

IMPACT OF THE COVID-19 PANDEMIC ON THE SURGICAL TREATMENT OF SPINE PATHOLOGIES IN SUS

IMPACTO DA PANDEMIA DA COVID-19 NO TRATAMENTO CIRÚRGICO DE PATOLOGIAS DE COLUNA NO SUS

IMPACTO DE LA PANDEMIA DE COVID-19 EN EL TRATAMIENTO QUIRÚRGICO DE PATOLOGÍAS DE LA COLUMNA VERTEBRAL EN EL SUS

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ABSTRACT

Objective: To evaluate the impact of the COVID-19 pandemic on spine surgeries performed by SUS. To identify changes in surgical volume, as well as which procedures and regions of Brazil were most affected. To correlate such changes with literature data. **Methods:** A retrospective, descriptive study was conducted with an analysis of the databases available to the public on the performance of spinal surgical procedures by SUS during the period from 2017 to 2021. The databases were created from variables of interest available in the SIH (Hospital Information System) of the SUS Information Technology Department website (DATASUS; <http://datasus.saude.gov.br>). The procedures were grouped according to type of surgery, topography, and access route for the construction of tables and statistical analysis. **Results:** In the years of the pandemic, a greater drop in surgical volume was observed, with a total of 13,276 procedures in 2020 and 12,158 in 2021, equivalent to -28.51% and -34.53%, respectively, of the average of the previous period. **Conclusions:** Given the paramount importance of attention to the fight against the pandemic, maintaining the level of assistance for spinal pathologies proved to be a great challenge, especially in relation to elective surgical pathologies that, when delayed too much, can seriously impact the quality of life and outcomes of future treatments. **Level of Evidence: IV; Retrospective, descriptive.**

Keywords: Ambulatory surgical procedures; Spine; COVID-19; Brazilian Unified Health System.

RESUMO

Objetivo: Avaliar o impacto da pandemia de COVID-19 na realização de cirurgias de coluna no SUS. Identificar mudanças do volume de cirurgias, bem como quais procedimentos e regiões do Brasil foram mais afetados. Correlacionar tais mudanças com dados da literatura. **Métodos:** Realizou-se um estudo retrospectivo, descritivo, com análise de banco de dados disponíveis para o público sobre a realização de procedimentos cirúrgicos de coluna pelo SUS no período de 2017 a 2021. Os bancos de dados foram criados a partir das variáveis de interesse disponíveis no SIH (Sistema de Informações Hospitalares) do site do Departamento de Informática do SUS (DATASUS; <http://datasus.saude.gov.br>). Os procedimentos foram agrupados de acordo com tipo de cirurgia, topografia e via de acesso para construção das tabelas e análise estatística. **Resultados:** Nos anos da pandemia observou-se uma queda maior no volume cirúrgico com um total de 13.276 procedimentos em 2020 e 12.158 em 2021, equivalentes a -28,51% e -34,53% com relação à média do período anterior, respectivamente. **Conclusões:** Diante da importância primordial da atenção ao combate da pandemia, a manutenção da assistência às patologias de coluna revela-se um grande desafio, principalmente com relação a patologias cirúrgicas eletivas que, quando postergadas em demasia, podem impactar de maneira grave a qualidade de vida e resultados de tratamentos futuros. **Nível de Evidência: IV; Estudo Retrospectivo Descritivo.**

Descritores: Procedimentos cirúrgicos ambulatoriais; Coluna vertebral; COVID-19; SUS.

