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## COVID-19 pandemic: An update on the reaction attitude of the spine societies and their members worldwide

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### Abstract

#### BACKGROUND

All surgical specialties have been influenced by the coronavirus disease 2019 (COVID-19) pandemic, and substantial changes have been determined in medical assistance, especially in elective surgery. Several spine societies have published recommendations to provide optimal care during this unique situation.

#### AIM

To discuss the recommendations by many spine societies for the management of spinal diseases during the COVID-19 pandemic.

#### METHODS

The present study was performed according to the PRISMA guidelines. A review of the MEDLINE database (PubMed – National Library of Medicine), Google, and Google Scholar was performed from March 2020 to date for articles published in the English Language.

#### RESULTS

Spine associations and societies worldwide were divided into three groups: Continental, specialty and country-based societies. A total of 27 spine associations were included in this review. There were eight major continental associations, but only one-third of these had published guidelines and recommendations on this topic. On the other hand, the specialty-based societies have not addressed the topic, except in two cases.

#### CONCLUSION

The national spine societies showed the deepest concern on this topic with several publications in scientific journals influenced by the local epidemiological severity. Contrarily, continental and specialty-based societies showed less interest in this topic.

**Key Words:** COVID-19; Pandemic; Spine surgery; Spine society; Guidelines; Recommendations

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**Core Tip:** We designed a review to verify the reaction of the worldwide spine societies to the coronavirus disease 2019 pandemic. Twenty-seven associations were identified. Continental and specialty-based companies showed less reaction attitude than the regional scientific societies, probably due to the local epidemiological severity of the disease.

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## INTRODUCTION

With the start of the global pandemic of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in December of 2019, governments and healthcare providers were put on alert, fearing this novel virus that would ultimately lead to the declaration of a global pandemic on March 11.

This naturally resulted in healthcare systems around the world bracing for impact. The biggest hurdle that these systems expected was the need to accommodate a huge surge of patients requiring intensive care (early data suggested that 15%-35% of patients affected with the virus would need admission to the intensive care units). This load would effectively break a healthcare system.

The scientific community has continued to study SARS-CoV-2 to understand its pathogenicity while also trying to avoid the collapse of the healthcare structure and decrease the number of collateral deaths.

Several studies on the recommendations have been published by the major spine scientific societies worldwide[1-5]. The concluding observations of this review highlighted how these surgical scientific communities had promptly reacted to the emergency by issuing documents and guidelines. Here we review the literature concerning the release of documents, guidelines, or recommendations by spine societies, providing a comprehensive overview on these topics, thus providing a useful resource for spine surgeons worldwide.

## MATERIALS AND METHODS

According to the PRISMA guidelines, a review of the MEDLINE database (PubMed - National Library of Medicine), Google, and Google scholar were performed on Monday, March 2, 2020, to date, for articles published in the English language. Search terms included: COVID-19 coronavirus AND pandemic AND spine AND surgery AND spine societies AND guidelines AND recommendations (Figure 1). We reviewed search results to assess the relevance of documents on these topics, including editorials, letters, and webpages. References were reviewed to locate other articles of interest.

## RESULTS

Twenty-eight associations and societies deal with the scientific aspects and interventional treatment of spine disorders. Spine associations and societies worldwide were divided into three groups: Continental (C) ( $n = 8$ ), specialty (Sb) ( $n = 7$ ), and country-based (Cb) ( $n = 12$ ) societies. There were eight C-companies (Table 1), but only three [North America Spine Society (NASS), World Spine Column Society (WSCS), Asia Pacific Spine Society] published guidelines in international scientific journals. The Sb societies (Table 2) seem not to have addressed the topic. Only the Spine Intervention Society (SIS) published an online paper on their website with its guidelines. Furthermore, the AO spine website shows different strategies for maintaining internal research and training.

All 12 Cb (Table 3) produced a publication: seven in scientific journals (French Spine Surgery Society), Saudi Spine Society (Saudi SS), Singapore Spine Society, Chinese Spine Society, The Japanese Society for Spine Surgery and Related Research, Egyptian Spine Association, Brazilian Spine Society) and the remaining five in websites or editorial documents (British Association of Spine Surgeons, Italian Spine Society, Association of Spine Surgeons of India, German Spine Society, Canadian Spine Society).

