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SPECIAL ARTICLE

Fixing the anesthesia research crisis in Japan

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Abstract

To explore the current status of anesthesia research activity in Japan, we analyzed the number of abstracts presented at the Japanese Society of Anesthesiologists (JSA) annual meetings by several factors including gender, society branches, and subspecialty categories. The number of abstracts at JSA annual meetings has declined sharply since 2016 with no gender gap. A decrease in the neurological field predated the overall decline, but other subspecialty categories showed a similar decline. Although the Tokyo, Tokai-Hokuriku, and Kyushu branches were responsible for more than half of the reduction, the trend was similar among all branches. In a survey regarding academic activities of university hospital residents and faculty, Ph.D. aspirants' rate was only 20–30%. Residents had never presented an abstract at scientific conferences and never published any papers at nearly 40% and 30% of the university hospitals, respectively. Our survey suggests that junior anesthetists are losing interest in research. Senior faculty and mentors must redouble efforts to embed and encourage research in departments and by anesthetists in training. If a revival of anesthesia research in Japan does not occur then a service only specialty awaits.

Keywords Anesthesiology · Research activity · Academic crisis

Introduction

We have previously reported a steep decline in submitted and accepted abstracts for annual meetings of the Japanese Society of Anesthesiologists (JSA) between 2006 and 2019 although a V-shaped recovery of anesthetic publication output from Japan was recognized from 2012 [1]. In addition, we are also concerned about a reduction in publication output in the near future as about 20–40% of full paper publications would be converted from abstracts of scientific meetings [2–6]. To determine the current status of anesthesia research activity in Japan, we obtained data for the annual scientific meetings of other anesthesia-related societies via

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the Japanese Society of Anesthesiology office. Regarding the use of data for general abstracts of other academic meetings, we posted the main purpose on the website of the Japanese Society of Anesthesiologists asking members to opt-out. Using these data, we analyzed the number of abstracts presented at JSA Annual Meetings by several factors such as gender, society branch, and subspeciality category (Pain, emergency room/intensive care unit [ER/ICU], Respiratory, Cardiovascular, Pediatric/Obstetric, Neurology, Anesthesia associated, Anesthesia general). In addition, we obtained the number of papers published in anesthesia journals (categorized by Journal Citation Reports: Reports (Anesthesiology, Br J Anaesth, Anesth Analg, Eur J Anaesthesiol, Anaesthesia, Can J Anaesth, Anaesth Intensive Care, J Clin Anesth, Reg Anesth Pain Med, Acta Anaesthesiol Scand, Minerva Anestesiol, J Cardiothorac Vasc Anesth, J Neurosurg Anesthesiol, Int J Obstet Anesth, J Clin Monit Comput, Paediatr Anaesth, BMC Anesthesiol, J Anesth, Pain, Eur J Pain, Clin J Pain, Pain Pract, Curr Opin Anaesthesiol, Anaesthesist, Rev Bras Anestesiol, Anasthesiol Intensivmed Notfallmed Schmerzther, Pain Physician, Schmerz, Anaesth Crit Care Pain Med, Pain Med, Anaesthesiol Intensivmed) from Japan using PubMed that is a free search engine accessing primarily the MEDLINE database. Furthermore, we conducted a questionnaire survey (Ph.D. aspirations rate, Ph.D. acquisition rate, graduate school admission rate, research theme [clinical vs. basic], conference presentations, publication) to monitor the present research activity of young anesthetists at university hospitals in Japan. The survey was conducted from October 6 to October 31, 2022, with the approval of the Ethics Committee of the Japanese Society of Anesthesiologists. Due to the poor response rate, a reminder letter was sent to those facilities that had not submitted the questionnaire and the deadline was extended to November 20, 2022.

