



# Publication Performance of University Anaesthesiology in Germany

**Nabila Khesrewi-Elshinnawi; Eike Sebastian Debus; Reinhart Thomas Grundmann\***

University Heart and Vascular Centre, Department for Vascular Medicine, Hamburg, Germany.

**\*Corresponding Author(s): Reinhart T Grundmann**

University Heart and Vascular Centre, Department for Vascular Medicine, Hamburg, Germany.

Tel: 0049-8677-878483;

Email: reinhart@prof-grundmann.de

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## Abstract

**Purpose:** The publication performance of German anaesthesiology university departments should be analyzed.

**Objective:** The total number of publications of each department should be measured and the impact factors should be determined.

**Background:** One of the performance criteria of a university department are its publication activities. The aim of this bibliometric study was a comparative benchmarking of the publication activities of German university departments of anaesthesiology.

**Methods:** The publication performance of the leading groups, consisting of chief and senior physicians, section and division heads of 39 university departments of anaesthesiology, was recorded over a period of 10 years (January 1, 2010 - January 1, 2020). All publications that were listed in PubMed and for which the appropriate persons were first or last author were considered. In addition, the impact factor (IF) was determined.

**Results:** A total of 3,716 publications were recorded, published by 1056 anaesthesiologists. The share of publishing authors was 46.7%. The articles were published in 624 journals. The average IF of all publications was 2.7. The publication activities of the departments showed a wide range, this applied to both the number of publications and the IF generated by the author. The publication activity ranged from an average of 11.7 publications per author in the top-ranked department to 1.1 publications in the last-placed department. Peri, intra- and postoperative management was the focus of publication with 20.6% of all publications. Narrative reviews (22%), research including animal experiments (19%) and retrospective observational studies (19%) were published most frequently.

**Conclusions:** The publication performance of German university departments of anaesthesiology showed a high variance. The causes must remain open, but a different research motivation cannot be ruled out.



## Introduction

This bibliometric study deals with the publication performance of German anaesthesiology university departments. Data on this have already been published for the years 2001 to 2010 by Putzer et al. [1] and for the period 2011 to 2015 by Miller et al. [2]. In the study by Putzer et al. [1] 4972 articles from university hospitals for anaesthesiology from Germany, Austria and Switzerland were analysed in 56 of 65 anaesthesiology journals, as well as 2308 publications in 2798 non-anaesthesiology journals. The study showed that there were large differences in the publication performance of the 45 university hospitals. Measured by total publications and impact factors, the university hospitals of Berlin, LMU Munich, Innsbruck, Vienna and Geneva were the most successful. In the study by Miller et al. [2], Zurich had published the most in 2011-2015 with 245 publications, followed by LMU Munich with 228 and Vienna with 210 publications. The latter authors concluded that, in contrast to the rising trend worldwide, the publication numbers of university hospitals from Germany/Austria/Switzerland were stagnating and called for greater efforts to promote academic work in anaesthesiology. In both studies, the total number of publications of the individual university hospitals was examined; there were no statements about the activity of the individual members, although the total number of publications depends on the number of employees. This was to be made up for in the present study. We focused on the publication performance of the leading groups of German anaesthesiology university departments and, for reasons of comparison, used a methodology first described by Schubert et al. [3] in their analysis of the publication performance of university plastic surgery. The chosen methodology was thus intended to enable a comparison of publication activities with other large clinical divisions such as visceral and general surgery [4], orthopedic trauma surgery [5], and cardiac surgery [6] under identical conditions. Another aim was to analyse the frequency of publications in the journals used and to show the focus of the publications as well as the type of studies and their impact factors.

## Materials and methods/Methods

The chosen methodology is identical to that described by Böckmann et al. [4] and Preut et al. [5]. The publication performance of the leading groups, consisting of chief and senior physicians, section and division heads of 39 German university departments of anaesthesiology, was recorded. The staffing was taken from the departments' websites; the cut-off date was September 1<sup>st</sup>, 2020. The 10-year observation period extended from January 1<sup>st</sup>, 2010, to January 1<sup>st</sup>, 2020. All publications in which the staff members were first or last author were included. The literature search recorded the name of the author, first or last authorship, the journal in which it was published and the year of publication. Publications that did not have an abstract (such as editorials) or were not listed in the PubMed database were not included. In a second step, the 5-year impact factor of the year 2016 (5-year IF 2016) was determined in "Web of Science" for each journal recorded. If the journal did not have a 5-year IF 2016, the impact factor (IF) of the publication year was used. Journals without an IF were necessarily only included in the calculation of the number of publications. Intrinsic factors assigned by journals were not taken into account. For the calculation of the total sum of publications of a department, the total sum of impact factors of a department, for the journal analysis and the analysis of publication priorities, duplicate publications were removed in a second step. A so-called double publication