RESUMEN

Objetivo: Evaluar el impacto de la pandemia de COVID-19 en la realización de cirugías de columna en el SUS. Identificar cambios en el volumen de cirugías, así como qué procedimientos y regiones de Brasil se vieron más afectados. Correlacionar dichos cambios con datos de la literatura. **Métodos:** Se realizó un estudio retrospectivo, descriptivo, con análisis de bases de datos disponibles públicamente sobre la realización de procedimientos quirúrgicos de columna vertebral por el SUS en el período comprendido entre 2017 y 2021. Las bases de datos fueron creadas a partir de las variables de interés disponibles en el SIH (Sistema de Información Hospitalaria) del sitio web del Departamento de Informática del SUS (DATASUS; <http://datasus.saude.gov.br>). Los procedimientos fueron agrupados según tipo de cirugía, topografía y vía de acceso para la elaboración de tablas y análisis estadístico. **Resultados:** En los años de pandemia se observó un mayor descenso en el volumen quirúrgico, con un total de 13.276 procedimientos en 2020 y 12.158 en 2021, equivalentes a -28,51% y -34,53% respecto a la media del período anterior, respectivamente. **Conclusiones:** Dada la trascendental importancia de la atención en el combate a la pandemia, mantener la asistencia a las patologías de la columna resulta un gran desafío, especialmente en lo que respecta a las patologías quirúrgicas electivas que, cuando se demoran demasiado, pueden repercutir gravemente en la calidad de vida y en los resultados de futuros tratamientos. **Nivel de evidencia: IV; Estudio Retrospectivo Descriptivo.**

Descriptorios: Procedimientos quirúrgicos ambulatorios; Columna vertebral; COVID-19; SUS.

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INTRODUCTION

In December 2019, the first cases of acute respiratory syndrome caused by the new coronavirus (COVID-19) emerged in the city of Wuhan, Hubei Province, China. The virus spread rapidly throughout the world until March 2020, when the World Health Organization (WHO) declared a state of pandemic.¹⁻⁴

The virus can be asymptomatic, evolve with mild symptoms like fever, cough, fatigue, and myalgia, or, in some cases, progress to severe forms. The most severe manifestations, which tend to affect elderly patients and/or those with comorbidities, include pneumonia, acute respiratory discomfort syndrome (ARDS), multiple organ failure, and death.⁵⁻⁹ Like other types of coronaviruses, COVID-19 is highly infectious and can be easily transmitted via droplets, secretions from the airways, and direct contact. In this way a rapid global spread followed causing the collapse of the healthcare systems in several countries and requiring social distancing measures to mitigate the transmission of the virus.^{10,11}

The first case of COVID-16 recorded in Brazil was on February 26, 2020 in the city of São Paulo and by the second half of March, all states had issued decrees aimed at promoting social distancing policies.¹² The direct effects of the pandemic, together with the social isolation measures, dramatically changed the profile of seeking care from health services in various places around the world.^{13,14} Linked to this, the collapse of SUS (Brazil's Unified Health System) further reduced the offering of services unrelated to COVID-19 by Brazilian public services.¹⁵

In the orthopedics and traumatology environment, several services registered a decrease in the flow and profile of urgent and emergency care and elective surgical procedures.^{16,17} Regarding the volume of spine surgeries, no reports were found in the literature specifically about the consequences of the pandemic on SUS.

The objectives of this study were to evaluate the impact of the COVID-19 pandemic on spine surgeries performed by SUS, to identify changes in the surgical volume, as well as which procedures and which regions of Brazil were most affected, and to correlate such changes with literature data.

METHODS

We conducted a retrospective, descriptive study, with an analysis of publicly available databases on surgical procedures of the spine conducted at SUS from 2017 to 2021. The surgical spine procedures were identified according to the SIGTAP table classification by all procedures beginning with the code "04083" (four – surgical procedures, eight – surgery of the musculoskeletal system, three – spine and rib cage). The total number of procedures performed was evaluated using the Hospitalization Authorizations (AIHs) accounted for in the SUS Hospital Information System (SIH-SUS). The databases were built from the variables of interest available in the SIH of the SUS Information Technology Department (DATASUS; <http://datasus.saude.gov.br>). The study compared the variables from the two years of the pandemic (2020 and 2021) with the averages of the previous three years (2017-2019), established as the baseline values. The procedures were grouped by type of surgery, topography, and access route for the building of tables and statistical analysis.