Publication output

The annual trend of publication number in the three major anesthesia journals (Anesthesiology, Br J Anaesth, Anesthe Analg) in three East Asian countries indicated that the decline in Japanese output stopped in 2012; unfortunately a second decline started from 2020 (Fig. 1A). Output from China increased year on year. South Korea has fluctuated; changing little. Regarding total publication output, China has shown a rapid increase since 2013, while Japan and Korea have remained stagnant. The Japanese output per 1,000 JSA members show a V-shaped recovery since 2012 [7], but stagnation since 2017. We previously found a significant negative correlation between publication output and the level of dependence on The Journal of Anesthesia (J Anesth), a JSA official journal [1]. As this dependence had been declining since its peak in 2011, but leveled off since 2016, this further indicates stagnation of publication output. As noted earlier, the number of papers was once in a V-shaped recovery trend, as abstracts at annual meetings tended to be converted into papers, but the increase stopped and stagnated after 2017. In particular, the number of papers published in the three major high-quality anesthesia journals has continued to decline, likely due to the drop in the number of abstracts for presentations at the JSA annual meetings. In the future, the total number of papers may again fall.

The number of abstracts at anesthesia scientific meetings

Despite our repeated warnings in a series of editorials [7–9] in the J Anesth regarding the crisis in anesthesia research in Japan the number of abstracts at JSA annual scientific meetings decreased sharply since 2016, and the same decline occurred in the Japanese Society for Clinical Anesthesia (JSCA), the second largest scientific anesthesia meeting in Japan. Abstract numbers in both Japanese Society of Regional Anesthesia and Japan Society of Pain Clinicians did not change. The number of abstracts by the Japanese Society of Cardiovascular Anesthesiologists (JSCVA) has increased by nearly 250 in the last seven years. However, as the decline in the number of abstracts by the JSA and the JSCA has been about 1300 in total in the last seven years, the increase by the JSCVA cannot compensate. A decline in anesthesia research activity in Japan is again clear. (Fig. 2).

To identify the factors responsible for the decline in the number of abstracts at JSA annual meetings, the numbers of abstracts by gender, abstract category, and branch (Hokkaido-Touhoku, Kanto-Koshinetsu, Tokyo, Tokai-Hokuriku, Kansai, Chyugoku-Shikoku and Kyushu) were evaluated. There was no marked gender difference in the decline of the number of abstracts at JSA annual meetings. In addition, since the ratio of male to female members in JSA in 2015 was 5:3, the difference in the number of abstracts between male and female seemed to be associated with the ratio of male to female JSA members (Fig. 3A, B). By category, the decrease in the neurological field was significant and predated the start of the overall decrease. The other categories decreased in a similar way (Fig. 4A). Although the Tokyo, Tokai-Hokuriku, and Kyushu branches showed the largest decreases, the Chugoku-Shikoku branch showed the smallest, the trend was similar among all branches (Fig. 4B).

Academic activity of residents and faculty members of university hospitals

Number of new residents and faculty members

The number of new residents at university hospitals was about 120 every year, with an average of 4 in each. The number of full-time physicians is fewer than 15 in more than half

