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Letter to the Editor: Spinal and Neurosurgical Publications During the COVID-19 Era



LETTER:

The COVID-19 outbreak has strongly impacted neurosurgical practice all over the world, often confusing both patients and neurosurgeons. Hospitals vary in their responses to the virus surge in terms of availability of operating rooms, intensive care unit beds, and staffing.

Worldwide, neurosurgical programs report a significant decrease in the volume of operating room cases and neurosurgeons are expected to devise alternative plans of how and when to treat nonemergent neurosurgical patients. Clinic visits have transitioned to telemedicine where possible, decreasing the exposure to outpatient encounters as telemedicine may allow patients to link with their health care providers at a distance.¹

A recent review of literature conducted to study the Neurosurgical Societies recommendations update revealed 14 articles that described suggestions and considerations to optimize care of neurosurgical patients, editorials on operational models, perspectives from neurosurgical departments, letters to the editor describing experiences on how to help medical staff to be prepared in advance for pandemic situations, and descriptions of regional or departmental models and/or organizational schemes.²

Maintaining a standard medical and surgical education among medical students and neurosurgical residents during the epidemic is one of the important concerns in neurosurgical programs globally. Most programs have reduced resident COVID exposure risk by reducing the number of residents in the hospital at once and reducing the number of days per week that each resident works.³ Al-Haj et al⁴ reported an 80% change in studying hours during COVID-19 among neurosurgical residents. Nonetheless, the number of study hours might be affected positively or negatively. Medical students, residents, and staff may use the fewer working hours during the pandemic to spend more time on research and publications. The literature on COVID-19 has grown exponentially, from no manuscripts to more than 4000 publications to date.²

We are presenting this review as a reflection of the impact of COVID-19 on spinal and neurosurgical publications since January 2020.

LITERATURE REVIEW

We searched human, English language publications, in MED-LINE (PubMed and Ovid), Google Scholar, and the Cochrane Library from January 1, 2020 to June 3, 2020. We used, in various relevant combinations, key words, and MeSH terms pertinent to the area of interest: COVID-19, coronavirus, neurosurgery, spine, surgery, neuro-intervention. We reviewed search results to assess the relevance of publications on this topic. Identified articles were then selected according to a combination of study type, the number of authors, country, journal, publication months, and patient involvement (yes/no).

RESULTS AND DISCUSSION

In total, 199 publications were identified (Table 1). The majority of publications were published in May (120/199, 60%), followed by April (65/199, 33%), June (12/199, 6%), and then March (2/199, 1%). Publications had an average of 7 authors, ranging from 1 to 24. Figure 1 shows the distribution of authors across the globe. The majority of authors came from the United States of America (97), followed by Italy (36), China (17), and Canada (13) (see Figure 1). Forty-six countries were involved overall. Publications were taken from 52 different journals, with the majority being *World Neurosurgery* (58/199, 29%), *Neurosurgery* (41/199, 21%), and *Journal of Neurosurgery* (12/199, 6%).

Editorials comprised the greatest portion of the publications (118/199, 59%), followed by original articles (26/199, 13%) and reviews (20/199, 10%) (see Table 1). There was patient involvement in only a minority of identified publications (26/199, 16%), mostly case reports or case series (10/26, 38%). Workflow during COVID-19

Table 1. Characteristics of All Included Publications

Article Characteristics	Number	Percent (%)
Article type		
Brief report	1	1%
Case report	7	4%
Case series	3	2%
Doing more with less	1	1%
Early career forum	3	2%
Editorial	118	59%
Introduction	1	1%
News and opinions	3	2%
Observational	1	1%
Original article	26	13%
Perspective	4	2%
Retrospective	2	1%
Review	20	10%
Survey	9	5%
Total	199	100%
Article topic		
Clinical case	15	8%
Early experience and recommendations	63	32%
Experimental	2	1%
Fellow training and education	1	1%
Medical students	5	3%
Pathophysiology, neurologic manifestations	3	2%
Resident training and education	15	8%
Telemedicine	11	6%
Workflow during COVID-19	84	42%
Total	199	100%



Figure 1. Distribution of authors across the globe.

was the most common topic identified (84/199, 42%), followed by early experience and recommendations (63/199, 32%), clinical cases (15/199, 8%), resident training and education (15/199, 8%), and telemedicine (11/199, 6%). Most publications focused on neurosurgical topics (94/199, 47%) versus spinal topics (26/199, 13%). Two focused on both (2/199, 1%), and 77 were unspecified (77/199, 39%).

There are no previous similar articles to compare our findings. However, since the COVID-19 virus was identified in humans, the literature on coronavirus disease 2019 (COVID-19) has grown. Authors were able to share their expertise in order to provide more high standards of better and safe ways of clinical flow during COVID-19 crises and provide the best applicable methods for continuing surgical residents and medical students' education. Such publications have served as guides for neurosurgeons and training programs worldwide and resulted in more optimized care of neurosurgical patients all over the world.

CONCLUSION

COVID-19 has strongly impacted neurosurgical practice globally by changing the flow of operation rooms, clinic visits, resident education, and research. Moreover, the pandemic led to a significant increase in research and publications in order to provide the neurosurgical field with more evidence-based information, suggestions, and consideration. More research and publications are needed in order to maintain high standards of surgical education,

thus guiding the neurosurgical community through the COVID-19 pandemic.

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REFERENCES

- Bambakidis NC, Tomei KL. Editorial. Impact of COVID-19 on neurosurgery resident training and education. *J Neurosurg.* 2020;133:1-271.
- Germanò A, Raffa G, Angileri FF, Cardali SM, Tomasello F. Coronavirus disease 2019 (COVID-19) and neurosurgery: literature and neurosurgical societies recommendations update. *World Neurosurg.* 2020;139:e812-e817.
- Pennington Z, Lubelski D, Khalafallah A, et al. Letter: changes to neurosurgery resident education following onset of the COVID-19 pandemic. *World Neurosurg.* 2020;139:734-740.
- Alhaj AK, Al-Saadi T, Mohammad F, Alabri S. Neurosurgery residents' perspective on COVID-19: knowledge, readiness, and impact of this pandemic. *World Neurosurg.* 2020;139:e848-e858.