The present study used the online public data from the Ministry of Health. It was not necessary to submit it for evaluation by the Institutional Review Board (IRB), since there were no variables included that could make identification of the study subjects possible, and only an analysis of information from a government source would be performed.

RESULTS

The mean number of spine surgeries performed annually within SUS during the period before the pandemic (2017-2019) was 18,571.67. The highest volume was recorded in 2017, totaling 19,175 procedures, and the lowest in 2019 with 18,250 procedures, showing a slight decrease of -4.82% over this three-year period. During the years of the pandemic, a greater drop in surgical volume was observed, with a total of 13,276 procedures in 2020 and 12,158 in

2021, equivalent to -28.51% and -34.53%, respectively, as compared to the mean of the previous period.

In 2020, the decrease in relation to the average of the previous three years was similar in the North, Central-West, and Southeast Regions with reductions of -26.54%, -26.88%, and -26.59%, while the decrease was smaller in the Northeast at -21.44% and larger in the South at -34.83%. In 2021, the largest and smallest reductions persisted in the South Region (-45.87%) and the Northeast Regions (-22.58%), with variations in the North, Central-West, and Southeast Regions of -40.16%, -33.08%, and -29.77% (Figure 1).

The states most affected in each region during the first year of the pandemic were Rondônia (-61.95%), Alagoas (-70.17%), Mato Grosso (-46.70%), Espírito Santo (-54.82%), and Paraná (-46.76%), while the least affected were Roraima (+62.16%), Sergipe (+38.29%), Mato Grosso do Sul (+6.50%), São Paulo (-23%), and Rio Grande do Sul (-12%). In the second year of the pandemic, the most affected states in each region were Tocantins (-73.99%), Pernambuco (-71.81%), Mato Grosso (-56.16%), Espírito Santo (-98.61%), and Paraná (-56.02%), while the least affected were Roraima (+45.94%), Sergipe (+12%), Mato Grosso do Sul (+16.52%), Rio de Janeiro (-23.88%) and Rio Grande do Sul (-32.52%) (Figure 2).

The surgical procedure groups most affected during the two years of the pandemic were interbody arthrodesis (-39.16% and -45.96%), arthrodesis revisions (-33.86% and -39.21%), surgical treatment of spinal deformities (-36.70% and -36.80%), and surgical treatment of congenital torticollis (-57.5% in both years). There was an increase in the number of cervical vertebral body resection procedures in both years (+46.96% and +22.47%). In 2021, specifically, there were above-average drops in the number of foreign body removals from the spine (-42.32%), anterior access thoracolumbar discectomies (-39.34%), vertebroplasties (-43.15%), and a slight rise in resections of posterior vertebral elements up to 2 segments distal to C2 (+0.51%) (Table 1).

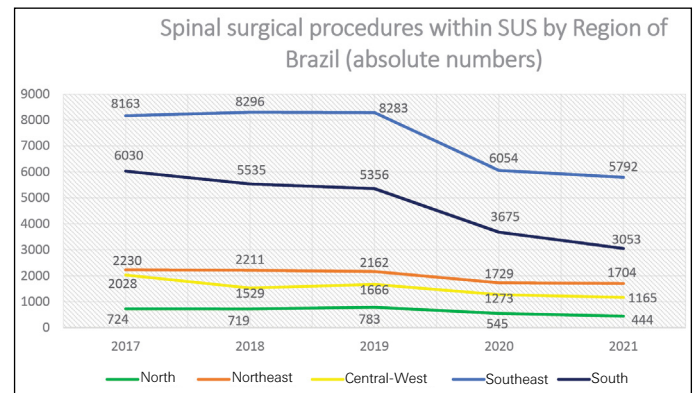


Figure 1. Spinal surgical procedures within SUS by Region of Brazil (absolute numbers).