**Table 1 List of the 8 spinal continental societies**

Continental societies	Links
World Spinal Column Society	<a href="https://www.worldspinalcolumn.org/">https://www.worldspinalcolumn.org/</a>
The Africa Spinal Cord Injury Network	<a href="http://www.afscin.org/afscin-4-2020">http://www.afscin.org/afscin-4-2020</a>
Asian Spinal Cord Network	<a href="https://ascon.info/">https://ascon.info/</a>
International Spinal Cord Society	<a href="https://www.iscos.org.uk/">https://www.iscos.org.uk/</a>
North American Spine Society	<a href="https://www.spine.org/">https://www.spine.org/</a>
European Spine Society	<a href="https://www.eurospine.org/">https://www.eurospine.org/</a>
Asia Pacific Spine Society	<a href="https://www.apsonline.org/">https://www.apsonline.org/</a>
Latin America	<a href="https://www.silaco.org/acerca">https://www.silaco.org/acerca</a>

**Table 2 List of the 7 specialty-based societies**

Specialty-based societies	Links
International Society for the Advancement of Spine Surgery	<a href="https://www.isass.org/">https://www.isass.org/</a>
AOSpine	<a href="https://aospine.aofoundation.org">https://aospine.aofoundation.org</a>
Society for Minimally Invasive Spine Surgery	<a href="http://ismiss.com/1-0-Home.html">http://ismiss.com/1-0-Home.html</a>
Scoliosis Research Society	<a href="https://www.srs.org/">https://www.srs.org/</a>
Cervical Spine Research Society	<a href="https://www.csrsg.org/">https://www.csrsg.org/</a>
The International Society for the Study of the Lumbar Spine	<a href="https://www.issls.org/">https://www.issls.org/</a>
Spine Intervention Society	<a href="https://www.spineintervention.org/">https://www.spineintervention.org/</a>

**Table 3 List of the 12 country-based societies**

Country-based societies	Links
Italian Spine Society	<a href="https://www.gis-italia.org/">https://www.gis-italia.org/</a>
Saudi Spine Society	<a href="http://saudispine.org/">http://saudispine.org/</a>
Association of Spine Surgeons of India	<a href="http://assi.in">http://assi.in</a>
Singapore Spine Society	<a href="https://www.singaporespinesociety.org.sg/">https://www.singaporespinesociety.org.sg/</a>
German Spine Society	<a href="https://www.dwg.org/startseite/">https://www.dwg.org/startseite/</a>
French Spine Society	<a href="http://scfr.it">http://scfr.it</a>
Egyptian Spine Association	<a href="https://www.facebook.com/Egyspine/">https://www.facebook.com/Egyspine/</a>
Chinese Spine Society	<a href="https://www.apsonline.org/">https://www.apsonline.org/</a>
Iranian Spine Surgery	<a href="http://www.aicnss.com/">http://www.aicnss.com/</a>
British Ass. Spine Surgeons	<a href="https://spinesurgeons.ac.uk/">https://spinesurgeons.ac.uk/</a>
Canadian Spine Society	<a href="https://spinecanada.ca/">https://spinecanada.ca/</a>
Brazilian Spine Society	<a href="http://www.plataformainterativa2.com/coluna/">http://www.plataformainterativa2.com/coluna/</a>

The literature search yielded a sum of 28 articles that were relevant to spine surgery and coronavirus disease 2019 (COVID-19) (Table 4). We were able to identify four main topics developed in these papers.

## DISCUSSION

COVID-19, also known as acute respiratory disease, is an infectious respiratory disease caused by SARS-CoV-2. The first cases were identified in China, and after that, diffused around the world through respiratory droplets, with a high lethality rate. In this scenario, the COVID-19 pandemic has changed

