

Who takes care of intensive care? Changes over the last two decades

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Abstract. – OBJECTIVE: Intensive care units are very important across various fields of medicine, and there are many high-quality journals that publish about intensive care. However, there is a lack of information regarding which disciplines publish the most in these journals. We aim to evaluate the intensive care literature.

MATERIALS AND METHODS: We searched the papers published in the American Journal of Respiratory and Critical Care Medicine, Intensive Care Medicine, Critical Care Medicine and Critical Care to gain information regarding authors' specializations. We collected specialization data from PubMed, Google Scholar, and also from various journal websites. We examined the changes in the proportion of disciplines that are actively contributing to intensive care literature.

RESULTS: Regardless of the year and the journal, intensivists were the most common writers (1,047/4,807, 21.8%) overall. This was followed by pulmonology (843, 17.5%), anesthesia (827, 17.2%), others (602, 12.5%), and pediatrics (374, 7.8%). The United States of America (1,470/30.8%), France (573/11.2%), and Germany (332/6.9%) were at the top of the list in terms of productivity.

CONCLUSIONS: With the increase in the number of intensive care units and the development of an understanding of intensive care, we observed that intensivists are publishing more in intensive care literature.

Key Words:

Anesthesia, Authors, Informetrics, Literature, Measurement, Pulmonology.

designated a part of his ward for postoperative treatment². In 1953, Danish anesthetist Bjørn Aage Ibsen, known as the “father of intensive care” founded the first intensive care unit (ICU) during the polio epidemic^{3,4}. The number of ICUs worldwide has increased since then.

Although pulmonary specialists and anesthesiologists were initiators of the ICUs, other specialists, such as surgeons, cardiologists, pediatricians, and internal medicine specialists have begun to be included in the ICUs^{5,6}. Training programs began with board certification in the early 1970s which evolved into separate intensive care training programs in recent years, and intensive care specialization started^{6,7}. With the establishment of the “Society of Critical Care Medicine (SCCM)” and start of the publications from the official journal “Critical Care Medicine (CCM),” the number of intensive care associations, meetings, and journals have rapidly increased^{1,8,9}.

Although authors writing in intensive care journals were affiliated with their primary specialty, the authors affiliating themselves as intensivists (intensive care specialists) increased with intensive care education. We hypothesized that the number of intensivists is increasing in the recent past and becoming more prominent in ICU literature. This study evaluated the changes in author specializations in high impact intensive care journals over the last 20 years.

Introduction

Intensive care refers to the monitoring and treating of critically ill or injured patients using special medical facilities and services. During the Crimean War, the renowned nurse Florence Nightingale used triage to distinguish severely ill patients from others, thereby initiating the concept of intensive care¹. Later, in 1926, the American neurosurgeon Walter Dandy of Boston

Patients and Methods

Data Source

We investigated the original research papers in four high impact intensive care journals, American Journal of Respiratory and Critical Care Medicine (AJRCCM), Intensive Care Medicine (ICM), Critical Care Medicine (CCM), and Critical Care (CC), regarding the author specializations. We used Endnote software, version X8.2, to

obtain the details of the articles published in the journals during the past 20 years. We also checked the data from the journals' official websites.

Identification of Authors

Since the term "co-author" for first and senior authors was not a defined standard across journals, we preferred to use the author sequence. We analyzed the first authors' specializations, countries, continentals, and the gender of the first and senior authors.

To determine the authors' genders, we used Google, LinkedIn, Twitter, the websites of their institutions, and Genderize database, which contains over 200 thousand names in different languages from all over the world¹⁰⁻¹². We also collected data on the countries and continentals of the first authors to determine the geographic distribution.

Article Information

We searched for the publications from 2003, 2008, 2013, and 2018, to represent the last two decades. We included original articles, reviews, case reports, and case series to study the search, rather than historical articles, editorials, and letters. We collected specialization data from PubMed, Google Scholar, and journal websites. The affiliation that the author selected was saved first because there are over hundred different specializations. We then divided them into specific groups according to common features and numbers. Specializations over 50 were accepted as a particular group and fewer were included in the appropriate group.

Statistical Analysis

Data were collected and analyzed *via* SPSS (version 24.0; IBM Corp., Armonk, NY, USA). Specialization, sex, country, and continental distribution were analyzed using χ^2 tests. We used the Cochran-Armitage trend test to assess the changing trends in specializations over time. A *p*-value lower than 0.05 was considered to be statistically significant.

Ethics committee approval was not required, as it was a study conducted by collecting data from the published literature.