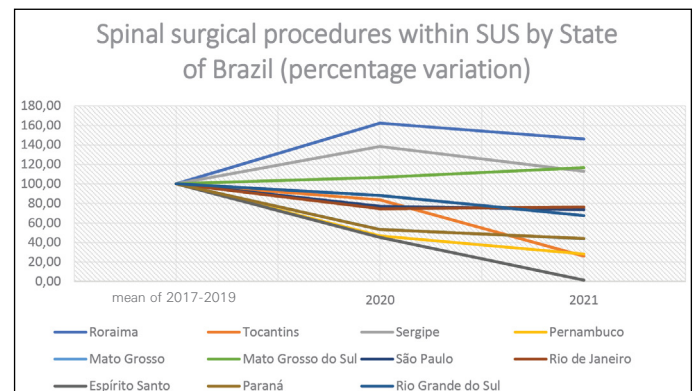


Figure 2. Spinal surgical procedures within SUS by State of Brazil (percent variation).

Table 1. Spinal surgical procedures (by group).

	Mean	2020	2021	2020(%)	2021(%)
Procedures of the high cervical spine	254.64	255	213	+0.14	-16.35
Anterior cervical discectomy	272.33	218	206	-19.95	-24.35
Resections of cervical vertebral bodies	32.66	48	40	+46.96	+22.47
Anterior access cervical arthrodeses	2237	1680	1496	-24.89	-33.12
Posterior access cervical arthrodeses	1241.66	1197	941	-3.59	-24.21
Posterior access thoracolumbar discectomies	4135	2708	2686	-34.51	-35.04
Anterior access thoracolumbar discectomies	244	194	148	-20.49	-39.34
Anterior access thoracolumbar arthrodeses	329.33	264	223	-19.83	-32.28
Posterior access thoracolumbar arthrodeses	5266	3497	3173	-33.59	-39.74
Thoracolumbar vertebral body resections	117	108	106	-7.69	-9.40
Posterior/posterolateral access interbody arthrodeses	1397.33	850	755	-39.16	-45.96
Resection of the posterior vertebral element up to 2 segments	289.66	223	230	-23.01	-20.59
Resection of the posterior vertebral element more than 2 segments	389	367	391	-5.65	+0.51
Device-guided vertebroplasty	95	69	54	-27.36	-43.15
Surgical treatment of deformity	969.99	614	613	-36.70	-36.80
Arthrodesis revisions	710.66	470	432	-33.86	-39.21
Removal of foreign body from the spine	189	140	109	-25.92	-42.32
Surgical drainage of the iliopsoas	296	298	277	0.67	-6.41
Surgical treatment of congenital torticollis	40	17	17	-57.5	-57.5
Resection of the coccyx	20	14	11	-30	-45
Costotransversectomy	16.33	15	12	-8.16	-26.53
Costoplasty	3.66	2	3	-45.45	-18.18
Surgical treatment of the thoracic outlet	25.33	28	22	10.52	-13.15
TOTAL	18571.67	13276	12158	-28.51	-34.53

The main posterior approach spinal procedures, grouped by type (cervical arthrodesis, thoracolumbar arthrodesis, resection of the posterior vertebral elements up to 2 levels and more than 2 levels) experienced a reduction in the 2020 volume and the downward trend continued in 2021 but only for the arthrodeses. The posterior vertebral element resection procedures trended towards recovery, with an emphasis on resections of up to two levels, reaching a positive change of 0.51% compared to the pre-pandemic values (Figure 3).

In the main groups of anterior access surgeries (cervical arthrodesis, thoracolumbar arthrodesis, cervical vertebral body resection, and thoracolumbar vertebral body resection), there was a downward movement in the two years 2020 and 2021, except for cervical vertebral body resections, which experienced a significant increase in 2020 (+46.96%) and a subsequent reduction in 2021 (+22.47%), but still maintaining growth in relation to the pre-pandemic surgical volume (Figure 4).

