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Sex and gender reporting in neurosurgical journals: A cross-sectional study on enactment of the SAGER guidelines

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Abstract

Background: In 2016, the SAGER (sex and gender equity in research) guidelines were developed to standardize research reporting and to facilitate the generalizability of research findings for women and men, thereby impacting clinical practice.

Objectives: To assess the extent to which the SAGER guidelines have been implemented in neurosurgical publications.

Methods: Original research articles from leading neurosurgical journals indexed in Google Scholar under the category 'Neurosurgery' were examined and assessed for the extent to which the articles conformed to the SAGER guidelines. Data were extracted on subjects (sample size and relative proportions of sex or gender) and on adherence to the SAGER guidelines (one item for general principles and five items from recommendations for each section of the article) and summarized.

Results: We included 98 articles from 10 leading neurosurgical journals. The average number of subjects for a journal was 4728, of which 2056 (43.5%) were women. Only nine (9.2%) of the 98 articles used the terms 'sex' and 'gender' appropriately. The outcomes were disaggregated by sex in 16 (16.3%) articles; sex differences were acknowledged in the introduction in six (6.1%) articles; considered in the 'Methods' section in five (5.1%) articles; the differing numbers of women and men were justified in the methods in two (2%) articles; and the generalizability of the results to women or men was discussed in five (5.1%) articles. The journals showed no differences in the extent to which they adhered to the guidelines.

Conclusions: Reporting sex and gender equity in neurosurgical journals is negligible for the most screened SAGER items as is the endorsement of the guidelines. The results likely reflect the lack of awareness of both the importance of disaggregating data by sex or gender and the existence of pertinent guidelines.

Keywords:

Equality, gender, journals, neurosurgery

Introduction

In 2016, the European Association of Science Editors (EASE) published the SAGER guidelines (sex and gender equity in research) aimed at systematizing the reporting of sex and gender.¹ The rationale for the guidelines was the fact that sex and gender are crucial determinants of health that impact, among other aspects of well-being, the outcomes of a given treatment.¹ At the same time, it was recognized that reporting of outcomes disaggregated by gender and sex is almost always ignored, much to the detriment of women.¹ The SAGER efforts were led by the Gender Policy Committee of EASE and had begun in 2012. In the first 5 years of their publication, the guidelines were translated into several languages, adopted widely by researchers, and endorsed by journals and publishers.^{2,3} Although initially met with resistance, the guidelines continue being developed and, more recently, there have been calls to extend them to encompass variables other than sex and gender.²⁻⁵ So far, the guidelines have been accessed over a million times on the publisher's website and cited almost 700 times in peer-reviewed journals. More recently, EASE had extended its efforts and published the SAGER checklist, aimed at expediting editorial scrutiny, guidelines implementation, and promotion of the awareness of the importance of proper reporting of sex and gender.⁶

Although the SAGER guidelines have undoubtedly had an impact on sex and gender (non)equity in academic output and on publishing practices, problems still persist, as is evident from inadequate reporting of sex and gender data during the coronavirus disease 2019 pandemic.^{1,7} Likewise, a recent study aimed at assessing sex and gender equity in submission guidelines of radiology journals found that the majority of screened journals did not meet a single SAGER

criterion in the submission guidelines and that promoting sex and gender equality was associated with publication metrics (mainly the journal impact factor).⁸

The extent to which sex and gender equity reporting policies are endorsed in neurosurgical publications remains unclear, and it was to bridge this gap that we aimed to assess (1) the extent the guidelines are adopted by neurosurgical journals and (2) the level of awareness of sex and gender equality among authors publishing in those very journals.

Methods

Journal selection

Journals by Google Scholar under the category 'Health & Medical Sciences', subcategory 'Neurosurgery' were listed and sorted in descending order of their impact factor, and the top 10 journals – full texts of which were accessible through institutional subscription – were examined. The names of the journals along with other relevant details are shown in Supplementary Table 1.

Articles included in the analysis

After selecting the top 10 journals, we chose 10 latest (as on 19 July 2024) original research articles from each of the journals to reach a total 100 articles. We excluded other types of articles (reviews, letters to editors, animal studies, etc.). We sorted the chosen articles in chronological order, with the most recent published article on top. The contents of all the 10 journals were accessible, either because the journals were open access or because the authors had institutional access to them.

Data extraction

Two researchers (HAC and OA) extracted and double-checked the data independently and any discrepancies were resolved late by reaching a consensus.

The guidelines or instructions for authors as published by the 10 journals were examined to identify any endorsement of the SAGER guidelines, and the 100 chosen articles were read for their adherence to the items listed in the SAGER checklist.⁶ For each of the article, the following data were extracted.

