



# Publishing trends in Journal of Paediatric Surgery, Pediatric Surgery International and European Journal of Pediatric Surgery over the past three decades

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Accepted: 22 January 2019 / Published online: 29 January 2019  
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## Abstract

The aim of this study was an analysis of the changing publication trends over the last three decades in the Journal of Pediatric Surgery (JPS), Pediatric Surgery International (PSI) and European Journal of Pediatric Surgery (EJPS) by studying the bibliometric variables, authorship, collaboration, and citation trends. A previously applied methodology using intermittent years was applied to review the archives of JPS, PSI and EJPS over the last 30 years. Citation data were collected from the Web of Science database. Statistical analysis was performed using SAS 9.4 software. A total of 1917 articles originating from 63 countries met the inclusion criteria. The number of articles published every year increased significantly in the last three decades from 336 in 1987 to 626 in 2017 ( $P < 0.0001$ ). Multinational papers made up 5% of the total, of which 58% involved more than one continent. A majority of papers (75%) were single institution papers, there was strong evidence of an increase in multi-institution publications over time. There was a statistically significant increase in the number of female first and corresponding author. The publishing landscape of paediatric surgery has evolved to be more inclusive with increased collaboration, female authors and mentors and more publications from developing nations.

**Keywords** Bibliometric · Sex · Authorship · Region · Paediatric surgery · International collaboration

## Introduction

Publications in peer reviewed journals provide clinicians and researchers the platform to share scientific discovery and experiences which promote the practice of evidence based medicine. High-quality publications, especially in the best journals, represent a strong currency. They afford the opportunity to facilitate admission to desired programs, obtain research grants and for career advancement and incumbency

[1]. The aphorism “publish or perish” is truer now than ever. Furthermore, with the expanding possibilities for collaborative research, due to the increasing ease of communication and continued specialization, there are changing trends in publication. These changes are likely to be reflected in the field of pediatric surgery.

The Journal of Pediatric Surgery (JPS) was established in 1966. It is the Official Journal of the Section on Surgery of the American Academy of Pediatrics, the British Association of Paediatric Surgeons, the American Pediatric Surgical Association, the Canadian Association of Pediatric Surgeons, and the Pacific Association of Pediatric Surgeons. Established in 1986, Pediatric Surgery International (PSI) is the official journal of the Society of Pediatric Surgical Research, the Japanese Society of Pediatric Surgeons, the Asian Association of Pediatric Surgeons and the World Federation of Associations of Pediatric Surgeons. The European Journal of Pediatric surgery (EJPS) was created in 1991 by the amalgamation of the German publication “Zeitschrift für Kinderchirurgie” and the French “Chirurgie Pédiatrique” [2]. Today it is the official journal of the Union of European Medical Specialists-Section Paediatric Surgery

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and European Paediatric Surgeons Association. These three journals are pivotal in the arena of scientific literature in Paediatric surgery and embody global perspectives in the field.

In this study we aim to analyse the changing publication trends in the field of paediatric surgery by a bibliometric analysis of authorship, collaboration and citation trends over the last three decades.

## Methods

### Publication demographics

A previously applied methodology using intermittent years was applied to review the archives of JPS, PSI and EJPS over the past 30 years [3–6]. One year from every decade was selected starting with 2017 (most recent year with a complete data set), counting every 10 years to 2007, 1997 and 1987 (PSI and JPS), 1991 (EJPS, first English edition). Publication data were extracted from archives of the journal available online and tabulated in an Excel spreadsheet (Microsoft, Redmond, CA, USA). The country of origin, number of countries, continents and institutions, number of authors, sex of first and corresponding author, order of corresponding author, printed pages and number of references for each paper published in the journal in those years were tabulated. Countries were grouped by regions as defined by the population data website <http://www.worldometers.info/world-population/population-by-region>. United States and Canada were designated as North America; Mexico, Central America, and South America as Latin America; the European continent including Russia as Europe; and Asia as all Asian countries beginning east of Turkey, including the Middle East and Israel. The other regions were Africa and Oceania. We classified articles arising from two or more countries (as derived by the author affiliations) as multinational. An article was considered collaborative when there were authors listed from institutions based in two or more countries. Manuscripts without authors' names and those that were not original research or review articles (e.g., case reports, memoranda, meeting notes, editorials and abstracts) were excluded. Funding for collaborative papers was collected from the acknowledgements of the paper. Information on grants and funding was extracted from World RePORT available online at <https://www.report.nih.gov/>. The proportion of the grants awarded to paediatric surgery was assumed to be proportionate worldwide.