In general, the numbers of other groups of spinal procedures, such as the removal of foreign bodies, surgical treatment of deformities, vertebroplasty, surgical treatment of congenital torticollis, and interbody arthrodesis, decreased in the two years following the onset of the pandemic (Figure 5).

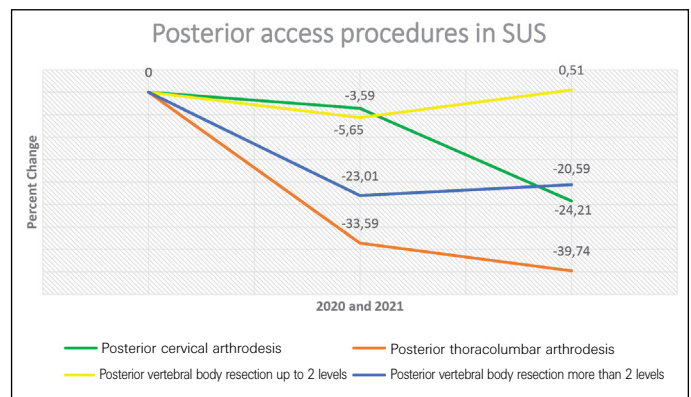


Figure 3. Posterior access spinal procedures in SUS.

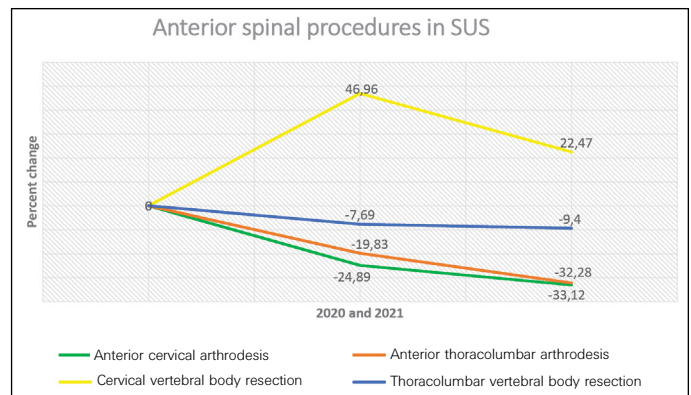


Figure 4. Anterior access spinal procedures in SUS.

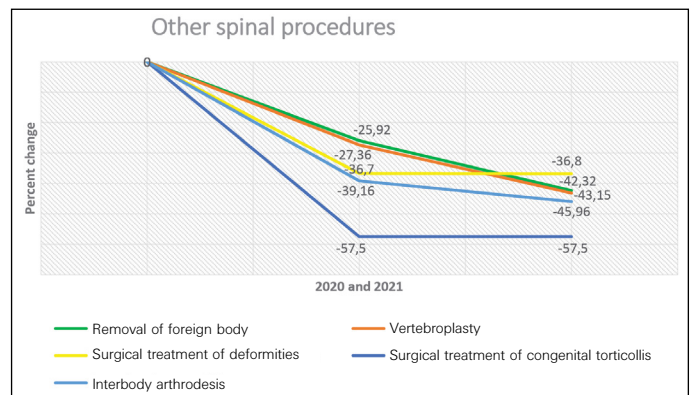


Figure 5. Other spinal procedures.

DISCUSSION

The impacts of the pandemic on the volume of spine surgeries in SUS is notable, causing widespread drops in the procedure groups, especially in the second year of the pandemic, consistent with the collapse of SUS and the redirecting of health services to care for COVID-19.¹⁵ The regional and state variations in surgical production may be related to the fact that social isolation models and health policies originated mainly from heterogeneous decrees and guidelines, with the formulation of strategies to combat the pandemic and organize the health care systems at the state level.¹²