**Table 4 Selection of 28 articles from members of the spine societies**

Article title	Journal	Society/Country	Ref.
Triaging Spine Surgery in the COVID-19 Era	<i>Journal of Spinal Disorders and Techniques</i>	AO Spine	[1]
Triaging Spine Surgery and Treatment during the COVID-19 Pandemic	<i>Journal of Orthopaedics and Traumatology</i>	USA	[2]
French Spine Surgery Society guidelines for management of spinal surgeries during COVID-19 pandemic	<i>World Journal of Clinical Cases</i>	French	[3]
Strategy for the Practice of Spine Oncological Surgery During the Covid-19 Pandemic	<i>Spine</i>	Italy	[6]
Spine Surgery and COVID-19: The Influence of Practice Type on Preparedness, Response, and Economic Impact	<i>Global Spine Journal</i>	AO Spine	[7]
Spine Surgery and COVID-19: Challenges and Strategies from the Front Lines	<i>Journal of Bone and Joint Surgery</i>	Singapore	[8]
Spine Surgery and COVID-19: Early Experiences From Singapore	<i>Spine</i>	Singapore	[9]
COVID-19 Nonessential Surgery Restrictions and Spine Surgery: A German Experience	<i>Spine</i>	Germany	[10]
The Impact of COVID-19 pandemic on Spine Surgeons: An Asia Pacific Spine Society (APSS) Survey	<i>Spine</i>	Asia Pacific	[11]
COVID-19 and Spine Surgery: A Review and Evolving Recommendations	<i>Global Spine Journal</i>	USA	[4]
Spine surgery in Atlantic Canada in the COVID-19 era: lessons learned so far	<i>Spine</i>	Canada	[12]
Spine Surgery in Italy in the COVID-19 Era: Proposal for Assessing and Responding to the Regional State of Emergency	<i>World Neurosurgery</i>	Italy	[13]
The Saudi Spine Society guidelines on spinal surgery during the COVID-19 pandemic	<i>Journal of Orthopaedics and Research</i>	Saudi	[5]
Recommendations for resuming elective spine surgery in the COVID-19 era	<i>British Journal of Anaesthesiology</i>	USA	[14]
Principles for Managing Patients with Spinal Ailments in the Coronavirus Disease 2019 Era: What Do We Know So Far? An Evidence-Based, Narrative Review	<i>Asian Spine Journal</i>	India	[15]
Medical care for spinal diseases during the COVID-19 pandemic	<i>Clinics</i>	Brazil	[28]
The management of emergency spinal surgery during the COVID-19 pandemic in Italy	<i>Bone and Joint Journal</i>	Italy	[16]
Scoring System to Triage Patients for Spine Surgery in the Setting of Limited Resources: Application to the Coronavirus Disease 2019 (COVID-19) Pandemic and Beyond	<i>World Neurosurgery</i>	USA	[17]
Management of Spine Trauma in COVID-19 Pandemic: A Preliminary Report	<i>Archives of Bone and Joint Surgery</i>	Iran	[18]
Advice on Standardized Diagnosis and Treatment for Spinal Diseases during the Coronavirus Disease 2019 Pandemic	<i>Asian Spine Journal</i>	China	[19]
The Role of Spine Surgeons in the Era of COVID-19 Outbreak	<i>Neurospine</i>	China	[20]
Addressing Coronavirus Disease 2019 in Spine Surgery: A Rapid National Consensus Using the Delphi Method <i>via</i> Teleconference	<i>Asian Spine Journal</i>	Singapore	[21]
Adapting Policy Guidelines for Spine Surgeries During COVID-19 Pandemic in View of Evolving Evidences: An Early Experience From a Tertiary Care Teaching Hospital	<i>Cureus</i>	India	[22]
Addressing a national crisis: the spine hospital and department's response to the COVID-19 pandemic in New York City	<i>Spine Journal</i>	USA	[23]
Essential Spine Surgery During the COVID-19 Pandemic: A Comprehensive Framework for Clinical Practice from a Specialty Orthopedic Hospital in New York City	<i>HSS Journal</i>	USA	[24]
Impact of the COVID-19 pandemic on spinal surgery in Singapore	<i>Singapore Medical Journal</i>	Singapore	[25]
The Novel Corona Virus COVID-19 and Spinal Surgery Practice: Review and Updates	<i>The Egyptian Spine Journal</i>	Egypt	[26]
Spine Surgery: Precautions and Strategies to Minimize Perioperative Risks Amid COVID-19 Outbreak	<i>Spine Surgery and Related Research</i>	Japan	[27]

COVID-19: Coronavirus disease 2019.