Results

We collected data from 4,807 articles published in 2003, 2008, 2013, and 2018 in the AJRCMM, ICM, CCM, and CC. There were 118 different

affiliations and they were assigned to 14 groups that were coded separately. Regardless of the year and the journal, intensivists were the most common writers (1,047/4,807, 21.8%) overall. This was followed by pulmonology (843, 17.5%), anesthesia (827, 17.2%), others (602, 12.5%), pediatrics (374, 7.8%), surgery (271, 5.6%), and internal medicine (266, 5.5%) (Figure 1).

When the distribution of specializations was analyzed over the years, anesthesia was initially the leading discipline and with time, the ICU took over as leading discipline involved in publishing in the following years. The number of articles written by intensivists increased and became more dominant among all disciplines over the years (Figure 2).

When journals were examined separately regarding the distribution of specializations, there was an interesting difference in their distribution. While the trend shifted from anesthetists to intensivists in total in ICM over the years, pulmonologists were at the top of the list in case of AJRCCM. Author-distribution of CCM and CC was consistent with the general picture and was dominated by intensivists followed by anesthetists, and pulmonologists (Figure 3).

We also analyzed the geographic distribution of first authors by year in these four journals. Similar to the distribution of disciplines, there was a heterogeneous distribution between journals across countries and continents. In total, United States was at the top of the list (1,470/30.8%), followed by France (573/11.2%), Germany (332/6.9%), Canada (315/6.6%), United Kingdom (285/5.9%), Netherlands (209/4.3%) and Italy (209/4.3%). When we analyzed the journal basis separately, France (231/23.2%) had the highest proportion of publications in ICM, the United States in AJRCMM (601/44.2%), CCM (674/43.6%), and CC (124/13.7%). Although authors from the United States led the list in three of four journals according to distribution to countries, the majority of articles were written by authors from Europe (2,246/46.7%), followed by North America (1,820/37.9%), and Asia (418, 8.7%). The detailed distribution of authors among the countries and continents is shown in Figure 4.

Considering the authors' gender, 29.8% of first authors and 17.3% of senior authors were women. The percentages of female authors among first authors were 31.5%, 25.8%, 29.1%, and 33.5% in 2003, 2008, 2013, and 2018 respectively. 21.3%, 14.7%, 16.5%, and 17.2% of senior authors were women in 2003, 2008, 2013, 2018, respectively. In the AJRCCM, 39.8% and 26.4 of first and senior

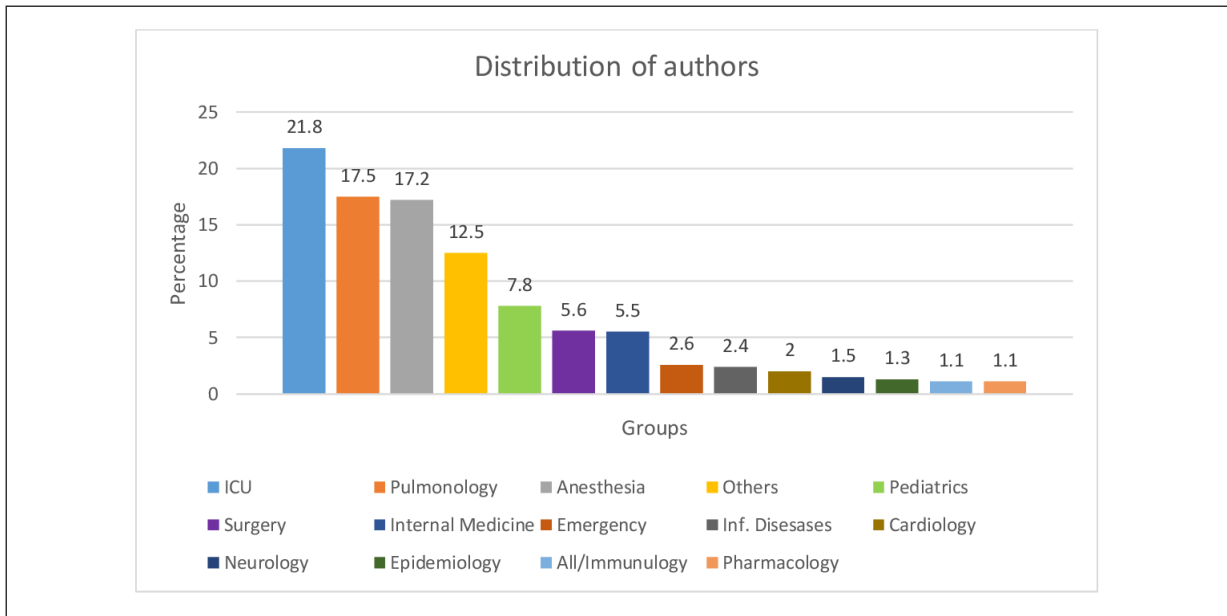


Figure 1. Distribution of author specializations.

authors were women, respectively, while they were 26.3% and 16.0 % in CC, 25.8% and 13.3% in CCM, and 25.5% and 12.6% in ICM (Table I).