Greater downturns were observed in some categories and smaller drops or even upticks in surgical volume in others. This asymmetrical repercussion may be related to different factors, such as a change in the health system search profile and a tendency to perform only the most urgent procedures.^{18,19} On the other hand, procedures associated with elective pathologies such as the surgical treatment of spinal deformities, congenital torticollis, postero-lateral interbody arthrodesis,

and vertebroplasty, generally suffered above-average drops, corroborating the policy of postponing elective procedures or avoiding invasive procedures in the elderly (Figure 5). Delay in performing these procedures can lead to a significant worsening of injuries with increased morbidity and the need for larger scale surgeries and higher risk, especially in the treatment of deformities, for example.²⁰

There were large reductions in cervical and thoracolumbar spinal arthrodesis codes, which were not accompanied by sequential procedures such as cervical and thoracolumbar corpectomies and by resections of the posterior vertebral elements in up to two levels. This can be attributed to the fact that corpectomies are associated with more serious injuries, there often not being an option to choose another technique or postpone the surgery, while the fact that resections of posterior vertebral elements up to two levels continued at the same rate or even increased may be a consequence of an attempt to perform smaller procedures for the treatment of pathologies that do not present an obvious instability or absolute indication of arthrodesis (Figures 3 and 4). Finally, the more marked drop in removals of foreign bodies from the spine must be related to the lower occurrence of firearm and stab wounds related to the reduced flow of people in the streets and indicators of violence during social distancing.²¹⁻²³

The drop in the number of elective surgeries is a point of concern for the healthcare system, since there is already a repressed demand within SUS for these pathologies. Regional variations evidencing smaller drops or even increased surgical volume are

important points to be studied in the search for effective strategies for maintaining adequate care for this patient profile.

The risk of new pandemics has grown with the development of an increasingly globalized world, making it essential to formulate contingency plans for the structuring of healthcare services in times of crisis. The study model has statistical limitations, and we were not able to establish a cause-and-effect relationship between the variables analyzed. However, it serves as a basis for guiding future research and establishing more conclusive evidence for an understanding of the impact of the COVID-19 pandemic.

CONCLUSION

The impact of the pandemic on spine surgery healthcare services is clear. The study presents statistical limitations, and we were unable to establish a cause-and-effect relationship between the variables analyzed. However, it serves as a basis for conducting further research and establishing guidelines of interest.

Given the paramount importance of the attention to combatting the pandemic, maintaining assistance for spine pathologies proved to be a great challenge, mainly in relation to elective surgical treatments, which, when postponed for too long, can seriously impact quality of life and the results of future treatments.

All authors declare no potential conflict of interest related to this article.

