

ORIGINAL ARTICLE

Publications by Doctoral Candidates at Charité University Hospital, Berlin, from 1998–2008

Esther Ziemann, Jörg-Wilhelm Oestmann

SUMMARY

Background: One quality parameter of medical theses is the number of articles published by the doctoral candidates. Over the course of the past decade the Charité-Universitätsmedizin Berlin has taken steps to improve the quality of the theses completed by its doctoral students in medicine and increase their publication activity. This study was designed to verify the efficacy of these measures and to detect general trends.

Method: Medical theses completed in 1998, 2004 and 2008 (sample size >250 for each year) were retrospectively analyzed with regard to associated publications within a 7-year period (from 5 years before completion to 2 years thereafter). Quality and quantity were recorded. Publications found in the PubMed database were evaluated; the impact factor of the publishing journal was used as quality parameter.

Results: The sample sizes were 264 for 1998, 316 for 2004, and 316 for 2008. The number of publications per doctoral student increased from 0.78 to 1.39 over the course of the study period, and the average impact factor rose from 2.42 to 3.62. Analysis using the current impact factors of the publishing journals showed an increase from 3.13 to 3.85. The proportion of case reports fell from 12.7% to 8%. The proportion of first authorships remained about the same.

Conclusion: The past decade has seen an increase in the number of publications by doctoral students at the Charité and a rise in the average impact factor of the journals concerned.

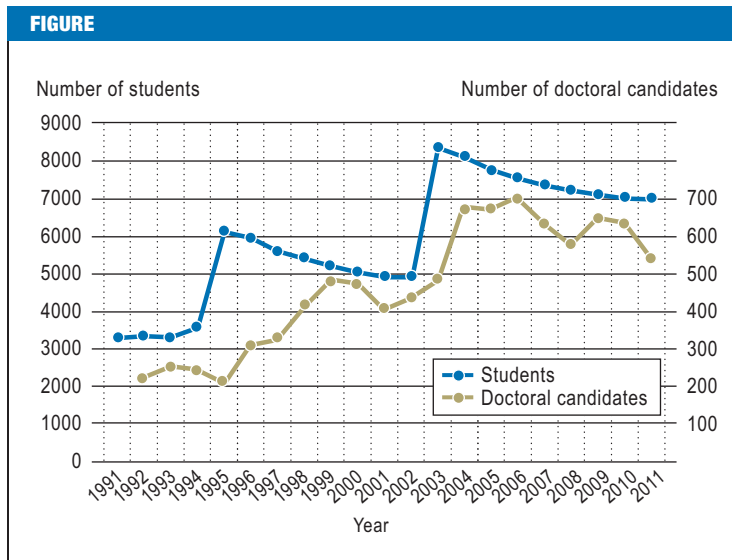
► Cite this as:

Ziemann E, Oestmann JW: Publications by doctoral candidates at Charité University Hospital, Berlin, from 1998–2008. *Dtsch Arztebl Int* 2012; 109(18): 333–7.
DOI: 10.3238/arztebl.2012.0333

The quality and importance of doctoral theses delivered by medical students in Germany has been the subject of scrutiny for quite some time—long before public discussion turned to doctoral theses in the subject of law. The public and some scientific organizations assume low quality in many cases of medical doctoral theses, which does not justify the award of an academic degree. Consequently, the European Research Council does not regard the Dr. med. (*doctor medicinae*) qualification as equivalent to the PhD (1) and disregards it on funding applications. The medical faculties are aware that the high numbers of doctoral theses put a strain on their financial and organizational resources without providing a commensurate impulse for research. On this background, the Alliance of Science Organizations in Germany (Deutscher Wissenschaftsrat, WR) has suggested to replace the Dr med in its current form with a “medical doctor” degree, similar to the MD (2), and to offer a degree for research oriented doctors that in terms of its requirements and academic quality is equivalent to doctoral theses in the basis sciences (Dr rer. nat.) or the PhD in the Anglo-American region. This approach solves the problem of poor quality in doctoral theses by reducing the motivation among normal medical students to start an academic thesis and putting trust into an individual’s early orientation towards an academic career. The medical faculties have thus far not pursued this approach in any sustained manner.