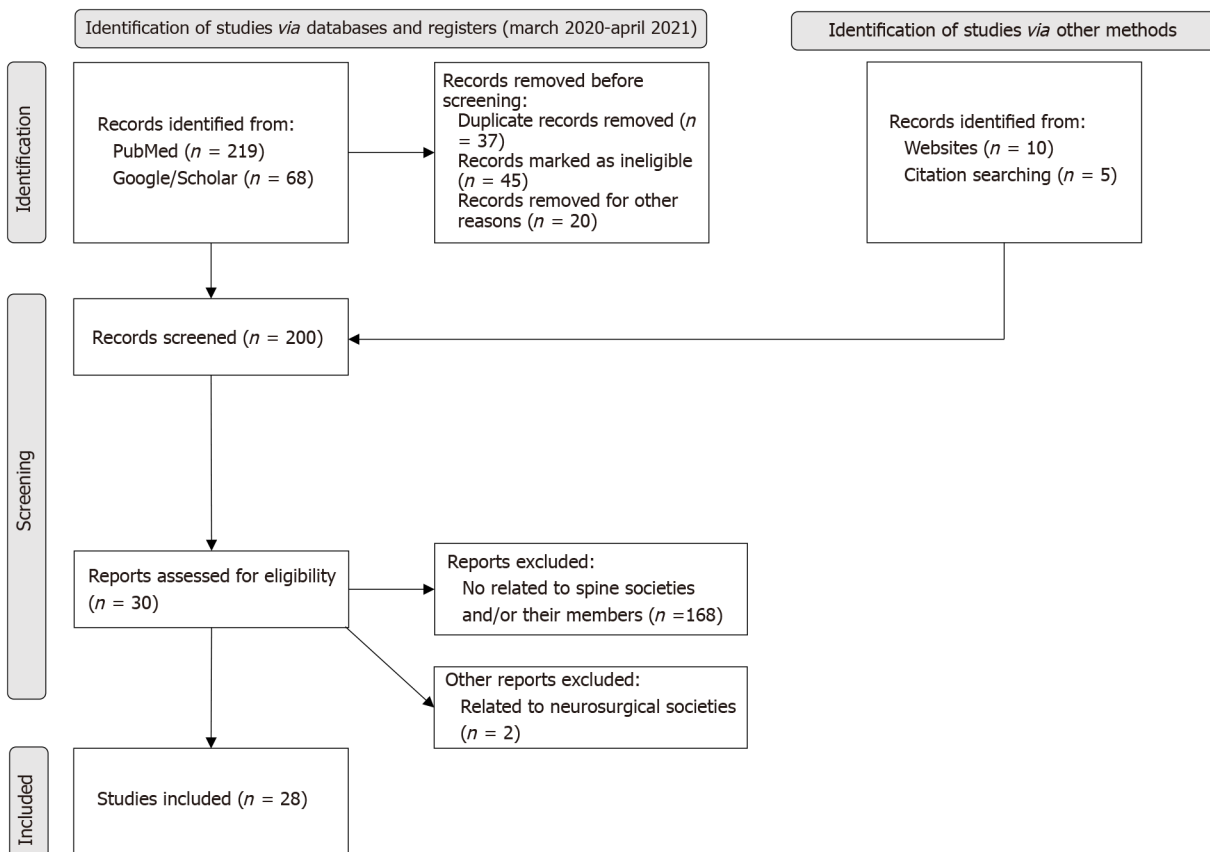


Figure 1 PRISMA flow chart.

medical and surgical practices worldwide. Major scientific societies have issued guidelines and recommendations to optimize resources and ensure treatment without putting patients’ lives at risk. Urgent or non-deferrable emergency interventions were favoured, postponing those in the election but seeking their reactivation as soon as possible[6,10,12,14,18]. These changes have had a significant socio-economic impact. Specialty-based societies have also taken action, and in particular, the neurosurgical scientific community has promptly developed recommendations for managing patients with cranial or spinal pathologies[29]. A group of Italian neurosurgeons summarized these guidelines in a recent publication[30]. They discussed the “grey zone” left by the generalized guidelines regarding neurosurgery and how they should be acting to resume control.