Discussion

The main finding of this study is that the authors with the most published articles in ICU journals are intensivists, and their dominance is

increasing annually. First, ICUs were the area of interest of surgeons and anesthetists because of wars. In the first half of the 20th century, wars were like wounded factories, and the wounded soldiers had two significant problems: 1) wounds that require surgery and 2) cessation of pain. Therefore, the surgeons and anesthetists were the first set of ICU doctors. During the polio epidemic, with the discovery of the impact of mechanical ventilation on polio patients by Bjørn Aage Ibsen,

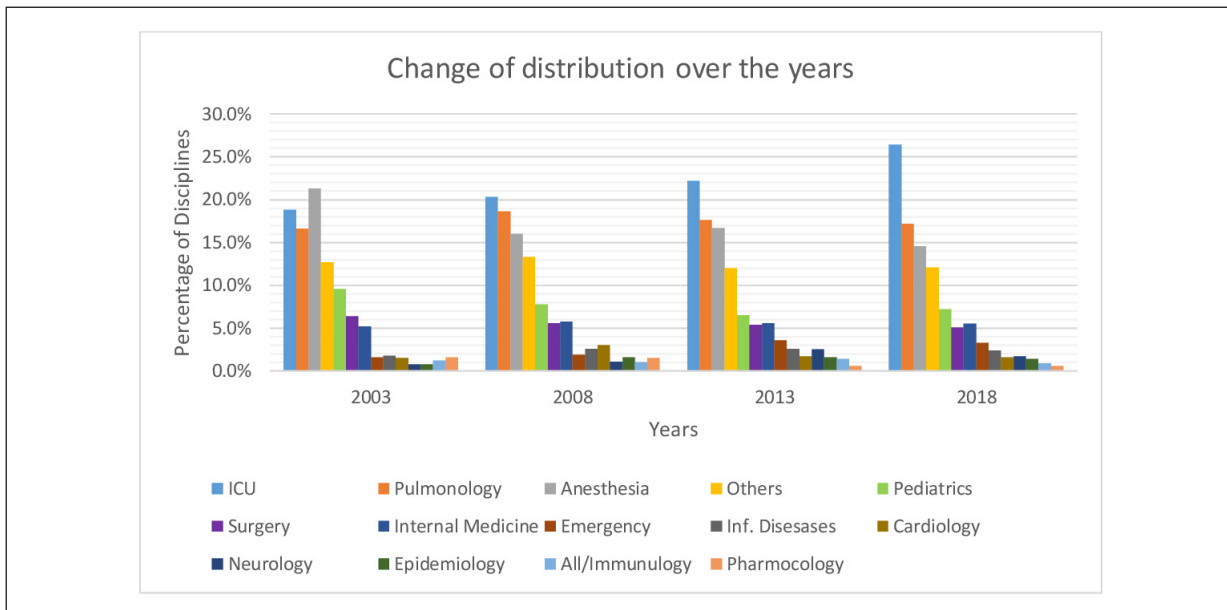


Figure 2. Change of distribution over the years.