The Charité-University Medicine Berlin assumes that all its students are equipped with the motivation to embark on research. It makes use of the high attractiveness of the academic degree for physicians in order to introduce a large group of young people to the life sciences and to stimulate their interest in research. The Charité regards the doctorate as an essential recruitment tool within academia. Its aim is not to stop less motivated students from pursuing doctorates but to directly improve the quality of medical theses. In pursuing this goal, medical theses based on a collection of published papers have been informally accepted since 2000—in the sense of a “cumulative” doctorate—and

Promotion Committee, Charité-University Medicine Berlin, Campus Virchow Klinikum: Ziemann, Prof. Dr. med. Oestmann



Numbers of students and doctoral candidates at the Charité-Universitätsmedizin Berlin. The first fusion of Campus Mitte (east Berlin) with the Campus Virchow of the Free University (FU) Berlin (west Berlin) took place in 1995–1997. The second fusion with the FU’s Campus Benjamin Franklin (west Berlin) took place in 2003–2004. Please note that in addition to doctoral theses leading to Dr. med. and Dr. med. dent., the data include doctoral theses leading to Dr. rer. medic., Dr. rer. cur., and PhD in medical neuroscience, altogether increasing and at present about 10% of the total

have been included in the doctoral regulations since 2005. In 2012, the thesis on the basis of the number of published articles will become standard at the Charité. This development reflects the continual drop in importance of the classic monograph in academic discourse. Since 2001, the university has also maintained an accompanying doctoral program, as stipulated in the Berlin University Framework Act for Higher Education (*Hochschulrahmengesetz*) (3).

In order to be able to assess the baseline as well as the effect of these measures in the quality of academic theses, the authors defined the publication activity of doctoral candidates by using specific variables, such as number of publications, impact factor, and first authorship as quality parameters and determined these for the years 1998, 2004 and 2008.

Methods

The authors collected the data retrospectively by means of an online search of the PubMed database and an analysis of the Charité’s own data on doctoral theses. The required complete lists of doctoral candidates were made available after discussion with and under the control of the data protection officer by the university’s doctoral committee. On PubMed, the authors determined all publications by the doctoral candidates for a defined time period of five years preceding the year in which the doctorate was awarded until two years after that date. This means that for purposes of the study, which started in 2010, 2008 was counted as the final year for doctorates to be awarded. As the intention was to cover as long a time period as possible, we selected

the year after the initial fusion of the Charité’s two campuses in 1998 as the baseline date. The year after the fusion between the Charité and the Benjamin Franklin Clinics, Free University Berlin—2004—was chosen as the middle date. The number of students at the Charité fluctuated in the context of the fusions and reduction in the numbers of available places (*Figure*).

This should be borne in mind when considering the absolute numbers. When searching for each individual doctoral candidate in the study samples for 1998, 2004, and 2008, we used last names and the initial letters of the first names as search terms for authors. If it was not possible to assign the search result unequivocally to a particular doctoral candidate, we searched for the names of their tutors or collaborators in the doctoral research group, where these were known, or for key words of the thesis’s topic. Doctoral candidates to whom publications could not be unequivocally assigned were excluded, for use in later evaluations.

We considered as a publication any original articles, reviews articles, meta-analyses, and case reports listed in PubMed. PubMed was selected as it represents the most widely accepted and used biomedical database (4). Comments, reader’s correspondence, book chapters, and chapters in conference proceedings were not counted and excluded from the selection. We used the ISI Web of Knowledge to determine the impact factor of the journals where the publications had appeared by entering the name of each journal directly, or its ISSN. Initially, we did this for the publication year of each publication. If a publication preceded the introduction of the impact factor for the journal in question then the next possible impact factor was selected. Journals with publications from 2010 were assigned the impact factor for 2009, since the impact factor for 2010 was not yet available at the time of our literature search.

Furthermore, in order to facilitate easier comparability of the results for 1998, 2004, and 2008, we determined the current impact factor for all journals. Journals without an impact factor at the time of publication were not included.

For journals that had been taken over by or absorbed into other journals we used as the current impact factor the impact factor that was available most recently for the journal under its previous name. We also used this approach whenever a journal was later divided into several parts. If a journal merely changed its title than the impact factors were determined for the new journal name.

The corresponding information about the genesis of a journal were obtained from PubMed and also from the online database registry for journals at the Charité.

In the context of its fusions and subsequent capacity adaptations, numbers of students and doctoral candidates have fluctuated widely at the Charité. For this reason, absolute numbers are meaningless in a comparison. We selected as the comparator groups samples of more than 250 doctoral candidates (264 from 1998, 316 from 2004 and 2008). The samples were selected in alphabetical order until the sample size was reached