### Citation analysis

The number of times each publication was cited was analysed as a proxy of research quality. A search of the Web

of Science (WoS) database was performed for each study year of the three journals individually. All searches were conducted on 19th and 20th of September 2018. Data downloaded from the WoS and tabulated in a Microsoft Excel spreadsheet (Microsoft, Redmond, CA, USA). All article types were included in the citation analysis. Because more recent publications have a lesser chance of being cited, an age-weighted citation normalization was performed by dividing the number of times cited by its age (year-2017+1) [7].

### Author sex analysis

The names of the first, last and corresponding author and corresponding author position were collected. The website “Baby Name Guesser” (<http://www.gpeters.com/names/baby-names.php>) was used to identify sex of the first and corresponding author by the sex ratio that indicated the likelihood of a correct sex. A ratio above 3.0 was chosen as correct [7]. If the ratio was less than 3.0, internet search engines were used to detect biographical information or photographs that could clarify author sex. The publication was excluded from sex analyses if such a search was inconclusive or if the first name of the authors was not available.

### Statistical analysis

Statistical analyses were performed with SAS 9.4 software. Descriptive statistics were used for each year of data, including percentages, means and standard deviations. Analyses of continuous and count data were performed using linear and Poisson regression analysis. Discrete data were analysed by the Chi-square test. Trends over time for categorical variables were assessed using the Cochran–Armitage trend test and logistic regression.

### Funding and ethics

No grant was received for this research from funding agencies in the public, commercial, or not-for-profit sectors. Institutional review board's approval was not required for this review of literature.

## Results

### Overall trends

A total of 1917 articles originating from 63 countries met the inclusion criteria for the study. The bibliometric variables studied are summarised in Table 1. The number of articles published every year increased significantly in the last three decades from 336 in 1987 to 626 in 2017 (mean

**Table 1** Bibliometric variables by publication year

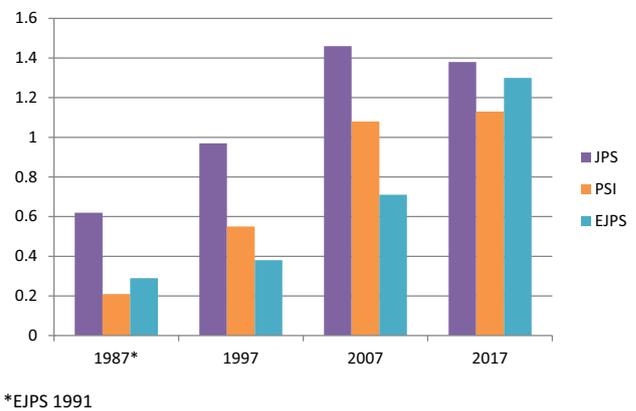
Variable analysed	1987 <sup>a</sup>	1997	2007	2017	P value
Number of papers published	336	444	511	626	
Multi-continent papers	9	13	11	23	0.49
Multinational papers	11	30	20	35	0.08
Multi-institution papers	34	151	112	189	<0.0001
Number of authors (mean ± SD)	3.6 ± 1.8	4.4 ± 2.2	5.4 ± 2.4	6.0 ± 3.3	<0.0001
Printed pages (mean ± SD)	4.2 ± 1.6	4.3 ± 1.6	5.2 ± 2.0	5.4 ± 1.9	<0.0001
Number of references (mean ± SD)	15.9 ± 10.1	19.3 ± 13.6	22.5 ± 16.7	26.3 ± 17.0	<0.0001
Female first author	34	42	129	254	<0.0001
Female corresponding author	28	38	82	186	<0.0001
Citations (mean ± SD)	15.1 ± 22.4	16.6 ± 22.3	14.1 ± 16.6	1.3 ± 1.8	0.39
Normalised citations (mean)	0.40	0.63	1.08	1.27	<0.0001

