Impact of the COVID-19 Pandemic on the Activity of a Public Orthopedics and Traumatology Service: Our Insights After the First Wave

Guillermo A. Ricciardi, Fernando Locaso, Martín A. Pérez, Santiago Soto Arriaga, Santiago Scalambro, Ariel A. Salinas, Mariano Riva, Alan Elorza, Diego Mansilla, Florencia Molina, Juan Urrica, Gustavo Ricciardi, Sol Manterola, Ignacio G. Garfinkel, Gabriel G. Carrioli, Daniel O. Ricciardi

Orthopedics and Traumatology Service, Hospital General de Agudos "Dr. Teodoro Álvarez", Autonomous City of Buenos Aires, Argentina

ABSTRACT

Introduction: Our aim was to compare our activity in the Orthopedics and Traumatology service during the first wave of the COVID-19 pandemic. **Materials and Methods:** Ambispective longitudinal observational analytical study of patients treated in the Orthopedics and Traumatology Service of a public health hospital of Buenos Aires during the first wave of the COVID-19 pandemic. The primary outcome variable was the total number of surgeries performed during the study period. **Results:** The pandemic was associated with fewer total surgeries (p = 0.002), emergency department surgeries (p = 0.000) and elective surgeries (p = 0.002). Total surgeries were reduced by 81.5%. Emergency surgeries accounted for 97%, a significant difference with the non-pandemic period (p = 0.080). Additionally, the average number of surgeries per available surgical day was significantly lower (p = 0.000). **Conclusions:** We believe that, under the regulations indicated by the national and regional pandemic contingency plan, the care of orthopedic pathology and musculoskeletal trauma was notoriously lower than our usual performance. Although we responded adequately to the emergencies of our specialty, the possibility of stratifying and considering types of patients with conditions that could be treated gradually during the pandemic remains pending.

Key words: COVID-19; orthopaedics and traumatology; epidemiology; activity.

Level of Evidence: IV

Impacto de la pandemia de la COVID-19 en el funcionamiento de un servicio público de Ortopedia y Traumatología: nuestro aprendizaje luego de la primera ola

RESUMEN

Introducción: El objetivo principal fue comparar la actividad clínico-quirúrgica de nuestro Servicio de Ortopedia y Traumatología antes de la instauración del plan de contingencia frente a la pandemia de la COVID-19 y durante este, un aspecto relevante para establecer antecedentes que permitan guiar nuestro desempeño ante la segunda ola de casos y futuras contingencias semejantes. **Materiales y Métodos:** Estudio analítico observacional longitudinal ambispectivo de los pacientes atendidos en el Servicio de Ortopedia y Traumatología de un hospital del sistema público de la Ciudad Autónoma de Buenos Aires, durante el plan de contingencia frente a la pandemia COVID-19. Como variable de resultado primaria se valoró el número total de cirugías realizadas durante el período de estudio. **Resultados:** La pandemia se asoció con menos cirugías totales (p = 0,002), de Guardia (p = 0,000) y de Planta (p = 0,002). Las cirugías totales se redujeron un 81,5%. Las cirugías de urgencia representaron el 97%, diferencia significativa con el período fuera de la pandemia (p = 0,080). Además, el promedio de cirugías por día quirúrgico disponible fue significativamente menor (p = 0,000). **Conclusiones:** Creemos que la atención de la enfermedad ortopédica y el trauma musculoesquelético, adaptada a las obligaciones indicadas por el plan nacional y regional de contingencia a la pandemia, fue notoriamente menor a nuestro desempeño habitual. Si bien respondimos adecuadamente a las urgencias de nuestra especialidad queda pendiente la posibilidad de estratificar y considerar tipos de pacientes con cuadros pasibles de ser tratados, en forma gradual, durante la pandemia.

Palabras clave: COVID-19; ortopedia y traumatología; epidemiología; funcionamiento.