TABLE

Overview of publication activity

	1998	2004	2008	P value
Total number of doctoral candidates evaluated in the study	264	316	316	–
Total number of publications	207	254	439	0.081
– of which case reports	26 (12.6 %)	18 (7.1 %)	34 (7.7 %)	
– 95 %-confidence interval	(8.1 %–17.1 %)	(3.9 %–10.3 %)	(5.2 %–10.2 %)	
Number of publications per doctoral candidate (all)	0.78	0.8	1.39	<0.001
– Standard deviation	1.777	1.733	2.458	
– Median (interquartile range)	0 (0–1)	0 (0–1)	1 (0–2)	
Number of doctoral candidates who have published	86 (33 %)	124 (39 %)	165 (52 %)	<0.001
– 95 %-confidence interval	(27.3 %–38.7 %)	(33.6 %–44.4 %)	(46.5 %–57.5 %)	
Number of publications per publishing doctoral candidate	2.41	2.05	2.66	0.023
– Standard deviation	2.413	2.263	2.864	
– Median (interquartile range)	2 (1–3)	1 (1–2)	2 (1–3)	
Average impact factor per publication at the time of publication	2.421 ^{*1}	3.658 ^{*2}	3.622 ^{*3}	<0.001
– Standard deviation	2.363	3.445	3.373	
– Median (interquartile range)	1.65 (0.79–3.28)	2.78 (1.63–4.99)	2.96 (1.88–4.45)	
Average current impact factor per publication	3.131 ^{*1}	4.275 ^{*2}	3.853 ^{*3}	0.005
– Standard deviation	2.415	4.283	3.485	
– Median (interquartile range)	2.61 (1.40–4.60)	3.08 (2.03–6.01)	3.12 (2.10–4.85)	
Number of first authorships	56 (27 %)	67 (26.4 %)	111 (25.3 %)	0.879
– 95 %-confidence interval	(20.9 %–33.1 %)	(21.0 %–31.8 %)	(21.2 %–29.4 %)	
– of which case reports	15	11	19	
(proportion of publications with first authorship)	(26.8 %)	(16.4 %)	(17.1 %)	
Number of last authorships	8 (3.9 %)	4 (1.6 %)	6 (1.4 %)	0.103
–95 %-confidence interval	(0 %–10.2 %)	(0 %–3.1 %)	(0 %–2.5 %)	
– of which case reports	3	1	0	
(proportion of publications with last authorship)	(37.5 %)	(25 %)	(0 %)	

^{*1} For 11 publications and their journals, no impact factor was available; ^{*2} for 12 publications and their journals, no impact factor was available; ^{*3} for 23 publications and their journals, no impact factor was available; case reports were included in the statistical calculations but usually not related to the doctoral thesis

and represents roughly half of each year’s candidates (*Figure*). In addition to the total number of publications we compared the average number of publications per doctoral candidate, the mean impact factor per publication at the time of publication and at the time of the study. Furthermore, we subcategorized the individual publications by first authorships or last authorships.

Results

The *Table* summarizes the results.

The number of publications per doctoral candidate rose over a decade from 0.8 to 1.4. The proportion of doctoral candidates who participated in a publication rose from 33% to 52%. The impact factor rose—uncorrected for trend—from 2.4 to 3.6. After correcting for most recent impact factors of journals, a rise from 3.1 to 3.9 was observed. The number of case reports fell.

Those who were successful in publishing achieved a constant average of more than two publications over the decade. The proportion of first authorships also remained roughly constant, at 25%.

Discussion

The results of our study show a positive trend over the decade. The number of publications per doctoral candidate rose, as did the quality of individual publications.

The proportion of first authorships remained constant, however. The chosen time period of seven years embracing the submission of a doctoral thesis accurately reflects the publications resulting from that thesis. However, new as well as parallel scientific projects are captured for this period. This means that it is general scientific academic activity that is being documented, rather than specific publications relating to the subject of a particular thesis. But even this is a relevant finding. By restricting the search to PubMed we may have underestimated publication output since marginal areas in medicine are not completely captured in the database. Furthermore, publications in journals with no impact factor were not included in the evaluation. This should be borne in mind when evaluating the absolute numbers. The authors have accepted this limitation.

The rising number of publications in itself is not proof of an improvement in the quality of an academic thesis. The necessity and pressure to generate as many publications as possible from one subject—key term: “smallest publishable unit”—has certainly increased in the past decade. The introduction of FACTScience, a software based registry for academic publications (which has formed the basis of an academic “enticement system” at the Charité since 1998 [5] and is used to allocate funding from the faculty budget) at

many medical faculties has further increased the pressure to publish. It can therefore be said that there is a certain focus on publishable results; but that is not in itself a weakness.

At the Charité, this process has not diluted the quality. The journals' impact factors, which we used in the absence of a better parameter, did not fall but increased notably. It needs to be borne in mind that the journals also generally developed in the decade in such a way that their impact factors increased (6). If one were to ignore this increase and measured all publications with the current impact factor, a clear gain can be observed at least for the comparison between 1998 and the other two years. However, impact factors rose mainly between 1998 and 2004. The number of publications per doctoral candidate stagnated in that same time period. This could be interpreted to mean that it was possible to place planned publications more appropriately, owing to higher quality and increased experience of the working groups, and thus utilizing the potential to its maximum. This time period at the Charité also saw the promotion of the publication based doctoral thesis, as well as restructurings and adaptation processes in the context of the fusion between east and west. In 2004–2008, however, the impact factor stagnated, whereas the number of publications rose notably. In the best-case scenario, this is due to an effect of the optimization measures taken at the Charité.