<sup>a</sup>EJPS 1991

increased by 19% per decade, 95% CI 15–23%,  $P < 0.0001$ ). Multinational papers made up 5% of the total, of which 58% involved more than one continent. Although, a majority of papers (75%) were single institution papers, there was strong evidence of an increase in multi-institution publications over time (OR 1.22 per decade, 95% CI 1.11–1.35,  $P < 0.0001$ ). When assessed by region; North America (40%), Europe (28%) and Asia (24%) together contributed 92% of the articles. Further, of the 90,846 research grants awarded in the fiscal year 2017, the US received 56,736 (62%), Europe 26,004 (29%), Asia 2855 (3%) and Oceania 772 (0.8%) grants. Looking at countries over the last three decades, the US with 32% led the way followed by Japan with 10%, Canada and the United Kingdom (UK) with 7% and Turkey and Australia with 4% contributions.

The number of printed pages has increased from a mean of 4.2 to 5.4 (mean increased by 10% per decade, 95% CI 8–12%,  $P < 0.0001$ ) and number of references per article from 16 to 26 (mean increased by 17% per decade, 95% CI 16–18%,  $P < 0.0001$ ). The same trends were reflected across the three journals. The number of normalised citations increased significantly over the three decades (mean increased by 29% per decade, 95% CI 24–33%,  $P < 0.0001$ ) (Fig. 1). The proportion of papers that have ever been cited is 82%.

In the 30 year span studied, there has been a 19% increase in the mean number of authors every 10 years (95% CI 17–21%,  $P < 0.0001$ ). Further, the corresponding author position has changed, with fewer first position corresponding authors recently (OR 0.77 per decade, 95% CI 0.70–0.84,  $P < 0.0001$ ). This variable has seen a similar trend in all three journals. Less than 1% of articles were group authored. The data on author sex was available for 82% first authors and 84% corresponding authors. Overall 29% first authors and 21% corresponding authors were women. There was, however, a statistically significant increase in the number of female first authors (17% in 1987, 42% in 2017) (OR



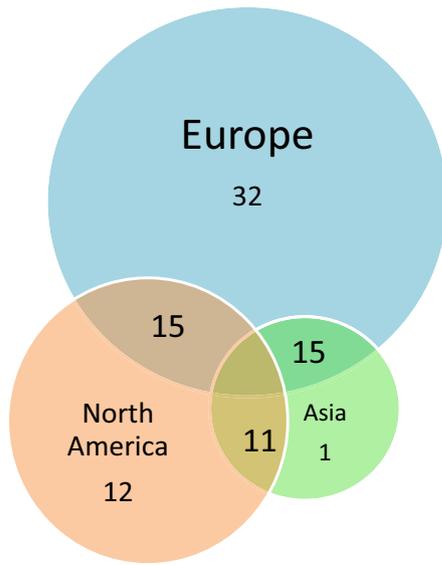
\*EJPS 1991

**Fig. 1** Normalised citation count

1.85 per decade, 95% CI 1.63–2.10,  $P < 0.0001$ ). The same trend was seen in the female corresponding author (14% in 1987, 30% in 2017) (OR 1.62 per decade, 95% 1.42–1.86,  $P < 0.0001$ ).