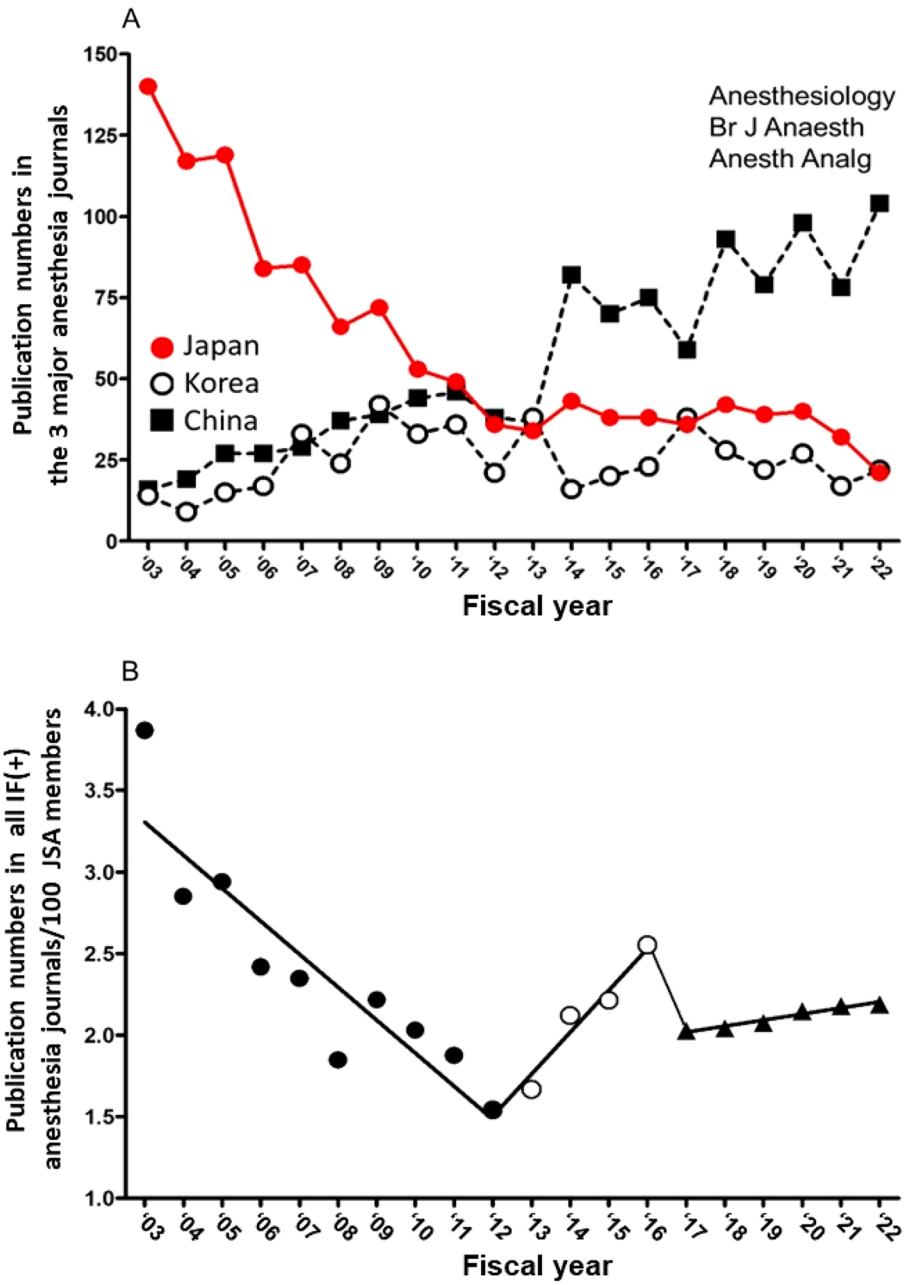

Fig. 1 Number of publications in the three major anesthesia journals (Anesthesiology, Br J Anaesth, Anesthe Analg) in the three East Asian countries (**A**) and in all anesthesia journals with an impact factors per 100 JSA members (**B**)

of public medical universities, while the number was more than 20 in more than half of private medical universities.

Number of Ph.D. aspirants and rates of graduate school admission at university hospital

The percentage of Ph.D. aspirants in departments of anesthesiology was only about 20–30% even at university hospitals while that in other clinical departments was close to 50% [10]. There is no difference between public and private universities in anesthesia, but the numbers have clearly declined since 2018 in private universities (Fig. 5). Less than 20% of female anesthetists were Ph.D. aspirants, which was about half that of male anesthetists. However, as the gender gap of research activity index in the US showed that female physicians were about half as active as male physicians in all fields [11], the present differences in Japan do not differ from the US. In addition, rates of graduate school admission and Ph.D. acquisition were less than 5% and around 4% in university hospitals, respectively. We should note that fewer researchers are able to obtain funding and fewer supervise their research, resulting in a deterioration of the research environment [12]. Thus, if we cannot break this vicious cycle, anesthesia research activity will continue to decline.