existed if one staff anaesthesiologist was the first author, and another staff member was the last author of the same publication of a department. Accordingly, double calculations of individual publications are not found in the present department ranking. Only in the case of the publication of a multicentre study was this attributed to both participating departments.

## Results

**Department ranking.** A total of 1779 (42.9%) first authorships and 2371 (57.1%) last authorships were recorded. After reducing the double-counted articles, the total number of publications was 3716, written by 493 of a total of 1056 staff anaesthesiologists. The proportion of publishing staff was therefore 46.7% across all.

In **Table 1**, the departments are ranked according to the number of publications per member, with 11.7 publications per member in the first-placed department and 1.1 publications per member in the last-placed department. The order of the departments is consistent in the table, although the ranking shifts depending on the measured parameters.

The number of publications of a department also depends on the number of its members. With 264, 239 and 228 publications, departments 9, 2 and 15 lead in the absolute number of publications; the last-placed departments according to this ranking are departments number 37, 35 and 39 with a total of 31, 29 and 14 publications. However, larger departments with higher numbers of staff were no more active than smaller ones in terms of the number of publications and cumulative IF per staff member.

Ranked by Cumulative Total Impact Factors (C-IF), the ranking is different again, with departments number 2, 9 and 15 leading with 929.7, 784.3 and 654.5 C-IF, while the last three departments (numbers 35, 36 and 39) only generated values of 66.9, 58.2 and 20.0.

Regardless of which criterion is used for the ranking, what is decisive are the serious differences between the departments.

**Publication analysis.** It was published in 624 journals, with the journal "Der Anaesthesist" (now "Die Anaesthesiologie") leading with 333 articles (9.0%), followed by "AINS - Anästhesiologie - Intensivmedizin - Notfallmedizin - Schmerztherapie" with 292 articles (7.9%). **Table 2** shows the 20 journals in which the most articles were published. With 1771 publications, this was about half of all publications (47.7%). The sum of the cumulative IF of all publications accounted for 10,071.4, and the sum of the IF of publications in the twenty most-used journals accounted for 4580.8 (44.5%). The 5-year 2016 IF of all 624 journals averaged 4.06, and the IF per publication was 2.7. The higher the impact factor of a journal, the lower its share of the total number of publications. Publications with an IF <2 accounted for 43% (n=1601) of all 3716 publications, those with ≥2 to <4 came to 36% (n=1344), publications with an IF ≥ 4 to < 6 to 11% (n=402), publications between >6 to <10 to 9% (n=322) and publications with an IF > 10 to 1% (n=47).

**Publication focus.** **Table 3** shows the main areas of publication. In terms of numbers, peri-, intra- and postoperative management led with 766 publications (20.6% of all publications, 16.8% of all C-IF) and basic research with 692 publications (18.6%). The highest IF per publication was achieved with publications in basic research (IF 3.8), which means that this topic also yielded the most cumulative IF (2631.8 of a total of

10,071.4 = 26.1%). Physiological research and publications with pharmacological topics (IF 3.2) were next in the ranking by IF per publication. In contrast, publications relating to anaesthesia in the narrower sense (n=112) only achieved an IF of 1.9 per publication. Risk evaluation brought up the rear with 1.1 IF per publication.

