions at the time of the survey. Announcements of academic vacancies for doctors often include a requirement for a clinical speciality. A doctor's academic career often grinds to a halt when he/she is undertaking specialist training. In addition, there are relatively few research positions available for PhD graduates in Norway. This may indicate a need for more combined positions in the specialisation training programmes.

One of the weaknesses of our study is its short follow-up time, meaning that many have not yet had the opportunity to establish a research career after completing their doctoral degree. Since no more than 15 students are admitted to the programme at the University of Bergen annually, the study population is relatively small, and this reduces the study's statistical strength. The differences we have detected are nevertheless large and plausible. Despite a high response rate, we cannot exclude the possibility of a selection bias in the sample, for example underestimation of the number of students who did not complete the research programme or go on to take a doctoral degree. Because of the study design, we cannot conclude that the research activity is higher among former students from the Medical Student Research Programme at the University of Bergen than among medical students who have not attended this programme.

CONCLUSION

Many medical students who have attended the Medical Student Research Programme at the University of Bergen proceed with a doctoral degree. Women more often pursue a doctoral degree, while the male students from the research programme more frequently engage in supervision and teaching. Those who do not complete the research programme continue to pursue research activities to the same extent as those who do complete the programme. Medical students in the research programme must be followed up, but also need to be provided with the latitude to become independent researchers in order to be able to pursue an academic career.

We wish to thank Henriette Aurora Selvik, Tor-Arne Hegvik, Fridtjov Edland Ravn, Sunniva Todnem Sakkestad, Jobin Varughese and Eivind Valestrand for their input to the design of the survey. We also wish to thank Marianne Heldal Stien for her help in tracing study participants, and Steinar Hunskår, Roland Jonsson and Eva Gerdts for their feedback on earlier versions of this article.

LITERATURE

1. Gilhus NE, Ottersen OP, Ytrehus K et al. Hvorfor forskerlinje for medisinstudenter? Tidsskr Nor Laegeforen 2001; 121: 1846–7. [PubMed]

2. Nes M, Røttingen JA. Leger og forskning–når er bunnen nådd? Tidsskr Nor Laegeforen 2003; 123: 344–5. [PubMed]

3. Hunskaar S, Breivik J, Siebke M et al. Evaluation of the medical student research programme in Norwegian medical schools. A survey of students and supervisors. BMC Med Educ 2009; 9: 43. [PubMed][CrossRef]

4. Jacobsen GW, Ræder H, Stien MH et al. Springboard to an academic career-A national medical student research program. PLoS One 2018; 13: e0195527. [PubMed][CrossRef]

5. Den norske legeforening. Andel med doktorgrad etter godkjent spesialitet, yrkesaktive spesialister < 70 år i Norge per 2.5.2016. https://legeforeningen.no/Emner/Andre-emner/Legestatistikk/Spesialister/Andel-med-doktorgrad-blant-yrkesaktivespesialister-under-70-ar-i-Norge-etter-spesialitet/2016-andel-med-doktorgrad-etter-godkjent-spesialitet-yrkesaktivespesialister-70-ar-i-norge/ (7.2.2018).

6. Sarpebakken B. Doktorgradsstatistikk – Tabeller og figurer. Oslo: Nordisk institutt for studier av innovasjon, forskning og utdanning, 2017. https://www.nifu.no/wp-content/uploads/2017/03/Figurer-og-tabeller-1980-2016-NY.pdf (17.9.2018).

7. Eskerud I, Müller KE, Stien MH et al. Veiledning av studenter ved Forskerlinjen. Tidsskr Nor Legeforen 2019; 139. doi: 10.4045/tidsskr.18.0575. [CrossRef]

Publisert: 7 February 2019. Tidsskr Nor Legeforen. DOI: 10.4045/tidsskr.18.0266
Received 20.3.2018, first revision submitted 25.7.2018, accepted 17.9.2018.