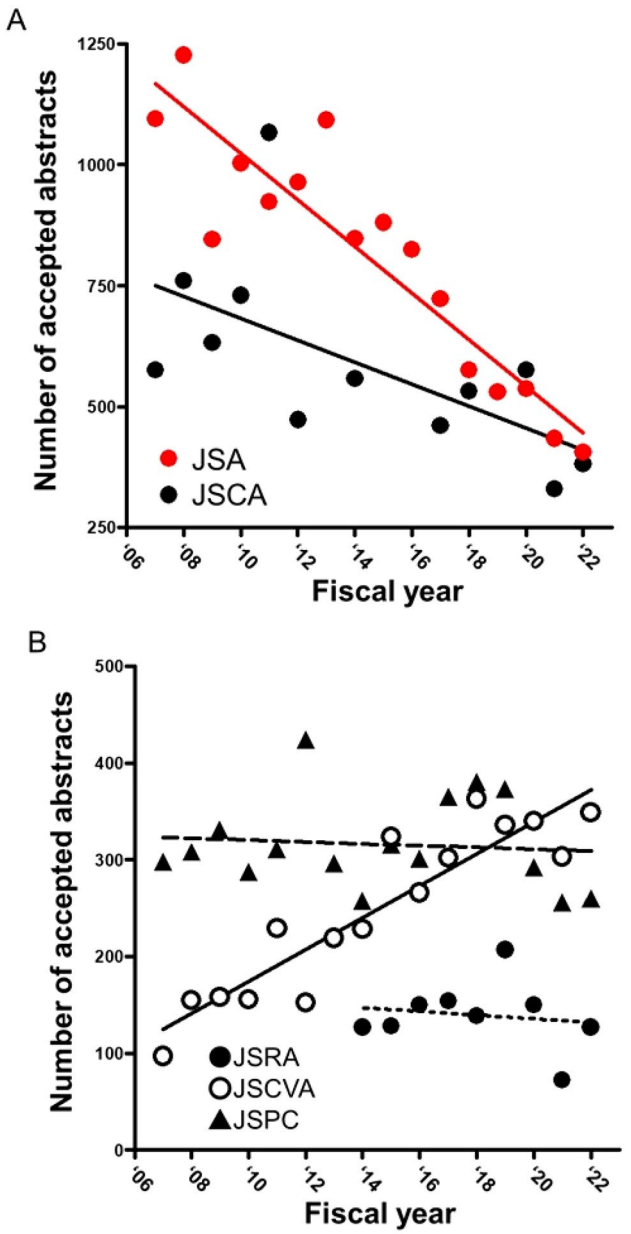

Fig. 2 Number of abstracts for anesthesia-related scientific meetings in Japan. **A** Japanese Society of Anesthesiologists [JSA] and Japan Society of Clinical Anesthesia [JSCA], **B** Japanese Society of Regional Anesthesia [JSRA], Japanese Society of Cardiovascular Anesthesiologists [JSCVA], Japan Society of Pain Clinician [JSPC]

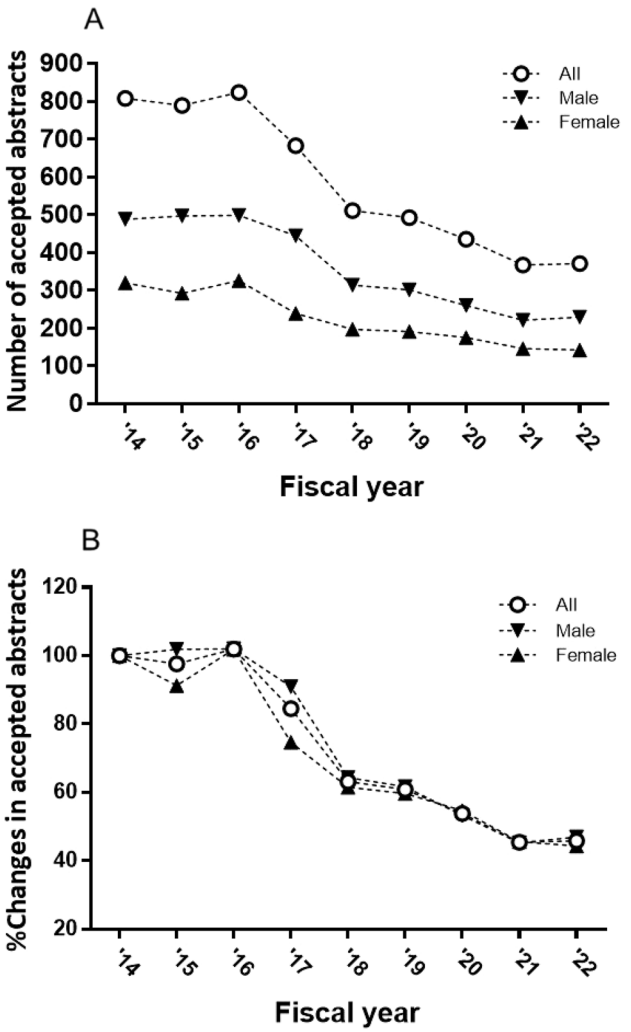

Fig. 3 Annual changes in the number (**A**) and %(**B**) of abstracts in JSA annual meetings by gender