Similarly, we wanted to verify the reaction of the worldwide spine societies to this emergency. This topic, to our knowledge, has not previously been addressed in the literature. Twenty-six associations, present on the web as companies or networks that deal with the interventional treatment of spinal pathologies, were identified. Three out of eight (37.5%) major continental companies (Saudi SS, NASS, WSCS) had issued guidelines in the form of scientific work in a journal or document. In particular, the NASS guidance, released on April 22, probably remains the most cited and applied document in subsequent scientific paper[21,26-28]: “.....after reviewing the recommendations regarding procedures and treatments developed by the Centers for Medicare and Medicaid Services (CMS) and the American College of Surgeons (ACS), NASS convened a multidisciplinary task force of orthopaedic surgeons, neurosurgeons and PM&R/pain specialists to provide spine-care specific guidance for procedures” (see the entire document by the link in Table 2). The Asia Pacific society published a survey about the impact of a pandemic on surgical activity[11]: a total of 222 respondents from 19 countries completed the questionnaire. The mean reduction of clinic volume for all countries was 48.1%. Surgical theatres were closed, reduced, or limited to semi-emergency and emergency surgeries, and spine surgeons were moderately concerned about contracting COVID-19 during their clinical practice extremely concerned to transmit the disease to their family members.

Most Sb societies seem not to have addressed the topic. Only the SIS published a website document with its guidance. The AO spine website shows some corporate strategies for maintaining internal research and training. The greatest interest was from 12 Cb, with publications in journals, websites, or editorial documents. However, other regional societies are lacking. Four themes were seen recurring in our review of 28 articles relating to the new proposed guidelines and line of action. The highest recurring theme, which was seen in 100% of the articles, was the use of protective personal equipment and protocols to follow with COVID positive and COVID suspected patients to curb the spread and limit the transmission (Table 4).

The second was the use of a multidisciplinary panel to evaluate each patient admitted and the urgency[8,9,13]: doctors would have to decide based on the COVID burden imposed on the healthcare system and hospitals[15,17,19,24].

The third theme aimed to decrease the general activity of the healthcare system, increasing the number of hospital intensive care and departments able to treat infected people and the expected wave of patients. This topic was further discussed in detail the distinction of patients concerning their clinical picture and severity[20,22,23,25,27], given priority and urgency in treatment.

The fourth and last theme, which was seen only in seven articles, was the use of a team-based approach: each team could act independent, developing its own schedule and location, reducing work delay and decreasing the mixing of the different teams. A minimal effect on their department's function was recorded. When viewing the Cb spine societies, we found different approaches to achieve similar objectives, ensuring a treatment activity on the most urgent patients or patients who cannot be postponed without increasing the risks of exposure or contact with the virus.

Most of the approaches were directed towards a "second phase", which defines a period when the healthcare system is not overburdened by the pandemic. One point shared was the distinction and separation of patients based on clinical urgency and COVID status, resulting in the avoidance of unneeded risk. Checklists and forms, along with history taking and evaluation of the physician to both the patient's condition and the system's utilization, were extremely useful. The evaluation of the system was carried out by taking into consideration risks and resources. These were respectively weighted on the patient's history and system capabilities, for example, by checking the ability of a healthcare facility to deal with an emergency situation. Surgery was chosen only when possible and needed, while a deferral was preferred to elective and low urgency cases. To guarantee patients during the hospital stay, hygiene, self-isolation rules, and restrictions on companionship rules were adopted. Fast-track recovery and online follow-up restricted the number of unneeded people in the hospital.

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## CONCLUSION

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Only one-third of continental spine societies have issued recommendations. The international specialist companies have little addressed the topic, except for the SIS and partly the AO spine. Paradoxically, the national companies were more stimulated to issue their guidelines. The local epidemiological severity has likely influenced the reactive corporate attitude. Spine specialists at different levels realized the liability of not addressing spinal cases and the possible liabilities that could arise if taken up during a pandemic. Articles and online video conferences presented real-life scenarios that proved the gravity of the situation. The discussed guidelines and seminars showed their efficacy to control the spread of COVID-19 and the efficiency of the healthcare system. The points raised by the spine worldwide societies may not solve all issues related to spinal case management in the COVID era, but at least they have set forward a relevant ground to raise possible questions for the future's sake, as well as the possibilities of reflecting upon these ideas on other similar areas of medicine. As a doctor of the Singaporean Spine Society commented, "We are all in the same storm, just different boats, and we should all work together to save each other".