1. Sample size.
2. Numbers and proportion of subjects by gender.
3. Outcome, that is whether the main outcome data had been disaggregated by sex or gender.
4. If only one sex was included, whether it was reported in the title and in the abstract (SAGER checklist item 2).
5. Whether sex and gender differences in the investigated phenomenon were acknowledged in the introduction (SAGER checklist item 4b).
6. Whether the methods section reported on how men and women were taken into account in study design (SAGER checklist item 5a).
7. Whether methods justified differing number of men and women (SAGER checklist item 5b).
8. Whether generalizability of results to both sex/genders was discussed (SAGER checklist item 6b).

9. Appropriate use of the terms ‘sex’ and ‘gender’ appropriately (SAGER checklist item 1): if both terms were used, it was taken as compliant with the guideline and appropriateness of usage was not investigated beyond that fact (variables three to eight comprise the SAGER guidelines).

Statistical analysis

Continuous data were summarized as mean (95% CI) and categorical data, as absolute and relative frequency (95% CI). We used SPSS (version 26.0; SPSS, Inc.) used for analysis.

Results

A summary of information on the chosen journals and articles, including details of the volume and issue numbers, the number of items considered eligible (original clinical research articles), the number eventually included in the analysis, and the number of openly accessible, is presented in Table 1. Two of the 100 chosen articles (one from the *Journal of Neurosurgery: Spine* and one from *Surgical Neurology International*) were subsequently excluded because they did not meet inclusion criteria.

Table 1. Summary of journals and articles included in the analysis

Journal	Volume	Issue(s)	Articles included	Articles eligible	Open access	OA (%)
<i>Journal of Neurosurgery</i>	140	6	10	32	6	18.8
<i>World Neurosurgery</i>	186	June	10	81	14	12.3
<i>Neurosurgical Review</i>	47	June	10	23	8	34.8
<i>Acta Neurochirurgica</i>	166	June	10	17	9	52.9
<i>Journal of Neurosurgery: Pediatrics</i>	33	6	9	12	2	16.7
<i>Operative Neurosurgery</i>	26	4–6	10	15	2	13.3
<i>Surgical Neurology International</i>	15	June	9	16	16	100.0
<i>Neurosurgical Focus</i>	56	6	10	18	18	100.0
<i>Journal of Neurosurgery: Spine</i>	40	6	10	14	3	21.4
<i>Journal of Korean Neurosurgical Society</i>	67	2–4	10	18	18	100.0

Overall, 98 articles were analysed (listed in Supplementary material); these comprised 4728 subjects, of which 2056 (43.5 %) were women (Table 2).

Of the 10 journals, only one, namely *World Neurosurgery*, formally endorsed the SAGER guidelines, encouraging authors to adopt them in its guide for authors, under the section ‘Reporting sex- and gender-based analyses’.⁹

Agreement on individual items in the SAGER guidelines was negligible, apart from disaggregate reporting of results by sex and gender (16 of the 100 publications) (Table 2).

The 10 journals did not differ among themselves with regard to compliance with individual items (Table 3). Of the 10 articles that were examined for each journal, the maximum was three: these articles complied with the item ‘Results: whether data were presented disaggregated by sex and gender’ and were published in the *Journal of Neurosurgery* and *World Neurosurgery*. All the other items across all the publications in all the ten journals showed poor compliance, and 29 out of 60, or 48%, items found no compliance at all (Table 2).

Discussion

We sought to assess the extent to which journals in neuroscience adhered to SAGER guidelines and were aware of sex and gender equity in reporting, as seen in nine or 10 most recent articles reporting original research from each of the 10 chosen journals. We found that only one journal, namely *World Neurosurgery*, endorsed the guidelines in its instructions for authors and implemented them in the articles it published. Awareness of the importance of disaggregate reporting of outcomes in the field of neurosurgery by sex is low, as is seen from overall low adherence to individual items that make up the SAGER checklist, regardless of endorsement – or otherwise – of the guidelines by a given journal.

It has been demonstrated time and again that women receive lower standards of care, which includes accessibility to health care, unmet health needs, and higher costs of health care.^{10,11} At the same time, women are less likely to report lack of health care coverage.¹² The results show that gender inequality is highly prevalent also in neurosurgical publishing.