Research environment and research activities of anesthesia residents

More than 80% of institutions conducted both basic and clinical research, and nearly 70% of the research sites were their own institutions. Approximately 20% of faculty members had research days. Surprisingly, anesthesia residents at nearly 40% of university hospitals had never presented any abstracts at scientific conferences, and 30% had never published any papers. The fact that anesthesia residents in university hospitals showed extremely low research activity suggests further decline is to come. Although increases in the time and effort to pass ethical review (as a consequence of changes in ethical guidelines for medical research on April 1, 2015) may have contributed to the decline, the principal cause is loss of research interest in junior anesthetists. In addition, the introduction of a new clinical training systemin 2004 caused maldistribution of both clinical residents and medical specialists-in-training creating a shortage of junior physicians in local university hospitals; many of them prefer to choose hospitals in large cities [9]. The introduction of national university incorporations in 2004 also deteriorated university hospital finance which forced an increase in clinical workload due to the need to increase hospital income [9]. In particular, the rapid increase in surgeries for improvement of hospital finance has made it

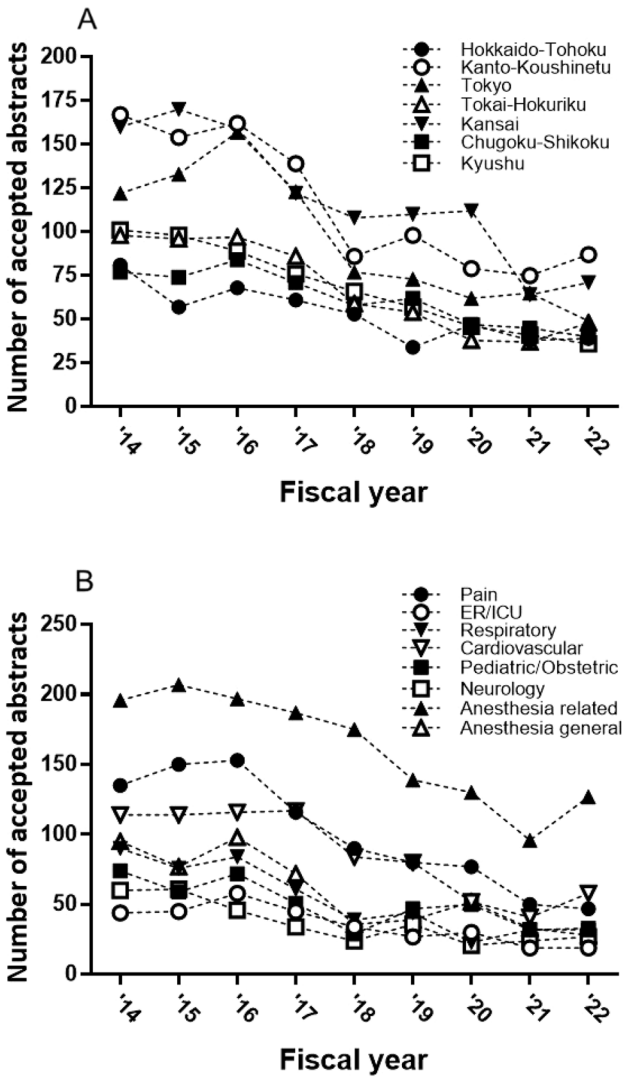

Fig. 4 Number of abstracts in JSA annual meeting by branch (**A**) and category (**B**) *ER/ICU* emergency room/intensive care unit

difficult for anesthetists to secure research time. At that time, the total publication number of clinical research increased. The world ranking markedly declined as the total number of anesthesia publications from Japan decreased. This indicated a serious decline in anesthesia research activity compared to that in other clinical fields. Clinical practice is prioritized over research. However, as JSA members has increased by about 4500 since 2004 [1, 9], the present situation must be improved. Moreover, it should be our responsibility to continue research as university faculty members.