Another, and crucial, parameter is the number of doctoral candidates who even participated in a publication—this rose from 33% in 1998 to 50% in 2008. These figures are comparable to data from the Hanover University Medical School. In a survey of doctoral candidates from 1 October 2000 to 30 September 2001, 38% reported having published original articles in scientific journals (7).

The proportion of doctoral candidates who were listed as the first authors remained constant, at just under 25%. This is disappointing since an increase in first-authorship among doctoral candidates is a declared objective at the Charité. However, the proportion of case reports in first authorships fell over the decade, so we can assume that the proportion of first author listings increased for the direct topics of doctoral theses. This will be the subject of a further analysis. For the future, however, the heads of faculties need to communicate more clearly the equivalence of first authorship and last authorship in the context of habilitation procedures and, accordingly, insist that the guidelines issued for correct authorship by the International Committee of Medical Journal Editors (ICMJE) (8) are followed in all institutes and hospitals.

The question of whether the number of authors per publication has increased was not the subject of the current study. Furthermore, the authors were not able—for reasons of data protection—to correlate publication activity with the grades awarded for the doctoral thesis. This will also be the subject of a future analysis.

In conclusion, the past decade showed a positive

trend in the scientific productivity of doctoral candidates, although the average medical thesis still does not reach the academic standards postulated for a PhD or Dr rer. nat. The proportion of theses that do not need to fear the comparison is steadily increasing, however. The improvements are probably due in large part to changes to the academic environment, such as have taken place as a result of science-orientated restructurings and systems such as FACTScience. For the Charité, the intentional support for the publication based doctoral thesis since 2000, and the fact that is has been written into the doctoral regulations (9) in 2005 constitute a further reason. In its new doctoral regulations, which will come in force in the summer semester 2012, the Charité will put the main emphasis on the publication based doctoral thesis—this will become the standard format for medical theses. The requirement is first authorship in a first-class journal, or first authorship and two co-authorships in non-first class journals; the first-class quality with regard to topic and subject matter will be verified by the doctoral committee. Adherence to the ICMJE guidelines regarding correct authorship will be binding for publications on the context of medical theses. An obligatory agreement (7) between doctoral tutors and doctoral candidates will further increase efficiency.

KEY MESSAGES

- From 1998 to 2008, the number of publications per doctoral candidate rose significantly.
- The impact factor of the publications also rose significantly.
- Even after correcting for trend, the impact factor improved.
- The proportion of case reports among the published articles fell.
- The proportion of first authorships remained constant, at just under 25%.

Conflict of interest statement

The authors declare that no conflict of interest exists.

Manuscript received on 13 September 2011, revised version accepted on 4 April 2012.

Translated from the original German by Dr Birte Twisselmann.

REFERENCES

1. Europäischer Forschungsrat (ERC): Antragsberechtigung bei Medizinern (StG). www.euburo.de/erc-gewusst.htm#DrMed (last accessed on 1 February 2012).
2. Wissenschaftsrat: Empfehlungen zur Doktorandenausbildung. Drs. 5459/02 Saarbrücken, 15.11.2002. www.wissenschaftsrat.de/download/archiv/5459-02.pdf (last accessed on 1 February 2012).
3. Gesetz über die Hochschulen im Land Berlin (Berliner Hochschulgesetz – BerHGG) in der Fassung vom 26. Juli 2011: §25 Absatz 3. <http://gesetze.berlin.de/default.aspx?words=BerHGG&btsearch.x=42&filter=> (last accessed on 1 February 2012).

4. Falagas ME, Pitsouni EI, Malietzis GA, Pappas G: Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *FASEB J* 2008; 22: 338–42.
5. FACTScience: LE Administrationsplattform zur Leistungsevaluierung und LOM www.gleo.de/produkte/facts-science-le.html (last accessed on 1 February 2012).
6. Seglen PO: Why the impact factor of journals should not be used for evaluating research. *BMJ* 1997; 314: 498–502.
7. Wehrauch M, Strate J, Papst R: Die Medizinische Dissertation – kein Auslaufmodell. Ergebnisse einer Befragung von Promovierenden stehen im Widerspruch zu oft geäußerten Meinungen. *Deutsche Medizinische Wochenschrift* 2003; 128: 2583–7.
8. The Uniform Requirements for Manuscripts Submitted to Biomedical Journals: www.icmje.org/ (last accessed on 22 March 2012).
9. Promotionskommission der Charité Universitätsmedizin Berlin: <http://promotion.charite.de/> (last accessed on 1 February 2012).

Corresponding author

Prof. Dr. med. Jörg-Wilhelm Oestmann
Vorsitzender der Promotionskommission der Charité
Campus Virchow Klinikum der Charité
Augustenburger Platz 1
13353 Berlin, Germany
joerg.oestmann@charite.de