Table 2. Summary of characteristics of subjects as reported in the chosen articles and the extent of their compliance with items in the SAGER guidelines

Attribute	Absolute value	95% CI ^c
Sample size ^a	4728	-1649; 11,106
Number of women ^a	2056	-571; 4684
Proportion (%) of women ^a	43.5	42; 45
Outcomes disaggregated by sex (Y) ^b	16	16.3 (9.6; 25.2)
Sex/gender differences acknowledged in the introduction ^b	6	6.1 (1.4; 10.9)
Methods report how sex/gender differences were taken into consideration ^b	5	5.1 (0.7; 9.5)
Methods justify differing number of men and women in the study ^b	2	2 (0.0; 4.9)
Generalizability of results to women/men is discussed ^b	5	5.1 (0.7; 9.5)
Study uses ‘sex’ and ‘gender’ appropriately ^b	9	9.2 (3.5; 14.9)

^aAverage of 10 articles for each journal.

^bTotal for all articles. ^cProportions (lower bound; upper bound 95% CI).

Table 3. Number of articles from selected journals showing compliance with SAGER guidelines, by sections of articles

Journal	General ^a	Introduction ^b	Methods		Results ^e	Discussion ^f
			Report ^c	Justify ^d		
<i>Journal of Neurosurgery</i>	1	1	1	0	3	1
<i>World Neurosurgery</i>	0	1	1	1	3	1
<i>Neurosurgical Review</i>	2	1	0	0	2	0
<i>Acta Neurochirurgica</i>	0	0	0	0	2	0
<i>Journal of Neurosurgery: Pediatrics^g</i>	0	0	2	1	1	0
<i>Operative Neurosurgery</i>	1	0	0	0	1	0
<i>Surgical Neurology International^g</i>	1	2	0	0	2	1
<i>Neurosurgical Focus</i>	0	0	0	0	0	1
<i>Journal of Neurosurgery: Spine</i>	2	1	1	0	1	0
<i>Journal of Korean Neurosurgical Society</i>	2	0	0	0	1	1

^aGeneral: SAGER item in the 'General principles' category; whether the terms sex and gender were used appropriately or were used at all ^bSAGER item 'Introduction': 'SAGER item 'Methods': whether the authors reported how sex and gender were taken into account in study design. ^dSAGER item 'Methods': whether any reasons were given for any exclusion of men or women. ^eSAGER item 'Results': whether data were presented disaggregated by sex and gender. ^fSAGER item 'Discussion': whether the study addressed the generalizability of results to women and men. ^gScore from nine articles.

Across the items in the SAGER checklist (items 1, 4b, 5a, 5b, 6b, 7a), there was not a single instance of adherence to a particular item in the majority of screened articles, with the sole exception of the item 'results' (SAGER item 6b: '*Where appropriate, data presented disaggregated by sex/gender, and sex/gender differences and similarities are described*').⁶ However, even this item, despite being the one most adhered to, was reported in only 16 out of 98 articles and in only one journal. SAGER item 5b: '*Description of how sex/gender was considered in the design, whether authors ensured adequate representation of female study participants, justification of the reasons for any exclusion of male and female study participants, or explanation if not considered*' was reported in only 2 out of 98 articles, and item 7a: '*Potential implications of sex/gender on the study results and analyses, including the extent to which the findings can be generalized to all sexes/genders in a population*' in only 5 out of 98 publications (Table 3). The remaining items (apart from SAGER item 2, namely title, the

compliance of which was not ascertainable in any of the publications, as none of the identified articles had subjects belonging to only one sex/gender) were also adhered to sporadically and the overall sense is that of accidental, rather than intentional, adequate reporting of sex and gender equity. Indeed, the notion is supported by a parallel finding of only a single journal (out of the 10) explicitly endorsing the SAGER guidelines and thereby being the only one among the leading scholarly neurosurgical journals with any reference to the issue. Thus the overarching sentiment is one of lack of awareness among neurosurgeons, and neurosurgical editors and publishers, of the importance of sex and gender equity in reporting, which then results in only anecdotal adoption of policies that have been shown to have a real-life impact on patient outcomes. Equity in reporting is more than a matter of falling in line with the cultural zeitgeist, because it brings about material outcomes, in particular those that concern human well-being.

Sex and gender are associated with outcomes in neurosurgical diseases

The rationale for adopting inclusive policies in neurosurgical publishing is based on the results of studies on outcomes of a wide spectrum neurosurgical diseases – studies that reported disaggregate data and showed that sex and gender are significant moderators of outcomes. For example, a recent multicentre international cohort study on patients who had undergone treatment for spinal metastases showed that women survived longer and faced fewer complications and concluded that ‘gender might be a prognostic factor’ and should be considered in decision-making and patient counselling.¹³ At the same time, the study is an example of inappropriate conflation of two separate concepts, namely ‘sex’, which encompasses biological characteristics, and ‘gender’, which encompasses socially constructed characteristics. An earlier study on complication rates and length of hospital stay in neurosurgical patients reported similar findings.¹⁴ Both of these studies share a common notion that sex and gender play a major role in outcomes and should therefore be considered while counselling patients, deciding on the treatment, and providing care. Indeed, it is along these lines that the results of a recent study on surgical treatment of degenerative spine disease can be interpreted¹⁵: namely, that females were more likely to undergo fusion as opposed to males, and concluded that the condition itself differs between sexes, owing to clinical and anatomical peculiarities.¹⁵