Nivel de Evidencia: IV

Received on April 9th, 2021. Accepted after evaluation on August 8th, 2021 • Dr. GUILLERMO A. RICCIARDI • guillermoricciardi@gmail.com https://orcid.org/0000-0002-6959-9301

How to cite this article: Ricciardi GA, Locaso F, Pérez MA, Soto Arriaga S, Scalambro S, Salinas AA, et al. Impact of the COVID-19 Pandemic on the Activity of a Public Orthopedics and Traumatology Service: Our Insights After the First Wave. *Rev Asoc Argent Ortop Traumatol* 2021;86(6):716-726. https://doi.org/10.15417/issn.1852-7434.2021.86.6.1341

INTRODUCTION

The rapid international spread of the SARS-CoV-2 virus from its original detection in Wuhan (December 2019) to the declaration of a pandemic status by the World Health Organization in less than three months, forced the prompt restructuring of the health systems of the world, which had an impact on the activity of all the areas and specialties that comprise it.[1,2] In our environment, the aggravating factor of lacking a history of comparable magnitude in Argentina and Latin American countries is added.

Under the guidelines of a state of health emergency, the Orthopedics and Traumatology Services had to limit and adapt their activity, conditioned by the different stages of the pandemic and with the fundamental objective of limiting the exponential growth of cases.[3]

Concerns related to COVID-19 invaded our practice, the joint effort of all health personnel was necessary to carry out the three fundamental objectives of an Orthopedic and Traumatology Service during the pandemic: 1) continue emergency care, 2) protect patients and health professionals from transmission and contagion, and 3) maintain available resources.[4]

Due to the later temporary evolution of the effects of the pandemic in our country compared to other regions, we have the contribution of publications from Asia, Europe and North America, which represented a vital contribution to the development of a contingency plan that contemplates the different areas of our discipline.[4-11] The recommendations available to date published by international scientific societies and prestigious institutions were adapted.[12-16] This information allowed us, in a timely manner, to adapt our work in the Orthopedics and Traumatology Service of a public hospital in the Autonomous City of Buenos Aires. We have already published our strategy development process.[17]

The main objective of this study was to compare the clinical-surgical activity of our Orthopedics and Traumatology Service before the implementation of the contingency plan against the COVID-19 pandemic and during it. The data obtained are relevant to establish antecedents that allow us to guide our performance in the face of the second wave of cases and similar future contingencies.

MATERIALS AND METHODS

We carried out an ambispective longitudinal observational analytical study of the patients treated by the Orthopedics and Traumatology Service of a hospital of the public health system of the Autonomous City of Buenos Aires, during the implementation of the contingency plan against the COVID-19 pandemic according to the protocols and guidelines established by the Ministries of Health of the Nation and the Autonomous City of Buenos Aires.[17] The study period spanned from April 2019 to September 2020, an interval that involved the year prior to the pandemic and the probable peak of COVID-19 cases, according to the official epidemiological reports available when the study began (Figure 1).