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REFERENCES

- Ludwig S, Zarbock A. Coronaviruses and SARS-CoV-2: A Brief Overview. *AnestAnalg*. 2020;131(1):93-6.
- Li H, Liu SM, Yu XH, Tang SL, Tang CK. Coronavirus disease 2019 (COVID-19): current status and future perspectives. *Int J Antimicrob Agents*. 2020;55(5):105951. doi: 10.1016/j.ijantimicag.2020.105951.
- Weston S, Frieman MB. COVID-19: Knowns, Unknowns, and Questions. *mSphere*. 2020;5(2):e00203-20. doi: 10.1128/mSphere.00203-20.
- Tu H, Tu S, Gao S, Shao A, Sheng J. Current epidemiological and clinical features of COVID-19; a global perspective from China. *J Infect*. 2020;81(1):1-9.
- Singhal T. A Review of Coronavirus Disease-2019 (COVID-19). *Indian J Pediatr*. 2020;87(4):281-6.
- Cevik M, Bamford CGG, Ho A. COVID-19 pandemic – a focused review for clinicians. *CML*. 2020;26(7):842-7.
- Ahn DG, Shin HJ, Kim MH, Lee S, Kim HS, Myoung J, et al. Current status of epidemiology, diagnosis, therapeutics, and vaccines for novel coronavirus disease 2019 (COVID-19). *J Microbiol Biotechnol*. 2020;30(3):313-24.
- Sun P, Lu X, Xu C, Sun W, Pan B. Understanding of COVID-19 based on current evidence. *J Med Virol*. 2020;92(6):548-51.
- Wu D, Wu T, Liu Q, Yang Z. The SARS-CoV-2 outbreak: What we know. *Int J Infect Dis*. 2020;94(1):44-8.
- Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - A n update on the status. *Mil Med Res*. 2020;7(1):11. doi: 10.1186/s40779-020-00240-0.
- Boulos MNK, Geraghty EM. Geographical tracking and mapping of coronavirus disease COVID-19/severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic and associated events around the world: How 21st century GIS technologies are supporting the global fight against outbreaks and epidemics. *Int J Health Geogr*. 2020;19(1):8. doi: 10.1186/s12942-020-00202-8.
- Pereira AK, Oliveira MS, Sampaio TS. Heterogeneidades das políticas estaduais de distanciamento social diante da COVID-19: aspectos políticos e técnico-administrativos. *Ver Adm Pub*. 2020;54(4):678-96.
- Jaffe E, Sonkin R, Strugo R, Zerath E. Evolution of emergency medical calls during a pandemic – An emergency medical service during the COVID-19 outbreak. *Am J Emerg Med*. 2021;43(1):260-6.
- Park C, Sugand K, Nathwani D, Bhattacharya R, Sarraf KM. Impact of the COVID-19 pandemic on orthopedic trauma workload in a London level 1 trauma center: the “golden month”: The COVID Emergency Related Trauma and orthopaedics (COVERT). *Collaborative Acta Orthop*. 2020;91(5):556-61.
- De Melo CML, Silva GAS, Melo ARS, De Freitas AC. COVID-19 pandemic outbreak: The Brazilian reality from the first case to the collapse of health services. *An Acad Bras Cienc*. 2020;92(4):1-14.
- De Queiroz HVR, Toldo NEN, De Oliveira BGP, Santana MVF, Dobashi ET. The Impact Of Covid-19 On The Orthopedic Care System In A Private Hospital. *Acta Ortop*. 2021;29(6):289-92.
- Motta Filho GDR, Leal AC, Amaral MVG, Maia PAV, Duarte MEL, Bähr GL. Impact of the Strategies Adopted to Face the COVID-19 Pandemic in a Brazilian Reference Institute for High Complexity Surgery in Orthopedics and Traumatology. *RBO*. 2021;56(2):161-7.
- Flemming S, Hankir M, Ernestus RI, Seyfried F, Germer CT, Meybohm P, et al. Surgery in times of COVID-19 – recommendations for hospital and patient management. *Langenbeck's Arch Surg*. 2020;405(3):359-64.
- Truche P, Nunes Campos L, Marrazzo EB, Rangel AG, Bernardino R, Bowder AN, et al. Association between government policy and delays in emergent and elective surgical care during the COVID-19 pandemic in Brazil: a modeling study. *Lancet*. 2021;3(1):100056. doi: <https://doi.org/10.1016/j.lana.2021.10>.
- Neto NJC, Umeta R, Meves R, Caffaro MFS, Landim E, Avanzi O. Estudo demográfico de portadores de deformidade. *Coluna/Columna*. 2012;11(3):219-22.
- Ceccato V, Kahn T, Herrmann C, Östlund A. Pandemic Restrictions and Spatiotemporal Crime Patterns in New York, São Paulo, and Stockholm. *J Contemp Crim Justice*. 2022;38(1):120-49.
- Monteiro JCM, De Carvalho EF, Gomes RC. Crime and police activity during the COVID-19 pandemic in Rio de Janeiro, Brazil. *Cien Saude Colet*. 2021;26(10):4703-14.
- Ribeiro-Junior MAF, Néder PR, Augusto SS, Elias YGB, Hluchan K, Santo-Rosa OM. Current state of trauma and violence in são paulo-brazil during the COVID-19 pandemic. *CBC*. 2021;48(1):1-7. <https://doi.org/10.1590/0100-6991e-20202875>.