Survey completion rate

Less than 40% of public universities completed the survey even after a reminder. Thus, it is possible that selection bias occurred.

How can we effect change?

It is clear from this survey that both junior physicians and residents in anesthesia, are losing interest in research because of the extremely low numbers of Ph.D. aspirants in anesthesia compared to other clinical fields [10]. As the decline in anesthesia research activity is likely to worsen, immediate corrective responses are needed. The obvious response is to raise the rate of Ph.D. students to the same level as other clinical fields, which means double the number of Ph.D. students. If the number of Ph.D. students doubles, the number of abstracts at scientific meetings should also double. However, doubling these numbers will be extremely difficult as there is already research apathy.

Anesthetic leadership must accept deficiencies in embedding research into training pathways. They must enthuse trainees to undertake research and lead by example. Research provides knowledge and that fuels evolution of our specialty such as the elucidation of pathologies, the development of new diagnostic methods and the discovery of new treatments. In addition, even papers published in major scientific journals may not always be correct, depending on statistical processing and interpretation of data, but the ability to recognize this is also an ability acquired through conducting one's own research and writing papers. Research is therefore essential.

Although it is important to memorize guidelines in their entirety to ensure proper medical practice, we should be among those who formulate such guidelines. To achieve this, it is necessary to conduct research that can build up evidence. JSA should hold workshops on how to conduct research, analyze data statistically and write papers to stimulate research interest in junior anesthetists. Moreover, JSA should establish some projects to encourage female anesthetists to conduct research, and engage outside organizations to further promote these activities. JSA should also consider incentives for research.

If a revival of anesthesia research in Japan does not occur then a service only specialty awaits.