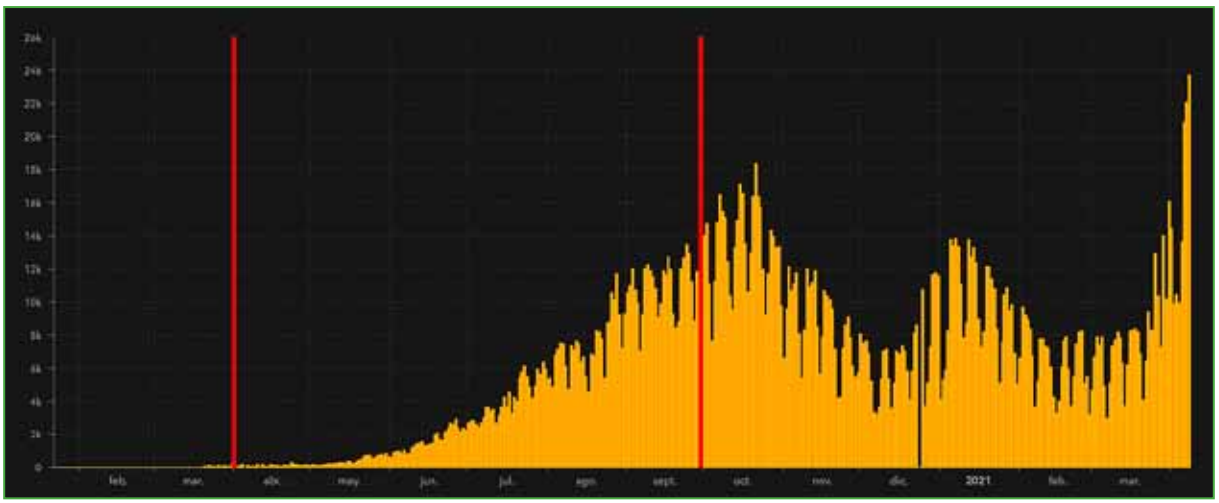

Figure 1. Curve of daily cases by month: February 2020-March 2021. Pandemic period considered: April-September (between red lines). Source: John Hopkins University. Available at: https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6

The inclusion criteria were: records of patients treated in the Orthopedics and Traumatology Service and the Traumatology area of the Emergency Department. The exclusion criteria were: files, reports, or medical records that were incomplete or illegible in the variables of interest.

We recorded the study variables taken from the data of medical records, administrative records, and archives of our institution. The primary outcome variable was the total number of surgeries performed during the study period. The surgeries were divided into five categories, according to the classification proposed by Massey and the American Association of Orthopedic Surgeons, taking into account the surgical delay they admit: emergency (within 24 hours), urgency (within 48 hours), expedited surgery (within 2 weeks), short-term delayed (within 3 months), long-term delayed (>3 months).[8] The variable was divided into two: 'urgent' and 'delayed'. Those classified as emergencies, urgencies, and expedited surgeries were grouped into "emergency surgeries" and those classified as short- and long-term delayed were grouped into "delayed surgeries". The total number of surgeries calculated involved the registry of ward surgeries and emergency department surgeries. The latter included major surgeries and minor procedures (surgeries with local anesthesia, wound sutures).

The number of surgeries per team (upper limb, lower limb, pelvis and hip, knee, spine, and shoulder), the need for hospitalization (hospitalization / outpatient) and the average number of surgeries performed per assigned surgical day were also recorded.

As independent variables, we evaluated those related to the hospital movement of our inpatient wards (Units 10 and 11), the activity in the Emergency Department, and the activity in outpatient offices: admissions, transfers to our inpatient units, discharges, average days of stay, percentage of bed occupancy, bed turnover rate, patients seen in the ED and assigned appointments in the outpatient clinic.

We also recorded non-trauma activities performed by trauma doctors during the pandemic; these were not included in the comparison, but are valuable for the description of the setting: assistance of patients in the fever clinic and swab testing.

The prospective recording of data began after the approval of the ethics committee of our institution, according to the Declaration of Helsinki and current regulations, ensuring the confidentiality and security of the data.

Registration forms were prepared to be completed on a daily basis and then to be loaded weekly in digital spreadsheets with monthly control of the data entered by a doctor in charge of this task. This information was added to the retrospective data record of the pre-pandemic period. It was necessary to rely on the exhaustive participation of residents and ED and attending physicians from the surgical, inpatient, and outpatient areas, who made up the research team.

Comparison

The study variables were measured at two defined time intervals within the study period for comparison: 1) during the pandemic: April to September 2020, 2) before the COVID-19 pandemic (April to September 2019).