## ARTICLE HIGHLIGHTS

### **Research background**

During the second phase of the coronavirus disease 2019 (COVID-19) pandemic, some authors have felt the need to summarize and order data on the recommendations issued by the major surgical scientific societies in the world. The concluding observations of this review highlighted how these surgical scientific communities had promptly reacted to the emergency by issuing documents and guidelines. In particular, the neurosurgical scientific community has promptly developed recommendations for managing patients with cranial or spinal pathologies.

### **Research motivation**

We designed a review of the literature concerning the release of documents, guidelines, or recommendations by the spine societies in the world, intending to offer an overview on these topics to which spine surgeons worldwide can easily refer.

### **Research objectives**

This study aimed to discuss the recommendations by many spine societies for the management of spinal diseases during the COVID-19 pandemic.

**Research methods**

A review of the MEDLINE database according to the PRISMA guidelines.

**Research results**

We identified 28 associations present on the Internet as companies or networks that deal with the interventional treatment of spinal pathologies. We distinguished societies, associations, or networks worldwide into three groups. The literature search yielded a sum of 28 articles that were relevant to spine surgery and COVID-19.

**Research conclusions**

Only one-third of continental spine societies have issued recommendations. The international specialist companies have dealt little or nothing with the topic, except the SIS and partly AO spine. Paradoxically, the national companies were more stimulated to issue their guidelines. The local epidemiological severity has likely influenced the reactive corporate attitude.

**Research perspectives**

Articles and online video conferences presented real-life scenarios that proved the gravity of the situation. The discussed guidelines and seminars showed their efficacy to control the spread of COVID-19 and the efficiency of the healthcare system. The discussing points by the spine worldwide societies may not solve all issues related to spinal case management in the COVID era, but at least they have set forward a relevant ground to raise possible questions for the future's sake, as well as the possibilities of reflecting upon these ideas on other similar areas of medicine.

**FOOTNOTES**

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**REFERENCES**

- 1 **Donnally CJ 3rd**, Shenoy K, Vaccaro AR, Schroeder GD, Kepler CK. Triaging Spine Surgery in the COVID-19 Era. *Clin Spine Surg* 2020; **33**: 129-130 [PMID: 32235170 DOI: 10.1097/BSD.0000000000000988]
- 2 **Rizkalla JM**, Hotchkiss W, Clavenna A, Dossett A, Syed IY. Triaging Spine Surgery and Treatment during the COVID-19 Pandemic. *J Orthop* 2020; **20**: 380-385 [PMID: 32764857 DOI: 10.1016/j.jor.2020.06.015]
- 3 **Prost S**, Charles YP, Allain J, Barat JL, d'Astorg H, Delhaye M, Eap C, Zairi F, Guigui P, Ilharborde B, Meyblum J, Le Huec JC, Lonjon N, Lot G, Hamel O, Riouallon G, Litrico S, Tropiano P, Blondel B; French Spine Surgery Society. French Spine Surgery Society guidelines for management of spinal surgeries during COVID-19 pandemic. *World J Clin Cases* 2020; **8**: 1756-1762 [PMID: 32518767 DOI: 10.12998/wjcc.v8.i10.1756]
- 4 **Jain NS**, Alluri RK, Schopler SS, Hah R, Wang JC. COVID-19 and Spine Surgery: A Review and Evolving Recommendations. *Global Spine J* 2020; **10**: 528-533 [PMID: 32677557 DOI: 10.1177/2192568220923655]