**Table 1:** Comparison of the publication performance of 39 departments.

| Ranking      | Publications / member (n) | IF/member | Publications total (n) | IF total       | Members total (n) | Publishing members n (%) |
|--------------|---------------------------|-----------|------------------------|----------------|-------------------|--------------------------|
| 1            | 11.7                      | 29.9      | 211                    | 537.4          | 18                | 15 (83.3)                |
| 2            | 6.8                       | 26.6      | 239                    | 929.7          | 35                | 22 (62.9)                |
| 3            | 6                         | 16.7      | 200                    | 551.6          | 33                | 16 (48.5)                |
| 4            | 6                         | 9.7       | 102                    | 164.3          | 17                | 9 (52.9)                 |
| 5            | 5.5                       | 16        | 106                    | 302.7          | 19                | 13 (68.4)                |
| 6            | 5.5                       | 10.9      | 110                    | 217.8          | 20                | 16 (80)                  |
| 7            | 5.1                       | 14.8      | 97                     | 280.2          | 19                | 12 (63.2)                |
| 8            | 4.7                       | 13.4      | 91                     | 255.6          | 19                | 10 (52.6)                |
| 9            | 4.6                       | 13.8      | 264                    | 784.3          | 57                | 27 (47.4)                |
| 10           | 4.3                       | 10.7      | 136                    | 331.7          | 31                | 17 (54.8)                |
| 11           | 4.2                       | 9.2       | 102                    | 221.6          | 24                | 12 (50)                  |
| 12           | 4.1                       | 13.9      | 74                     | 251            | 18                | 8 (44.4)                 |
| 13           | 4.1                       | 11.3      | 136                    | 372.6          | 33                | 14 (42.4)                |
| 14           | 3.8                       | 10        | 92                     | 242.3          | 24                | 15 (62.5)                |
| 15           | 3.6                       | 10.1      | 228                    | 654.5          | 65                | 33 (50.8)                |
| 16           | 3.6                       | 9.4       | 61                     | 159.2          | 17                | 8 (47.1)                 |
| 17           | 3.6                       | 9.3       | 96                     | 241.5          | 26                | 13 (50)                  |
| 18           | 3.3                       | 10.7      | 113                    | 365.1          | 34                | 18 (52.9)                |
| 19           | 3.3                       | 7.9       | 125                    | 292.9          | 37                | 18 (48.6)                |
| 20           | 3.2                       | 9.9       | 59                     | 178.6          | 18                | 7 (38.9)                 |
| 21           | 2.9                       | 4.7       | 87                     | 142.6          | 30                | 14 (46.7)                |
| 22           | 2.8                       | 8.1       | 46                     | 129.9          | 16                | 8 (50)                   |
| 23           | 2.7                       | 11.2      | 68                     | 280.1          | 25                | 10 (40)                  |
| 24           | 2.7                       | 6.2       | 83                     | 192            | 31                | 15 (48.4)                |
| 25           | 2.6                       | 7.9       | 60                     | 182.8          | 23                | 6 (26.9)                 |
| 26           | 2.6                       | 7.8       | 45                     | 133.1          | 17                | 7 (41.2)                 |
| 27           | 2.5                       | 6.6       | 62                     | 160.3          | 24                | 9 (37.5)                 |
| 28           | 2.5                       | 5.8       | 104                    | 241.9          | 41                | 12 (29.3)                |
| 29           | 2.4                       | 5.9       | 59                     | 141.9          | 24                | 15 (62.5)                |
| 30           | 2.4                       | 5.4       | 43                     | 97             | 18                | 9 (50)                   |
| 31           | 2.3                       | 8         | 47                     | 160.6          | 20                | 9 (45)                   |
| 32           | 2.1                       | 6         | 103                    | 287.5          | 48                | 19 (39.6)                |
| 33           | 1.8                       | 4.4       | 74                     | 185.2          | 42                | 16 (38.1)                |
| 34           | 1.7                       | 5.5       | 38                     | 121.9          | 22                | 10 (45.5)                |
| 35           | 1.7                       | 3.9       | 29                     | 66.9           | 17                | 4 (23.5)                 |
| 36           | 1.6                       | 2.5       | 38                     | 58.2           | 23                | 9 (39.1)                 |
| 37           | 1.5                       | 3.4       | 31                     | 67.4           | 20                | 6 (30)                   |
| 38           | 1.3                       | 1.8       | 43                     | 67.5           | 35                | 9 (25.7)                 |
| 39           | 1.1                       | 1.2       | 14                     | 20             | 16                | 3 (18.8)                 |
| <b>Total</b> | .                         | .         | <b>3716</b>            | <b>10071.4</b> | <b>1056</b>       | <b>493 (46.7)</b>        |

<sup>1</sup> The numbering of the departments follows the number of average publications per member. If the number of publications per member is the same, the ranking of the average impact factor (IF) per member decides.