Statistical analysis

Categorical variables are expressed as number and percentage, and were analyzed with the chi-square test or Fisher's test. The interval variables are described with average and median, according to their distribution and their dispersion measures, with standard deviation (SD) and interquartile range 25-75 (IQR). The Shapiro-Wilk normality test was performed to estimate the type of distribution of the quantitative variables. For the comparison of continuous variables, Student's t or Mann-Whitney U tests were used, according to the expressed distribution. A p-value ≤0.05 was considered statistically significant. The SPSS Statics 25 program was used for the analysis.

RESULTS

During the period of the COVID-19 pandemic considered, surgical activity decreased significantly, 127 surgeries were performed (average = 21, SD ± 2): 104 were ward surgeries (average = 17, SD ± 7) and 23 were ED surgeries (average = 4, SD ± 3). The surgical team activity only comprised 35 surgeries of the upper limb, 28 of the lower limb, 32 of the pelvis and hip, five of the knee, five of the shoulder, and one of the spine. These figures are significantly lower than those registered in the usual activity of our Service before the pandemic. The description and the results obtained from the comparison between the periods before the pandemic and during the pandemic are summarized in Tables 1-3.

Table 1. Surgeries depending on the work period: pre-pandemic and during the pandemic.

Variables	Period		
	Pre-pandemic (April-September 2019)	During the pandemic (April-September 2020)	p*
Surgeries			
n: average (SD) / median (IQR)			
Total	**687**: 115 (19)/117 (105-126)	**127**: 21 (9)/25 (11-28)	0.002
Ward	**253**: 42 (13)/40 (31-51)	**104**: 17 (7)/21 (10-23)	0.002
ED	**434**: 72 (11)/76 (68-78)	**23**: 4 (3)/3 (2-5)	0.000
Minor	**421:** 70 (12)/75 (64-77)	**14**: 2 (2)/2 (1-3)	0.002
Major	**4**: 2 (1)/2 (1-3)	**9:** 2 (1)/1 (1-3)	0.358
Urgent	**472**: 79 (30)/92 (67-99)	**124**: 21 (9)/25 (11-27)	0.080
Elective	**141**: 24(9)/22 (16-27)	**3**: 1 (1)/0 (0-1)	0.002
With hospitalization	**202**: 34 (9)/32 (28-43)	**93**: 16 (8)/16 (11-19)	0.080
Outpatient	**485**: 81 (15)/84 (74-92)	**34**: 6 (5)/6 (1-10)	0.002
Teams			
n / average (SD)/ median (IQR)			
Upper limb	11 (6)/10 (6-18)	6 (3)/6 (3-8)	0.73
Lower limb	7 (3)/7 (5-8)	5 (2)/5 (4-6)	0.176
Pelvis and hip	11 (5)/10 (7-16)	5 (3)/6 (3-8)	0.035
Knee	11 (5)/10 (7-15)	1 (1)/1 (0-1)	0.002
Shoulder	2 (1)/3 (1-3)	1 (1)/1 (0-1)	0.180
Spine	3 (1)/3 (2-4)	0 (0)/0 (0-0)	0.002
Surgeries Ward/day			
n / average (SD)/ median (IQR)	2.7 (0.6)/2.7 (2.5-2.8)	1.4 (0.3)/.3 (1.2-1.6)	0.000

* For categorical variables, the chi-square test or Fisher's test were used, and for numerical variables, the Student's t test or the Mann-Whitney U test, according to their distribution.
SD = standard deviation, IQR = interquartile range.

Table 2. Hospital movement according to the work period: pre-pandemic and during the pandemic