The history of ICU literature

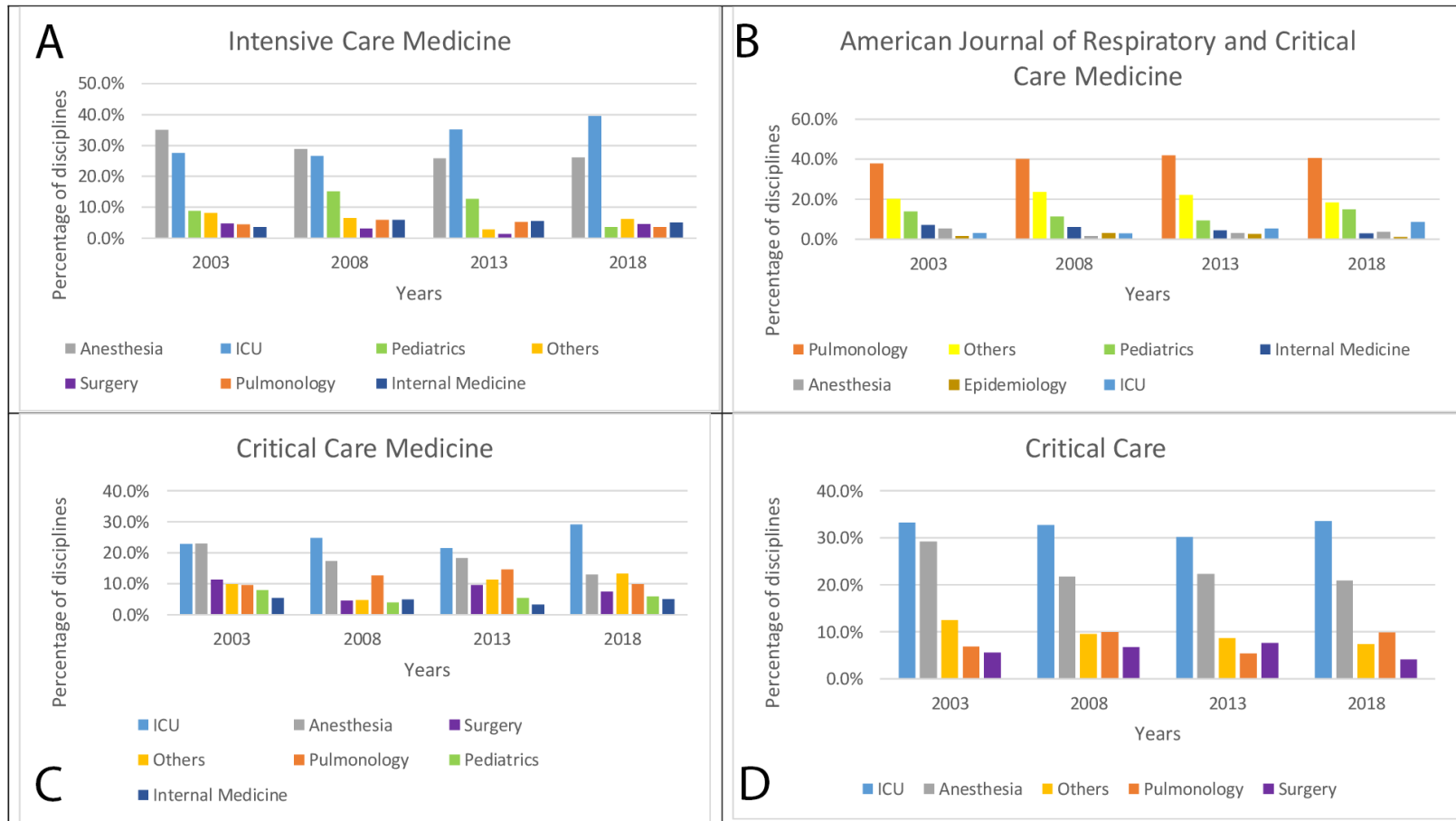


Figure 3. Change of authors in journals by years. A, Intensive Care Medicine, B, American Journal of Respiratory and Critical Care Medicine, C, Critical Care Medicine, D, Critical Care.

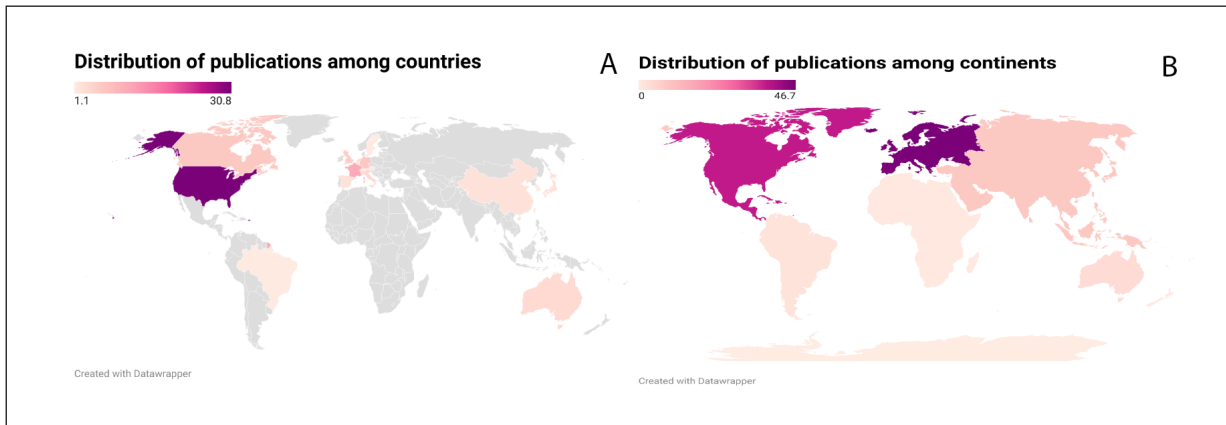


Figure 4. A, Distribution of publications among countries, B, Distribution of publications among continents.