## Collaboration

Ninety-six papers involved more than one country. Seventy-six (79%) collaborative papers were clinical. The most popular area of interest for clinical collaborative publications was Hirschsprung's disease (15) followed by anorectal malformation (6), urology (6) and oncology (5). The remaining collaborative work was animal experiments (18%) and foetal studies (2%). Animal studies focused on Congenital Diaphragmatic Hernia, Oesophageal Atresia, Necrotising enterocolitis and other gastrointestinal disorders. Thirteen percent of the collaborative work was funded [animal (5), clinical (5) and foetal (2)]. Gender data were available for 65% of the collaborative publications; 5% projects were female lead. Figure 2 elaborates the distribution of collaboration by region. Sixty-one of the 96 collaborative projects



\*Oceania, Central America and Africa excluded due to small numbers

Fig. 2 Ven diagram showing the regional collaboration

involve a European country, of which 32 involved collaboration within Europe, 15 each with NA and Asia. In contrast, as represented in the Ven diagram, NA had a more even collaborative network with almost equal numbers of projects with Europe, Asia and within NA. The Asian countries showed very little collaboration within themselves and most of the Asian collaboration was with Europe and NA.

### Journal comparisons

The regional distribution of the articles in the three journals by year is depicted in Fig. 3. The North American contribution was significant and consistent over time in the JPS (44–67%) with very little in the EJPS (3–12%). In contrast, there has been a steady increase in the North American contribution in the PSI over the last two decades. Contributions from Europe and Oceania have remained fairly consistent over time, whereas there has been a steady increase in the number of articles from Asia across all three publications. There was a uniform significant increase in number of articles, number of pages and references, female first authors and corresponding authors and normalised citations across all three journals over time. EJPS however, has shown the highest collaboration with a steep upward trend in multi-institution publications over the last three decades (OR 2.6 per decade, 95% CI 1.9–3.7,  $P < 0.0001$ ), whereas for PSI it has been more of a gentle trending up (OR 1.4 per decade, 95% CI 1.2–1.7,  $P = 0.0004$ ). JPS has the least collaborative publications and shown no evidence of changes over time (OR 0.98 per decade, 95% CI 0.87–1.1,  $P = 0.8$ ) (Fig. 4).

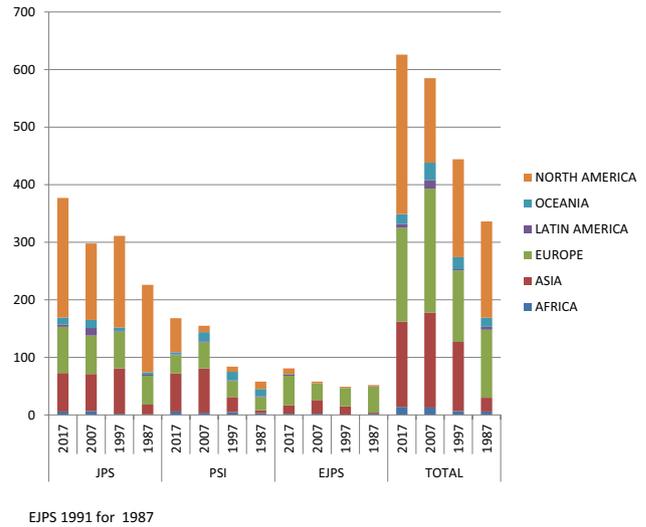


Fig. 3 Trend in the regional distribution of articles over time in the three journals and overall

### Discussion

The last three decades have seen many changes in the landscape of paediatric surgical publication. These changes are reflected in the changes in the bibliometric variables for the journals, including an increase in author number, change in corresponding author position, increase in number of normalized citations, and number of pages and references. There has been an increase in collaborative work across the world reflected in the increase in the number of multinational and multi-institution papers. This may be largely