Variables	Period		p*
	Pre-pandemic	During the pandemic	
Hospitalization: Unit 10 and Unit 11	**n:** average (SD) / median (IQR)	n / average (SD)/ median (IQR)	
Admissions U10	**159:** 27 (7)/29 (24-31)	**42:** 7(3)/9 (5-9)	0.002
Admissions U11	**29**: 5 (4)/3 (3-8)	**23:** 4 (3)/3 (2-6)	0.589
Transfers U10	**80**: 13 (3)/12 (12-17)	**144:** 24 (6)/24 (20-30)	0.002
Transfers U11	**41**:7 (3)/8 (6-8)	69 12 (4)/12 (10-14)	0.026
Discharges U10	**198**: 33 (6)/34 (32-38)	**162:** 27 (5)/28 (25-30)	0.100
Discharges U11	**59:** 10 (5)/11 (6-13)	**77:** 13 (2)/13 (12-13)	0.197
% occupancy U10	67 (2)/67 (64-68)	72 (18)/76 (69-83)	0.510
% occupancy U11	57 (12)/59 (46-68)	64 (12)/66 (51-74)	0.359
Stay U10	6 (1)/6 (5-6)	7(2)/6.5 (6-9)	0.394
Stay U10	19 (14)/15 (7-30)	9 (2)/9 (7-10)	0.103
Bed turnover U10	3.3 (0.4)/3.3 (3.3-3.7)	3.1 (0.8)/3 (2.6-3.8)	0.517
Bed turnover U11	1.2 (0.5)/1.2 (0.5-1.6)	2.3 (0.4)/2.3 (2.1-2.6)	0.001
Mortality Unit 10 and Unit 11			
Deaths U10	**2:** 0 (1)/0 (0-1)	**7:** 1 (2)/1 (0-2)	0.485
Deaths U11	**2:** 0 (1)/0 (0-1)	**5:** 1 (1)/1 (0-1)	0.310
U10 mortality rate	0.8 (1.2)/0.0 (0.0-2.3)	3.3 (4.3)/1.3 (0.0-7.1)	0.394
U11 mortality rate	4.1 (6.9)/0.0 (0.0-7.7)	5.3(4.7)/5.8 (0.0-8.3)	0.589
Emergency Department			
Patients	**7896:** 1316 (72)/1327 (1255-1385)	**1326**: 221(99)/196 (149-242)	0.002
Traffic accidents	**260:** 43 (9)/47 (44-48)	**116**: 19 (7)/18 (14-25)	0.004
Outpatient clinic			
Assigned appointments	**8688:** 1448 (115)/1415 (1375-1444)	**1640**: 273 (162)/247 (156-367)	0.002

* For categorical variables, the chi-square test or Fisher's test were used, and for numerical variables, the Student's t test or the Mann-Whitney U test, according to their distribution.
SD = standard deviation, IQR = interquartile range.

Table 3. Non-trauma tasks during the pandemic.

Variables	Period						
	April	May	June	July	August	September	Total
Febrile patients	3	38	78	175	188	191	673; average = 112 (SD ± 83)
Swab tests	2	7	30	68	58	161	326; average = 54 (SD ± 59)

SD = Standard Deviation

Surgical activity during the pandemic

The pandemic period was significantly associated with fewer total surgeries (p = 0.002), ED surgeries (p = 0.000), and ward surgeries (p = 0.002). Total surgeries were reduced by 81.5% compared to the pre-pandemic stage (pre-pandemic 685 and pandemic 127). Most of the patients required hospitalization, outpatient surgeries accounted for 27% of all interventions (34 out of 127 surgeries) in contrast to the pre-pandemic period (70% outpatient surgeries; 485 out of 687). The scheduled surgeries were limited to three procedures exclusively that involved the removal of a transyndesmal screw (n = 2) and the dynamization of an intramedullary nail (n = 3), all in the context of the treatment of acute fractures. Emergency surgeries accounted for 97% (124 of 127 surgeries), a significant difference with the pre-pandemic period (p = 0.080; 472 of 687 pre-pandemic surgeries; 69%). Likewise, the average number of surgeries per available surgical day was significantly lower (p = 0.000) (Figure 2).