Study types. Study types and their impact factors are listed in **Table 4**. Narrative reviews (n= 816), research with animal experiments (n= 705) and retrospective observational studies (n= 691) were published most frequently.

**Table 2:** The 20 journals in which were published most frequently, as well as the 5-year impact factor (IF) 2016 and the cumulative IF (C-IF) generated with the respective percentage shares.

| Ranking      | Journal                     | Publications n (%) | 5-year IF      | C-IF           | C-IF (Proportional share, %) |
|--------------|-----------------------------|--------------------|----------------|----------------|------------------------------|
| 1            | Anaesthesist                | 333 (9.3)          | 0.904          | 301            | 3.00%                        |
| 2            | Anesthesiol                 | 292 (7.9)          | 0.301          | 87.9           | 0.90%                        |
|              | Intensivmed                 |                    |                |                |                              |
|              | Notfallmed Schmerzther      |                    |                |                |                              |
| 3            | PLoS One                    | 127 (3.4)          | 3.394          | 431            | 4.30%                        |
| 4            | Crit Care                   | 106 (2.9)          | 5.926          | 628.2          | 6.20%                        |
| 5            | Eur J Anaesthesiol          | 91 (2.4)           | 3.622          | 329.6          | 3.30%                        |
| 6            | Br J Anaesth                | 87 (2.3)           | 6.235          | 542.4          | 5.40%                        |
| 7            | Anesthesiology              | 79 (2.1)           | 6.498          | 513.3          | 5.10%                        |
| 7            | Anesth Analg                | 79 (2.1)           | 3.883          | 306.8          | 3.00%                        |
| 8            | Curr Opin Anaesthesiol      | 78 (2.1)           | 2.359          | 184            | 1.80%                        |
| 9            | BMC Anesthesiol             | 73 (2.0)           | 1.701          | 124.2          | 1.20%                        |
| 10           | Schmerz                     | 56 (1.5)           | 1.187          | 66.5           | 0.70%                        |
| 11           | J Clin Monit Comput         | 55 (1.5)           | 2.1            | 115.5          | 1.10%                        |
| 12           | Crit Care Med               | 53 (1.4)           | 7.333          | 388.6          | 3.90%                        |
| 13           | Minerva Anesthesiol         | 43 (1.2)           | 2.206          | 94.9           | 0.90%                        |
| 14           | J Crit Care                 | 40 (1.1)           | 2.707          | 108.3          | 1.10%                        |
| 15           | Paediatr Anaesth.           | 39 (1.0)           | 2.208          | 86.1           | 0.90%                        |
| 16           | Acta Anaesthesiol Scand     | 38 (1.0)           | 2.649          | 100.7          | 1.00%                        |
| 17           | Med KlinIntensivmed Notfmed | 36 (1.0)           | 0.567          | 20.4           | 0.20%                        |
| 18           | J Cardiothorac Vasc Anesth  | 34 (0.9)           | 1.712          | 58.2           | 0.60%                        |
| 19           | Shock                       | 32 (0.9)           | 2.912          | 93.2           | 0.90%                        |
| Sum          | n=20                        | 1771 (47.7)        | MW=3.02        | 4580.8         | 45.50%                       |
| Rest         | n=604                       | 1945 (52.3)        | MW=4.09        | 5490.6         | 54.50%                       |
| <b>Total</b> | <b>n= 624</b>               | <b>3716 (100)</b>  | <b>MW=4.06</b> | <b>10071.4</b> | <b>100.00%</b>               |

**Discussion**

As the present study shows, the university departments for anaesthesiology differed quite considerably in the number of their publications, as already observed by Putzer et al. [1] and Miller et al. [2]. This applied not only to the total number of publications, but above all to the publications of individual staff members and their IF. The number of publications - defined in terms of the leading teams as chief and senior physicians as first or last author - ranged from 11.7 to 1.1 publications per staff member in the individual departments, the cumulative IF ranged from 29.9 to just 1.2 IF per staff member, and the proportion of staff members publishing in the individual departments had a range of 83.3% to 18.8%.

