

## Demographics and Scholarly Productivity of American Board of Anesthesiology Volunteers: Results of an Internet-Based Bibliometric Analysis



Paul S. Pagel, MD, PhD

**Objective:** The American Board of Anesthesiology (ABA) has been responsible for certification of anesthesiologists since 1938. Selected ABA diplomates provide their expertise to write the ABA's written and oral examinations and to administer the oral examination required for primary certification. The demographics, administrative and educational duties, and scholarly productivity of ABA volunteers and their dependence on subspecialty certification, transesophageal echocardiography (TEE) credentials, and grant funding are unknown.

**Design:** Observational study.

**Setting:** Internet analysis.

**Participants:** ABA volunteers who participated in the 2015 primary certification examinations identified from the 2016 issue of *ABA News*.

**Interventions:** None.

**Measurements and Main Results:** The 2016 issue of *ABA News* was downloaded from the public ABA website and was used to identify all volunteers who participated in any aspect of the 2015 primary certification process. Each individual's practice type, faculty rank if applicable, and affiliation were identified using Google with the keyword "anesthesiology." The practice location, time, and interval after original ABA certification; additional ABA subspecialty certification; the number of publications and citations; publication rate; citations per publication; and the

H-, M-, and i-10 indices were obtained using the ABA and Scopus databases. Credentials in TEE were identified for each individual using the National Board of Echocardiography database. National Institutes of Health (NIH) and Foundation for Anesthesia Education and Research (FAER) funding for each volunteer was evaluated using NIH Research Portfolio Online Reporting Tools and the FAER alumni databases, respectively. Three hundred ninety-three ABA volunteers were identified and analyzed. Three hundred ten individuals currently hold academic appointments (83.5%), whereas 83 (16.5%) hold private practice or military positions. Sixty-seven volunteers have major administrative roles (eg, dean, chief executive officer, associate or assistant dean, chair, vice chair). Thirty-five individuals are program directors of anesthesiology residencies or fellowships. Volunteers published 10,072 manuscripts that have been cited 194,835 times. Volunteers also received 51 NIH grants and 36 FAER grants. The median H-, M-, and i10-indices of volunteers were 4, 0, and 3, respectively. Scholarly productivity was dependent on academic rank, career duration, additional degrees, and extramural funding, but not on practice location, subspecialty certification, TEE credentials, or sex.

**Conclusions:** These results indicated that ABA volunteers are leaders in anesthesiology with established records of administrative, educational, and scholarly accomplishment. *Published by Elsevier Inc.*

**T**HE AMERICAN BOARD OF ANESTHESIOLOGY (ABA) is a nonprofit, volunteer organization that has been exclusively responsible for certification of anesthesiologists since its formation in 1938. The ABA has certified more than 50,000 anesthesiologists to date.<sup>1</sup> Selected ABA diplomates provide their expertise to write the ABA's written and oral examinations and to administer the oral examination required

for primary certification. ABA volunteers also are responsible for writing examinations for subspecialty certification, maintenance of certification in anesthesiology (MOCA), and resident evaluation (In-Training Examination). Even though it is assumed that ABA diplomates involved in these activities are leaders in the specialty, the demographics, administrative and educational responsibilities, and scholarly productivity of these individuals have not been documented formally. Accordingly, the author conducted an internet-based analysis of ABA volunteers who participated in any aspect of the primary certification examination in 2015. Scholarly productivity was quantified using H-index, a bibliometric statistic that has been used to describe productivity in anesthesiology<sup>2-12</sup> and other medical specialties.<sup>13-22</sup> H-index is defined as the number of an investigator's publications that have been cited at least H times.<sup>23</sup> Despite its inherent limitations,<sup>7,21</sup> H-index is a well-established indicator of the relative strength and consistency of an investigator's collective work based on the assumption that publications of less value are not cited as frequently.<sup>20,23-25</sup> The ability to obtain grant support from the National Institutes of Health (NIH) and the Foundation for Anesthesia Education and Research (FAER) also was

*From the Anesthesia Service, Clement J. Zablocki Veterans Affairs Medical Center, Milwaukee, WI.*

*P.S. Pagel is a volunteer for the American Board of Anesthesiology.*

*Address reprint requests to Paul S. Pagel, MD, PhD, Anesthesia Service, Clement J. Zablocki Veterans Affairs Medical Center, 5000 West National Ave, Milwaukee, WI 53295. E-mail: pspagel@mcw.edu*

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quantified. The relationship between National Board of Echocardiography (NBE) credentials in transesophageal echocardiography (TEE) and scholarly productivity in ABA volunteers was also evaluated. This investigation tested the hypothesis that ABA volunteers who participate in the ABA primary certification process are administrative, educational, and scholarly leaders in the specialty.