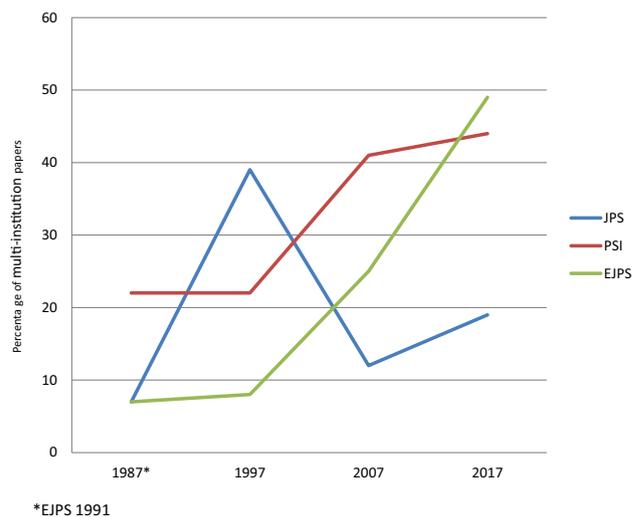


Fig. 4 Trend in the multi-institution papers in the three journals over time

contributed by the ease of communication and grant availability for collaborative work [8].

Paediatric surgery remains a niche area in the vast arena of grants and funding. The regional distribution of publications seems proportionate to the amount of research funding received by the region. Hu et al. evaluated the funding trends of the NIH between 2003 and 2013 and found that the allocations to surgery had significantly decreased (19%) [8]. Further, the allocation by specialty within the broad surgical fields found a decrease in pediatric surgery allocations from 7 to 3% within the same time frame. There may be several factors contributing to this: With the variable spectrum of disorders seen in Paediatric Surgical practice, it is a challenge to conduct randomized controlled trials and secure grants. Furthermore, funding was more favorable to cooperative agreements (increased 23%) rather than mentored projects (decrease 33%) and research projects (decrease 38%). We found less than 1% articles were group authored and 25% were collaborative over the last three decades. Increasing collaborative work would attract funding, improve the quality of research from developing countries, improve the standard of care and widen world perspectives on the unique challenges faced by researchers in these areas. It would further provide an opportunity to use collective experience to clinical advantage especially in rare diseases. Early initiation into research and adequate mentoring can improve the rates of securing grants. Shrinking medical budgets leading to reduced staffing and work-hour restrictions for junior staff necessitate increased clinical responsibilities among faculty, thereby reducing time available for research. There is a need to incentivize faculty to submit grant applications by providing protected time or salary support for the application process itself [8].

There has been an increase in the number of authors across medical publication over the last few decades [9–12]. We found a similar trend in Paediatric Surgery. This could be a reflection of increased complexity of research articles involving several teams, each with their own specialization. Additionally, with increasing multinational and multicentre collaboration, authorship may be offered as an incentive for recruitment. ‘Gift’, ‘honorary’ and ‘buy-in’ authorships are well known concepts which could play a part. In an effort to define authorship, the International Committee of Medical Journal Editors (ICMJE) recommends that authorship be based on the following four criteria [12]: substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately

investigated and resolved. These criteria may be difficult to follow in the current milieu of scientific publication. A double blinded or open peer review system would be one way to even the playing field. This would further address the issue of prejudice against female authors who feel that their work may be sideline due to the paucity of female mentors and reviewers.

Fishman and colleagues assessed female authorship in three paediatric-focused journals *Pediatrics*, *JAMA Pediatrics* (entitled *Archives of Pediatric and Adolescent Medicine* until 2013), and *The Journal of Pediatrics* between 2001 and 2016 [13]. There was increasing female representation across the selected journals in both first (40% in 2001, 58% in 2016) and senior (29% in 2001, 38% in 2016) authors, respectively. Despite the substantial improvements in Paediatric surgery, a gender gap remains. Over the past 30 years, there have been slower gains of female senior authorship (17% increase) compared to gains in female first author (25% increase). The complexities of this gender gap and the possible remedies were elegantly elaborated by Digman et al. [14]. Briefly, they called for targeted policies on pregnancy and maternity leave, childcare, and alternative work schedules, improved mentorship, and promoting opportunities of leadership to be instituted to enhance and accelerate the positive change [14].