**Table 3:** Focus of publications.

| Focus  | Number of publications (n) | C-IF           | IF per Publication |
|--|----------------------------|----------------|--------------------|
| Peri-, intra- and post-operative management    | 766                        | 1691.1         | 2.2                |
| Basic research (animal experiments)            | 692                        | 2631.8         | 3.8                |
| Pharmacological studies/ Physiological studies | 444                        | 1402.7         | 3.2                |
| Medical technology                             | 365                        | 886.2          | 2.4                |
| Intensive care medicine/<br>Emergency Medicine | 309                        | 891.4          | 2.9                |
| Pain therapy/<br>Local anaesthesia             | 268                        | 656.3          | 2.4                |
| Sepsis   | 195                        | 557.6          | 2.9                |
| Ventilation                                    | 171                        | 414            | 2.4                |
| Teaching / Human Resources Management          | 151                        | 235.3          | 1.6                |
| Anaesthesia in the narrower sense              | 112                        | 208.5          | 1.9                |
| Blood coagulation                              | 68                         | 200.2          | 2.9                |
| Risk assessment                                | 54                         | 60             | 1.1                |
| Palliative care                                | 41                         | 65.2           | 1.6                |
| Others   | 80                         | 171.1          | 2.1                |
| <b>Total</b>                                   | <b>3716</b>                | <b>10071.4</b> | <b>33.4</b>        |

**Table 4:** Types of study.

| Type of study                     | Number of publications n (%) | C-IF n (%)           | IF per Publication |
|-----------------------------------|------------------------------|----------------------|--------------------|
| Narrative Review                  | 816 (22)                     | 1243.9 (12.4)        | 1.5                |
| Research (incl. animal studies)   | 705 (19)                     | 2608.0 (25.9)        | 3.7                |
| Retrospective observational study | 691 (19)                     | 1661.9 (16.5)        | 2.4                |
| Case report                       | 515 (14)                     | 1429.9 (14.2)        | 2.8                |
| Randomised prospective study      | 402 (11)                     | 1433.1 (14.2)        | 3.6                |
| Research (laboratory in vitro)    | 275 (7.4)                    | 1028.8 (10.2)        | 3.7                |
| Survey                            | 103 (2.8)                    | 198.8 (2.0)          | 1.9                |
| Guideline                         | 66 (1.8)                     | 77.8 (0.8)           | 1.8                |
| Systematic Review                 | 57 (1.5)                     | 173.0 (1.7)          | 3                  |
| Meta-analysis                     | 47 (1.3)                     | 144.8 (1.4)          | 3.1                |
| Feasibility study                 | 25 (0.7)                     | 45.9 (0.5)           | 1.8                |
| Others                            | 14 (0.4)                     | 25.4 (0.3)           | 1.8                |
| <b>Total</b>                      | <b>3716 (100)</b>            | <b>10071.4 (100)</b> | <b>-</b>           |

**Table 5:** Publication performance of the leading staff members of university anaesthesiology, visceral surgery, orthopedic trauma surgery and cardiac surgery in comparison.

| Category                           | Anaesthesiology | Visceral surgery | Trauma surgery | Cardiac surgery |
|------------------------------------|-----------------|------------------|----------------|-----------------|
| Number of departments (n)          | 39              | 38               | 39             | 33              |
| Total publications (n)             | 3716            | 4699             | 4438           | 2535            |
| Staff members (n)                  | 1056            | 442              | 523            | 341             |
| Publishing members n (%)           | 493 (46.7)      | 351 (79.4)       | 381 (72.8)     | 235 (68.9)      |
| Publications per member            | 3.5             | 10.6             | 8.5            | 7.4             |
| Publications per publishing member | 7.5             | 13.4             | 11.6           | 10.8            |
| Cumulative impact factors          | 10071.4         | 14130            | 8009           | 7654.3          |
| IF per member                      | 9.5             | 32               | 15.3           | 22.4            |
| IF per publishing member           | 20.4            | 40.3             | 21             | 32.6            |
| IF per publication                 | 2.7             | 3                | 1.8            | 3               |

**Note:** Visceral surgery according to [4], Orthopedic trauma surgery according to [5], Cardiac surgery according to [6]

Comparative studies are not available in this form for anaesthesiology. In the UK, Ratnayake et al. [7] reviewed the publication activities of anaesthesiology consultants in 15 selected (English-language) journals from 2017 to 2019. The study was not limited to universities, but also included consultants working in academically affiliated institutions. Ratnayake et al. benchmarked 606 publications, ranging from 69 publications from University College London to 2 publications from Southend. They wondered whether this situation was satisfactory and concluded that of the 7422 anaesthesiology consultants in the UK with 769 authors, at best about 10% were active in publishing during the period mentioned, a situation that could be improved (here all authors of a publication were counted, regardless of first, last or only co-authorship = all author names listed on the paper).