- 5 **Alturkistany A**, Abduljabbar FH, Alhelal F, Dajim NB, Khalifah S, Konbaz F, Aleissa S, Al-Habib A, Kattan M, Alqahtani Y, Alatassi R. The Saudi Spine Society guidelines on spinal surgery during the COVID-19 pandemic. *J Orthop Surg Res* 2020; **15**: 211 [PMID: [32513216](#) DOI: [10.1186/s13018-020-01732-4](#)]
- 6 **Berjano P**, Vanni D, Fariselli L, Cecchinato R, Boriani S. Strategy for the Practice of Spine Oncological Surgery During the Covid-19 Pandemic. *Spine (Phila Pa 1976)* 2020; **45**: 1386-1394 [PMID: [32756271](#)]
- 7 **Weiner JA**, Swiatek PR, Johnson DJ, Louie PK, Harada GK, McCarthy MH, Germscheid N, Cheung JPY, Neva MH, El-Sharkawi M, Valacco M, Sciubba DM, Chutkan NB, An HS, Samartzis D. Spine Surgery and COVID-19: The Influence of Practice Type on Preparedness, Response, and Economic Impact. *Global Spine J* 2020; **21**: 2192568220949183 [PMID: [32762354](#) DOI: [10.1177/2192568220949183](#)]
- 8 **Soh TLT**, Ho SWL, Yap WMQ, Oh JY. Spine Surgery and COVID-19: Challenges and Strategies from the Front Lines. *J Bone Joint Surg Am* 2020; **102**: e56 [PMID: [32559051](#) DOI: [10.2106/JBJS.20.00503](#)]
- 9 **Soh TLT**, Ding BTK, Yap WMQ, Oh JY. Spine Surgery and COVID-19: Early Experiences From Singapore. *Spine (Phila Pa 1976)* 2020; **45**: 786-788 [PMID: [32479716](#) DOI: [10.1097/BRS.0000000000003532](#)]
- 10 **Mehta AI**, Chiu RG. COVID-19 Nonessential Surgery Restrictions and Spine Surgery: A German Experience. *Spine (Phila Pa 1976)* 2020; **45**: 942-943 [PMID: [32604352](#) DOI: [10.1097/BRS.0000000000003571](#)]
- 11 **Chan CYW**, Chiu CK, Cheung JPY, Cheung PWH, Gani SMA, Kwan MK. The Impact of COVID-19 pandemic on Spine Surgeons: An Asia Pacific Spine Society (APSS) Survey. *Spine (Phila Pa 1976)* 2020; **45**: 1285-1292 [PMID: [32756270](#) DOI: [10.1097/BRS.0000000000003622](#)]
- 12 **El Helou A**. Spine surgery in Atlantic Canada in the COVID-19 era: lessons learned so far. *Spine J* 2020; **20**: 1379-1380 [PMID: [32389734](#) DOI: [10.1016/j.spinee.2020.04.027](#)]
- 13 **Rispoli R**, Diamond ME, Balsano M, Cappelletto B. Spine Surgery in Italy in the COVID-19 Era: Proposal for Assessing and Responding to the Regional State of Emergency. *World Neurosurg* 2021; **145**: e1-e6 [PMID: [32777401](#) DOI: [10.1016/j.wneu.2020.08.001](#)]
- 14 **Wilson LA**, Zhong H, Poeran J, Liu J, Memtsoudis SG. Recommendations for resuming elective spine surgery in the COVID-19 era. *Br J Anaesth* 2020; **125**: e339-e341 [PMID: [32631616](#) DOI: [10.1016/j.bja.2020.06.022](#)]
- 15 **Viswanathan VK**, Subramanian S, Rao AK. Principles for Managing Patients with Spinal Ailments in the Coronavirus Disease 2019 Era: What Do We Know So Far? *Asian Spine J* 2020; **14**: 572-580 [PMID: [32493004](#)]
- 16 **Giorgi PD**, Villa F, Gallazzi E, Debernardi A, Schirò GR, Crisà FM, Talamonti G, D'Aliberti G. The management of emergency spinal surgery during the COVID-19 pandemic in Italy. *Bone Joint J* 2020; **102-B**: 671-676 [PMID: [32323563](#) DOI: [10.1302/0301-620X.102B6.BJJ-2020-0537](#)]
- 17 **Sciubba DM**, Ehresman J, Pennington Z, Lubelski D, Feghali J, Bydon A, Chou D, Elder BD, Elsamadicy AA, Goodwin CR, Goodwin ML, Harrop J, Klineberg EO, Laufer I, Lo SL, Neuman BJ, Passias PG, Protopsaltis T, Shin JH, Theodore N, Witham TF, Benzel EC. Scoring System to Triage Patients for Spine Surgery in the Setting of Limited Resources: Application to the Coronavirus Disease 2019 (COVID-19) Pandemic and Beyond. *World Neurosurg* 2020; **140**: e373-e380 [PMID: [32479913](#) DOI: [10.1016/j.wneu.2020.05.233](#)]