METHODS

All data were collected in April and May 2016. The 2016 issue of *ABA News* was downloaded from the public ABA website<sup>1</sup> and was used to identify all volunteers who participated in any aspect of the 2015 primary certification process, including as question writers, editors, or examination committee members of the part I, basic, or advanced examinations; question writers, editors, or examination committee members of the part II examination (soon to become part of the applied examination); or associate examiners responsible for administration of the part II examination to candidates. Writers, editors, and examination committee members of the 5 ABA subspecialty examinations (care medicine, hospice and palliative medicine, pain medicine, pediatric anesthesiology, and sleep medicine); the MOCA examination; the recently introduced “MOCA minute” continuous evaluation program; and the In-Training Examination were not included in this analysis. The date of original primary certification, the type and date of any subspecialty certification if applicable, and the most recent practice location of each volunteer were identified using the ABA website’s “Verify a Physician’s Certification” search engine.<sup>1</sup>

The current academic (including faculty rank, administrative title[s]; and educational leadership position[s]), private practice (including administrative title), or military affiliation of each ABA volunteer was identified using the Google search engine combined with the keyword “anesthesiology.” Academic practice was defined as a full-time appointment as noted on the corresponding anesthesiology department’s website. The duration of scholarly activity, number of publications, publications per year, number of citations, citations per publication, and H-index for each individual were obtained using the Scopus database. The number of publications was verified using PubMed to reduce possible inaccuracies in H-index values. The M-index (rate of increase of H-index) was calculated from these data as the ratio of H-index to the years of scholarly activity.<sup>26</sup> The i10-index (number of publications that have been cited at least 10 times) also was recorded from the Scopus database; the number of publications with 10 or more citations was identified in each author’s list of cited work. Credentials in basic or advanced perioperative TEE (“testamur” or “certification”) for each individual were quantified using the NBE database.<sup>27</sup>

Each ABA volunteer’s history of NIH funding was defined using NIH Research Portfolio Online Reporting Tools.<sup>28</sup> The number and type of NIH grants (mentored basic or clinical scientist development awards [K-series] and research grants [R-series]), the total number of grants, the years of grant funding, and the amount of grant awards were quantified. Affiliation history and primary research interests in the health sciences were used to distinguish grant recipients with similar names. The number of FAER grants and the number of individuals who had

participated previously in the FAER “Resident Scholar” program also were recorded from the FAER alumni database.<sup>29</sup>

Statistics

Categorical variables are presented as numbers with percentages. Continuous variables are expressed as median (interquartile range [range]) because they are not distributed normally (Kolmogorov-Smirnov test). Comparison of continuous variables was performed using the Mann-Whitney *U* test for 2 independent samples or the Kruskal-Wallis test for multiple independent samples where appropriate. The null hypothesis was rejected when *p* < 0.05. Statistical calculations were performed using StatPlus:mac LE software (AnalystSoft, Vancouver, BC, Canada).

RESULTS

Three hundred ninety-eight individuals were identified as ABA volunteers. Five volunteers could not be identified uniquely because of common names; these individuals were excluded from subsequent analysis. As a result, a total of 393 individuals who participated in the primary certification process were evaluated.

ABA volunteers published 10,072 manuscripts that have been cited 194,835 times in the peer-reviewed literature (Table 1). Approximately 40% of these articles have been cited at least 10 times. The H-, M-, and i10-indices of ABA volunteers were 4 (2-10 [0-52]); 0 (0-1 [0-2]); and 3 (1-10 [0-155]), respectively (data are median [interquartile range [range]). ABA volunteers received 51 NIH grants (to 27 individuals), including 12 (to 12 individuals) and 39 (to 22 individuals) K- and R-series awards, respectively, for a

Table 1. Summary of Scholarly Productivity for All ABA Volunteers

	Total	Median (IQR [range])	Mean ± SD
Years after certification	6,827	16 (9-25 [2-38])	17 ± 9
Publications	10,072	10 (3-30 [0-347])	26 ± 40
Publications/year	—	1 (0-2 [0-14])	1 ± 2
Citations	194,835	92 (15-470 [0-8,293])	496 ± 1,064
Citations/publication	—	9 (4-18 [0-76])	13 ± 12
H-index	—	4 (2-10 [0-52])	7 ± 9
M-index	—	0 (0-1 [0-2])	0 ± 0
i10-index	3,994	3 (1-10 [0-155])	10 ± 19
FAER grants	36	0 (0-0 [0-2])	0 ± 0
Number of individuals	35 (8.9%)		
K-series NIH grants	12	0 (0-0 [0-1])	0 ± 0
Number of individuals	12 (3.1%)		
R-series NIH grants	39	0 (0-0 [0-5])	0 ± 1
Number of individuals	22 (5.6%)		
Total NIH grants	51	0 (0-0 [0-5])	0 ± 1
Number of individuals	27 (6.9%)		
Years of NIH funding	177	0 (0-0 [0-24])	1 ± 2
NIH support (\$ million)	38.42	0 (0-0 [0-5.75])	0.10 ± 0.58

Abbreviations: FAER, Foundation for Anesthesia Education and Research; IQR, interquartile range; NIH, National Institutes of Health; SD, standard deviation.

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