Publication activities in Scandinavian university departments of anaesthesiology were reviewed by Miller et al. [8]. Again, there was considerable variation, with Copenhagen as the most active centre, followed by Stockholm and Helsinki in terms of number of publications. The authors pointed out that the Scandinavian university departments of anaesthesiology made almost the same contribution (4.5%) to anaesthesiology publications published worldwide (PubMed) as Germany, Austria, Switzerland (5.7%), although the population is only about a quarter compared to these countries. Again, however, the publications were not related to the number of staff and the most frequently used journals were not mentioned.

In the present analysis, it has been comprehensively shown for the first time in which journals German university anaesthesiologists prefer to publish, whereby all PubMed-listed journals selected by the members of the management teams were recorded here. This meant that no distinction had to be made between anaesthesiological and non-anaesthesiological journals; the only requirement was the PubMed listing with abstract. This resulted in the astonishing number of 624 journals, with the most frequent publication being in German-language journals (17.2%), with a share of 9.3% of the total number of all publications in *Die Anaesthesiologie* (formerly *Der Anaesthesist*) and 7.9% of all articles in *AINS - Anaesthesiology - Intensive Care Medicine - Emergency Medicine - Pain Therapy* (Table 2). In addition, there were 36 articles in *Medizinische Klinik - Intensivmedizin und Notfallmedizin*. In an analysis of anaesthesiology journals in which the most articles were published in the last 10 years, Gao et al. [9] named the *British Journal of Anaesthesia* in first place, followed by *Anaesthesia* and *European Journal of Anaesthesiology*. In the present study, *British Journal of Anaesthesia* was ranked 6th in terms of frequency, the other two journals were not found in the top twenty. However, possibly also due to the language, the German-language journals were disadvantaged in their impact factor and achieved only 4.8% of all cumulative impact factors (C-IF). Nevertheless, national-language publications - regardless of their origin - should be taken into account in international publication benchmarking if they are listed in PubMed; otherwise the bibliometric results would be even more distorted in favour of English-speaking countries.

There are also no data on the publication priorities that can be discussed, apart from the very general statement by Chen et al. [10] that mechanism and management of pain, cardiac anaesthesia, paediatric anaesthesia and airway management, analgesia and anaesthetics are among the priorities of anaesthesiological research. The publication foci listed in Table 3 can thus serve as a first-time basis for future comparative studies. Peri-

intra- and postoperative management was reported on most frequently (20.6%), followed by basic experimental research including animal studies (18.6%). The latter field also generated the most IF per publication on average (3.8), followed by physiological (IF 3.32) and pharmacological (IF 3.03) study foci.

Putzer et al. [1] and Miller et al. [2] distinguished between the total number of publications and original papers in their PubMed searches. The latter included "clinical study", "clinical trial", "clinical trial (I-IV)", "comparative study", "controlled clinical trial", "evaluation studies", "multicenter study", "observational study", "pragmatic clinical trial", "randomised controlled trial", "technical report", "twin study" or "validation studies". They observed a declining proportion of original papers (2001-2005: 33%, 2006-2010: 28%, 2011-2015: 22%) in the total number of publications during the study period [2]. In the present study, we took a different approach and differentiated according to the types of studies listed in Table 4. If only narrative reviews, case reports, guideline (discussions), surveys and "other" are designated as "non-original work" (and the 104 systematic reviews and meta-analyses with a comparatively high IF are counted as original work), 2202 of 3716 papers (59.3%) were still original work - essentially papers that reported retrospectively or prospectively on their own patient population or own investigations.

In this analysis, the publication activities of the staff members of university anaesthesiology departments in Germany were analysed. This was done for methodological reasons to be able to compare the publication activities of the leading teams of anaesthesiology with those of other specialties later on, given identical specifications (including the period under investigation), as shown in Table 5. As can be seen, anaesthesiology had significantly more staff than the other specialties, but the proportion of publishing staff was lower at 46.7% than, for example, in visceral surgery at 79.4%. The same was true for the number of publications per staff member and for IF per staff member. Causes for these differences cannot be named, but the call by Miller et al. [2] for greater efforts to promote academic work in anaesthesiology seems to be justified according to these data.