Gender and sex in neurosurgery

Sex and gender differences in neurosurgery extend beyond treatment policies and outcomes. A survey published in 2020 of

members of the Congress of Neurological Surgeons found that women neurosurgeons were less likely to consider neurosurgery again as a career, had lower sense of career fulfilment than men, and were less likely to marry or have offspring.¹⁶ The situation is far from being unique to the ‘Western’ countries, as a recent publication from Pakistan reported on gender gaps among neurosurgeons with regard to working conditions, mentoring, work-life balance, and burnout and called for interventions to address these issues.¹⁷ Likewise, the underrepresentation of and discrimination against women are prevalent in medicine and ultimately in society as a whole.¹⁸ Notwithstanding these issues, it seems that positive changes are possible and are indeed taking place, as equity has been reached at least in case volumes among neurosurgical residents in the United States.¹⁹

Another area in which gender and sex were shown to play a role is patient choice: a recent study from Taiwan showed that a substantial fraction of patients, mostly women, prefer women neurosurgeons.²⁰ This in itself is an interesting finding worth a deeper exploration.

Of the 10 journals we analyzed, five were published by national neurosurgical associations and five by major publishers, which shows that the neurosurgical society at large is at least as important as publishers in shaping the environment in which neurosurgical narratives evolve. Therefore if the importance of equity in conducting and reporting research is brought to the attention of neurosurgeons, including by reports such as this one, positive shifts might ensue sooner.

Disaggregation beyond gender/sex

The SAGER guidelines have been proven to be a landmark publication not only because they are garnering endorsement but also because they have raised awareness of the importance of a wider inclusivity and disaggregate reporting that extends beyond sex and gender and also includes other social determinants, such as race and ethnicity.^{4,21,22} The rationale that such policies share with that of the SAGER guidelines, namely that specific groups have specific determinants of health that affect treatments, and that a comprehensive assessment of outcomes is possible only if these determinants are considered while conducting and publishing research. In the publications we analysed, gender identity was not addressed by any means beyond the binary framework (including transgender, diverse, genderfluid, agender, or other populations).

It must be admitted that our study suffers from several limitations, first of them being convenient sampling, which included only a limited number of recent publications. The method offers the view of a cross-section of the current situation and fails to provide insight into temporal trends. Second, variables of social determinants other than the SAGER items were not assessed, although they might be as important. Third, some journals were excluded from assessment, as they were not accessible through institutional subscription. Finally, inter-rater reliability was not assessed formally, as data were extracted only after a consensus was reached.

Adoption and enforcement of equity policies by publishers, neurosurgical societies, and journals will likely fall short of fully addressing inequality in health care, yet are

important steps towards a mindful publishing environment that supports equal health opportunities regardless of socio-economic circumstances. In that respect, neurosurgical journals are no exception and are urged to endorse the SAGER guidelines.

To the best of our knowledge, this is the first such piece of research on sex and gender equity in neurosurgical publishing, and we hope it serves as an incentive for all partakers (from publishers to researchers and beyond) to further investigate the phenomenon, embrace existing guidelines, and develop new ones, all with the aim of changing the way we conduct and publish research. Due to the evolution of trial policies, gender representation has reached an acceptable level (as is also evident from this report); yet this advancement is offset by a lack of disaggregate reporting and sex/gender consideration. Therefore, representation alone is not sufficient to bring about health equity.

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Supplementary Material

Included Studies

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Supplementary Table 1. Selected journals and their publishers

Journal	Publisher
<i>Journal of Neurosurgery</i>	American Association of Neurological Surgeons
<i>World Neurosurgery</i>	Elsevier
<i>Neurosurgical Review</i>	Springer
<i>Acta Neurochirurgica</i>	Springer
<i>Journal of Neurosurgery: Pediatrics</i>	American Association of Neurological Surgeons
<i>Operative Neurosurgery</i>	Lippincott Williams and Wilkins
<i>Surgical Neurology International</i>	Scientific Scholar
<i>Neurosurgical Focus</i>	American Association of Neurological Surgeons
<i>Journal of Neurosurgery: Spine</i>	American Association of Neurological Surgeons
<i>Journal of Korean Neurosurgical Society</i>	Korean Neurosurgical Society