mechanic ventilation became an essential component of the ICU, and pulmonologists joined the team³. With the evolution of ICUs, as ICU patients had more than one problems, doctors to specifically deal with ICU care, and training and certification programs were recruited in the late 1960s. Intensivists decided to take responsibility for all the decision-making, except for the specific problems of other specialists (closed system)^{12,14}. It seems that this trend was reflected in recent publications, and writers who defined themselves as intensivists came at the forefront. During the last two decades, while intensivists took over the first place and became more dominant each year, the proportion of anesthetists and surgeons among all authors gradually decreased.

Distribution according to journals show the authors' tendencies for specific journals. While intensivists are first in ICM, CCM, and CC, most pulmonologists' articles are published in the AJRCCM. It seems likely that the AJRCCM is also a pulmonology journal and an official journal of the American Thoracic Society. Because we could not separate the articles according to which the specialty of field they were concerned with, a substantial number of articles may be about pulmonology. It may also be related to the fact that pulmonologists dealing with intensive

care are more likely to affiliate themselves with "respiratory care and the intensive care unit". Unlike AJRCCM, pulmonologists rank lower in ICM, CCM, and CC, dominated by intensivists and anesthetists. This may be because these journals are official journals of intensive care societies (except CC) and are preferred by intensivists. However, if we take the beginning of the study (2003) and end dates (2018), we can see that the proportion of intensivists increased in all journals.

The geographic distribution of the authors reflects the beginning of ICU history. The USA, Canada, and Europe, led by France, are the most productive countries. The USA is at the top of the list in total, followed by AJRCCM, CCM, and CC. AJRCCM and CCM are official journals of the American societies. Therefore, unsurprisingly, there are more authors from the USA in these journals.

Similarly, authors from Europe sent their articles to ICM, the European Society of Intensive Care Medicine's official journal. According to the data obtained from Scimago Journal&Country Ranks (SJR), the top five countries contributing to the ICM literature are the USA, UK, Germany, France, and Canada, respectively¹⁵. Although the top five countries are the same, the rankings in our study were the USA, France, Germany, Canada, and the UK. This relationship may be related

Table I. Distribution of women authors.

Journals	AJRCCM		ICM		CCM		CC		Total	
	Per	Num	Per	Num	Per	Num	Per	Num	Per	Num
First	39.8	542	25.5	254	25.8	399	26.3	238	29	1,433
Senior	26.4	351	12.6	124	13.3	198	16.0	141	17.3	814

Per: Percentage, Num: Number, AJRCCM: American Journal of Respiratory and Critical Care Medicine, ICM: Intensive Care Medicine, CCM: Critical Care Medicine, CC: Critical Care.

to our data containing four high-impact journals, while SJR includes all publications.

Limitations

The major limitation of our study is that it included data from only four journals, but not all journals. In addition, we collected data at 5-year intervals. We are aware of the many valuable journals in this field. However, it is a fact that it is impossible to collect data that includes all journals and all years. However, we believe that our study has high reflective power. There is also a possible misclassification of sex, specialty, and publication type. One of the strengths of our study was that it included over hundred disciplines. We think that grouping disciplines allows us to compare them with real-life. We also presented the geographic distribution, allowing for mutual interpretation of ICU history and publication trends.

Conclusions

Approximately, 60 years have passed since the modern definition of intensive care was given. Many high-quality papers have been published since then. Initially, anesthesiologists, pulmonologists, and surgeons worked in ICUs and published scientific articles, but in recent years intensivists appear to have taken over. Considering the need for intensive care units and intensive care specialists that we faced with the COVID-19 pandemic, we can predict that this trend will continue. Future studies examining a more extended period of time will give us an idea about this subject.

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Conflict of Interest

Authors declare that they have no conflict of interest.

Ethics Approval

This article does not contain any studies with human participants or animals performed by any of the authors. Ethical committee approval was not required since the study was carried out with the method of examining public databases, not on volunteers.

Informed Consent

Not applicable.

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