This work has limitations. In the present study, the publication activities of the leading teams of university anaesthesiology departments were analysed and not those of the scientific staff as a whole, which cannot be equated with the publication performance of the individual department. Departments that had a change in departmental leadership within the observation period or departments where senior physicians had taken over non-university positions during the observation period may be underrepresented in the publication figures if those who followed in the position published less than their predecessors. On the other hand, new appointments may also have been more active than their predecessors in the last 10 years, as a new head or staff member brought his or her publications from the last 10 years into the evaluation. Another controversial point is the fact that in the present study publication activity was determined with the IF, which initially only says something about the citation frequency (and limited quality) of the journal, but nothing about the quality of the individual article. However, these justified objections should not distract from the essential result that, under identical conditions, the university anaesthesiology departments differed considerably in the publication activities of their leading teams, which can only be explained by a different research motivation. This is also demon-

strated by the comparison with other clinical specialties under identical conditions. Conclusion: The publication activities of the leading teams of anaesthesiological university departments in Germany, measured as first and last authorship, showed considerable differences that cannot be explained by the number of staff. Reasons and framework conditions that led to these differences should continue to be examined.

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### References

1. Putzer G, Ausserer J, Wenzel V, Pehböck D, Widmann T, et al. Publikationsleistungen der Universitätskliniken für Anästhesiologie: Deutschland, Österreich und Schweiz von 2001-2010 [Publication performances of university clinics for anesthesiology: Germany, Austria and Switzerland from 2001 to 2010]. *Anaesthesist*. 2014; 63: 287-293.
2. Miller C, Ausserer J, Putzer G, Hamm P, Herff H, et al. Anästhesiologie-Publikationen aus Deutschland, Österreich und der Schweiz 2011–2015: Wissenschaftliche Publikationen der Universitätskliniken in D-A-CH [Publications by university Departments of Anaesthesiology from Germany, Austria and Switzerland in 2011-2015 : Scientific publications by university hospitals in D-A-CH]. *Anaesthesist*. 2019; 68: 294-302.
3. Schubert CD, Leitsch S, Haertnagl F, Haas EM, Giunta RE. Vorteil durch Eigenständigkeit? Analyse der Publikationsleistung der universitären Plastischen Chirurgie in verschiedenen Organisationsstrukturen [Independence in Plastic Surgery - Benefit or Barrier? Analysis of the Publication Performance in Academic Plastic Surgery Depending on Varying Organisational Structures]. *Handchir Mikrochir Plast Chir*. 2015; 47: 213-221.
4. Böckmann EC, Debus ES, Grundmann RT. Publication activity of chief and consultant general/visceral surgeons in German university hospitals-a ten-year analysis. *Langenbecks Arch Surg*. 2021; 406: 1659-1668.
5. Preut J, Frosch KH, Debus ES, Grundmann RT. Zur Publikationsleistung der universitären Unfallchirurgie in Deutschland [Publication performance of university orthopedic trauma surgery in Germany]. *Chirurgie (Heidelb)*. 2022; 93:702-710.
6. Debus ES, Dolg M, Reichenspurner H, Grundmann RT. Publication Performance in German Academic Heart Surgery. *Thorac Cardiovasc Surg*. 2021; 69: 19-25.
7. Ratnayake G, El-Boghdady K, Pandit JJ. An analysis of the academic capacity of anaesthesia in the UK by publication trends and academic units. *Anaesthesia*. 2021; 76: 500-513.
8. Miller C, Prenn R, Ausserer J, Hamm P, Neururer S, Paal P. Publications by Scandinavian university Departments of Anaesthesiology from 2001 to 2015. *Acta Anaesthesiol Scand*. 2018; 62: 1304-1313.
9. Gao M, Liu W, Chen Z, Wei W, Bao Y, Cai Q. Global trends in anesthetic research over the past decade: a bibliometric analysis. *Ann Transl Med*. 2022; 10: 607.
10. Chen QB, Yang HY, Chen DS, Lv YW, Hu LH, Yuan HB. Global distribution of publications in anesthesiology: A bibliometric analysis from 1999 to 2018. *Anaesthesist*. 2021; 70: 854-862.