## Limitations

There are several limitations to our study. Non-English pediatric surgery publications were excluded. Further we have limited our sample to three pediatric surgery journals. It is possible that we included some case reports as it was sometimes difficult to distinguish them from original articles. In using the corresponding author’s address to determine country of origin, we may have misinterpreted the nationality of articles from multiple geographic regions. These could have occurred across all three journals. Further the search was not uniform throughout the journals (*EJPS* 1991 used instead of 1987). We remained consistent in our analysis; however, it is unlikely these errors caused major changes in our conclusions. Additionally, the grant fund allocation was considered as a whole and not specific to surgery or paediatric surgery.

## Conclusions

The publishing landscape of Paediatric surgery is evolving to be more inclusive with increased collaboration, female authors and more publications from developing nations.

**Funding** None.

## Compliance with ethical standards

**Conflict of interest** The authors declare no conflict of interest.

**Research involve humans or animals** This research does not involve humans or animals.

**Ethical approval** Ethical approval was not necessary for this review.

## References

- Weeks WB, Wallace AE, Kimberly BCS (2004) Changes in authorship patterns in prestigious US medical journals. *Soc Sci Med* 59:1949–1954
- Holschneider AM (2004) The European Journal of Pediatric Surgery: 40 years of publication. *Eur J Pediatr Surg* 14:145–147
- Lehman JD, Schairer WW, Gu A et al (2017) Authorship trends in 30 years of the Journal of Arthroplasty. *J Arthroplasty* 32:1684–1687
- Riesenberg D, Lundberg GD (1990) The order of authorship: who's on first? *JAMA* 264:1857
- Jagsi R, Guancial EA, Worobey CC et al (2006) The “gender gap” in authorship of academic medical literature: a 35-year perspective. *N Engl J Med* 355:281–287
- Mimouni M, Zayit-Soudry S, Segal O et al (2016) Trends in authorship of articles in major ophthalmology journals by gender, 2002–2014. *Ophthalmology* 123:1824–1828
- Russell AF, Nguyen M, Bhuiya M et al (2018) Comparative analysis of bibliometric, authorship, and collaboration trends over the past 30-year publication history of the Journal of Orthopaedic Trauma and Injury. *J Orthop Trauma* 32:e327–e333
- Hu Y, Edwards BL, Brooks KD, Newhook TE, Slingluff CL Jr (2015) Recent trends in National Institutes of Health funding for surgery: 2003–2013. *Am J Surg* 209:1083–1089
- Onwude JL, Staines A, Lilford RJ (1993) Multiple author trend worst in medicine. *BMJ* 15(306):1345
- King JT Jr (2000) How many neurosurgeons does it take to write a research article? Authorship proliferation in neurosurgical research. *Neurosurgery* 47:435–440
- Durani P, Rimouche S, Ross G (2007) ‘How many plastic surgeons does it take to write a research article?’—authorship proliferation in and internationalisation of the plastic surgery literature. *J Plast Reconstr Aesthet Surg* 60:956–957
- Modi P, Hassan A, Teng CJ, Chitwood WR Jr (2008) ‘‘How many cardiac surgeons does it take to write a research article?’’: seventy years of authorship proliferation and internationalization in the cardiothoracic surgical literature. *J Thorac Cardiovasc Surg* 136:4–6
- Fishman M, Williams WA 2nd, Goodman DM, Ross LF (2017) Gender differences in the authorship of original research in pediatric journals, 2001–2016. *J Pediatr* 191:244–249
- Dingemann C (2017) The female pediatric surgeon. *Eur J Pediatr Surg* 27:228–233