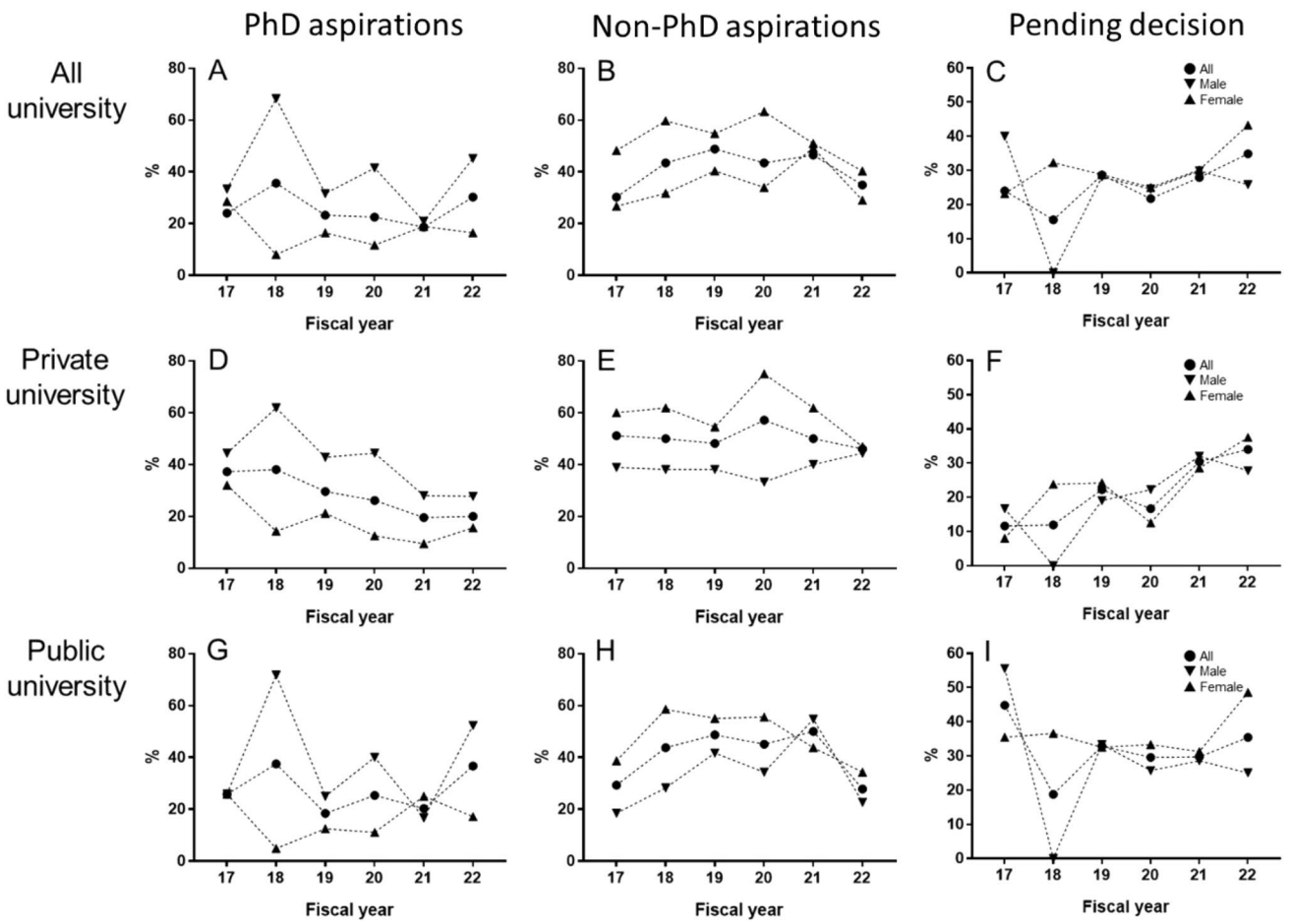

Fig. 5 Number of Ph.D. aspirants at medical education institutions, All (**A–C**), Private (**D–F**), and Public (**G–I**) university

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Declarations

Conflict of interest Dr. Kazuyoshi Hirota is a board member of Journal of Anesthesia (JA). Dr. Yusuke Mazda, Dr. Kazuyoshi Aoyama and Dr. Koichi Suehiro are JA section editors. Dr. Fumimasa Amaya is a JA editor-in-chief. Other authors do not have any conflicts of interest.

References

1. Hirota K. Has anesthesia research activity in japan successfully recovered? J Anesth. 2020;34:639–41.
2. Miguel-Dasit A, Martí-Bonmatí L, Sanfeliu P, Aleixandre R. Scientific papers presented at the European congress of radiology 2000: publication rates and characteristics during the period 2000–2004. Eur Radiol. 2006;16:445–50.
3. Kleine-Konig MT, Schulte TL, Gosheger G, Rödl R, Schiedel FM. Publication rate of abstracts presented at European paediatric orthopaedic society annual meetings, 2006 to 2008. J Pediatr Orthop. 2014;34:e33–8.
4. Dangouloff-Ros V, Ronot M, Lagadec M, Vilgrain V. analysis of subsequent publication of scientific orally presented abstracts of the French national congress of radiology part ii: focus on the French abstracts. Diagn Interv Imaging. 2015;96:467–76.
5. Lau AS, Adan GH, Krishnan M, Leong SC. What is the publication rate for presentations given at the British academic conference in otolaryngology (BACO)? Clin Otolaryngol. 2017;42:263–7.
6. Shelmerdine SC, Lynch JO, Langan D, Arthurs OJ. Presentation to publication: proportion of abstracts published for ESPR. SPR and IPR Pediatr Radiol. 2016;46:1371–7.
7. Hirota K. Anesthesia research in Japan: seeds of recovery and the role of the journal of anesthesia. J Anesth. 2017;31:803–5.
8. Hirota K. A worrying decline in anesthesia journal publications from Japan. J Anesth. 2013;27:323–4.
9. Hirota K. Launch of JA clinical reports. Anesthesia research crisis in Japan. J Anesth. 2015;29:161–3.
10. Survey Results of Residents completing clinical training in 2017 by Ministry of Health, Labor, and Welfare. https://www.mhlw.go.jp/file/06-Seisakujouhou-10800000-Iseikyoku/0000182128.pdf
11. Pashkova AA, Svider PF, Chang CY, Diaz L, Eloy JA, Eloy JD. Gender disparity among US anaesthesiologists: are women underrepresented in academic ranks and scholarly productivity? Acta Anesthesiol Scand. 2013;57:1058–64.

12. Reves JG. We are what we make: transforming research in anesthesiology: the 45th Rovenstine Lecture. Anesthesiology. 2007;106:826–35.