- 18 **Chehrassan M**, Ebrahimpour A, Ghandhari H, Sanei Taheri M, Athari B, Sadighi M, Jafari KafiAbadi M, Karami A, Zali A. Management of Spine Trauma in COVID-19 Pandemic: A Preliminary Report. *Arch Bone Jt Surg* 2020; **8**: 270-276 [PMID: [32733982](#) DOI: [10.22038/abjs.2020.47882.2368](#)]
- 19 **Zou J**, Yu H, Song D, Niu J, Yang H. Advice on Standardized Diagnosis and Treatment for Spinal Diseases during the Coronavirus Disease 2019 Pandemic. *Asian Spine J* 2020; **14**: 258-263 [PMID: [32222720](#) DOI: [10.31616/asj.2020.0122](#)]
- 20 **Wang B**. The Role of Spine Surgeons in the Era of COVID-19 Outbreak. *Neurospine* 2020; **17**: 342-343 [PMID: [32408725](#) DOI: [10.14245/ns.2040206.103](#)]
- 21 **Tan KA**, Thadani VN, Chan D, Oh JY, Liu GK. Addressing Coronavirus Disease 2019 in Spine Surgery: A Rapid National Consensus Using the Delphi Method via Teleconference. *Asian Spine J* 2020; **14**: 373-381 [PMID: [32403894](#) DOI: [10.31616/asj.2020.0224](#)]
- 22 **Verma V**, Nagar M, Jain V, Santoshi JA, Dwivedi M, Behera P, Selvanayagam R, Pal D, Singh K. Adapting Policy Guidelines for Spine Surgeries During COVID-19 Pandemic in View of Evolving Evidences: An Early Experience From a Tertiary Care Teaching Hospital. *Cureus* 2020; **12**: e9147 [PMID: [32789084](#) DOI: [10.7759/cureus.9147](#)]
- 23 **Lombardi JM**, Bottiglieri T, Desai N, Riew KD, Boddapati V, Weller M, Bourgois C, McChrystal S, Lehman RA. Addressing a national crisis: the spine hospital and department's response to the COVID-19 pandemic in New York City. *Spine J* 2020; **20**: 1367-1378 [PMID: [32492529](#) DOI: [10.1016/j.spinee.2020.05.539](#)]
- 24 **Soffin EM**, Reisener MJ, Sama AA, Beckman JD, Liguori GA, Lebl DR, Girardi FP, Cammisa FP, Hughes AP. Essential Spine Surgery During the COVID-19 Pandemic: A Comprehensive Framework for Clinical Practice from a Specialty Orthopedic Hospital in New York City. *HSS J* 2020; **1**: 1-7 [PMID: [32929320](#) DOI: [10.1007/s11420-020-09786-0](#)]
- 25 **Tan BJ**, Teo HLT, Loo WL, Dinesh SK. Impact of the COVID-19 pandemic on spinal surgery in Singapore. *Singapore Med J* 2020; **61**: 624-625 [PMID: [32460452](#) DOI: [10.11622/smedj.2020081](#)]
- 26 **Elkazaz MK**, Abou-Madawi AM, Khattab MF, Elkhatib E, Alshatoury HA. The Novel Corona Virus COVID-19 and Spinal Surgery Practice: Review and Updates. *Egypt Spine J* 2020; **34**: 2-12 [DOI: [10.21608/esj.2020.31620.1137](#)]
- 27 **Wang TV**, Ito M. Spine Surgery: Precautions and Strategies to Minimize Perioperative Risks Amid COVID-19 Outbreak. *Spine Surg Relat Res* 2020; **4**: 192-198 [PMID: [32864484](#) DOI: [10.22603/ssrr.2020-0076](#)]
- 28 **Silva RTE**, Cristante AF, Marcon RM, Barros-Filho TEP. Medical care for spinal diseases during the COVID-19 pandemic. *Clinics (Sao Paulo)* 2020; **75**: e1954 [PMID: [32401963](#) DOI: [10.6061/clinics/2020/e1954](#)]
- 29 **Ricciardi L**, Trungu S, Scerrati A, DE Bonis P, Miscusi M, Raco A. Neurosurgery at the time of COVID-19: how this pandemic infectious disease is influencing neurosurgical activities and patient management. *J Neurosurg Sci* 2021; **65**: 216-217 [PMID: [32347683](#) DOI: [10.23736/S0390-5616.20.04976-0](#)]
- 30 **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 [PMID: [32360733](#) DOI: [10.1016/j.wneu.2020.04.181](#)]



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