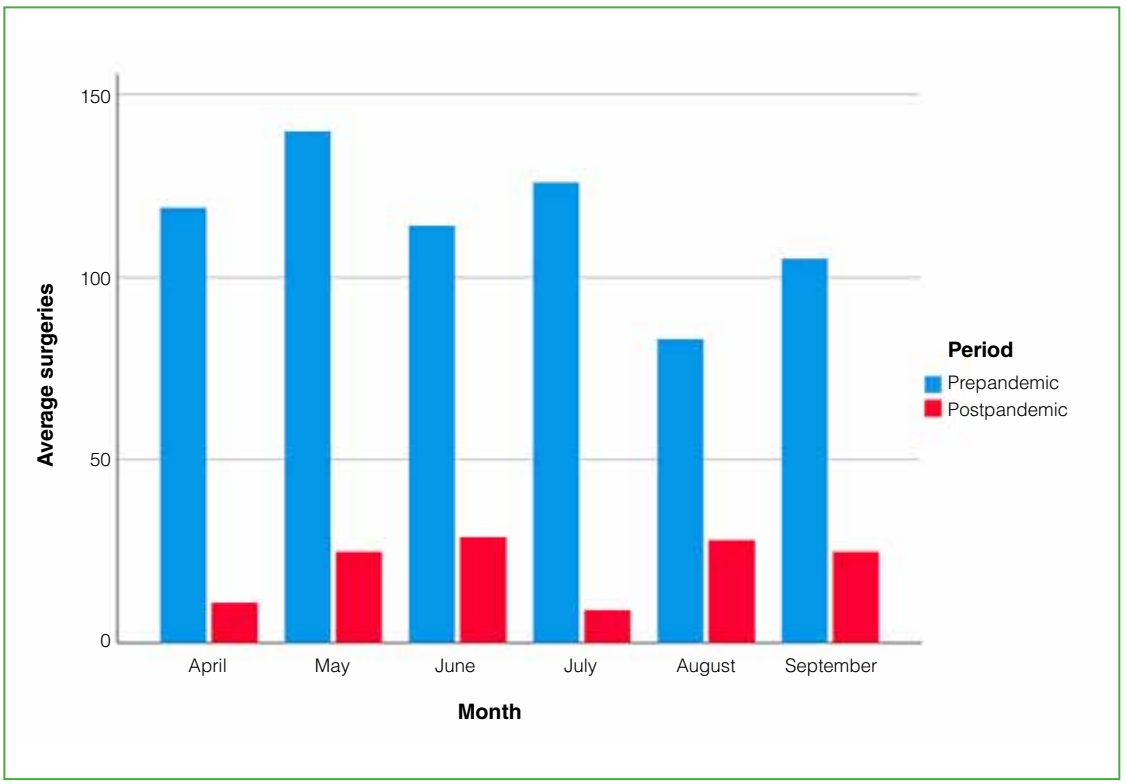

Figure 2. Distribution of surgeries (total) by month and period.

Hospital turnover in the Inpatient Units

Hospital turnover during the pandemic was significantly associated with a lower number of admissions (Unit 10; p = 0.002) and an increase in transfers from other services and the ED (p = 0.002). There were no significant differences in the average days of stay, but the bed turnover variable was optimized in one of the units (Unit 11: bed turnover p = 0.001). Although the percentage of bed occupancy increased, it was not statistically significant compared with the pre-pandemic period (p = 0.510; p = 0.359).

Activity in the ED and the outpatient clinics

The pandemic was significantly associated with less activity in our specialty, which was reflected in a smaller number of patients seen (pre-pandemic: n = 7896; average = 1316, SD ± 72; pandemic: n = 1326; average = 221, SD ± 99 ; p = 0.002), less attention of traffic accidents (pre-pandemic: n = 260; average = 43, SD ± 9; pandemic: n = 116; average = 19, SD ± 7; p = 0.004); a lower rate of surgeries, especially routine minor procedures (pre-pandemic: n = 421; average = 70, SD ± 12; pandemic: n = 14; average = 2, SD ± 2; p = 0.002) (Figure 3).

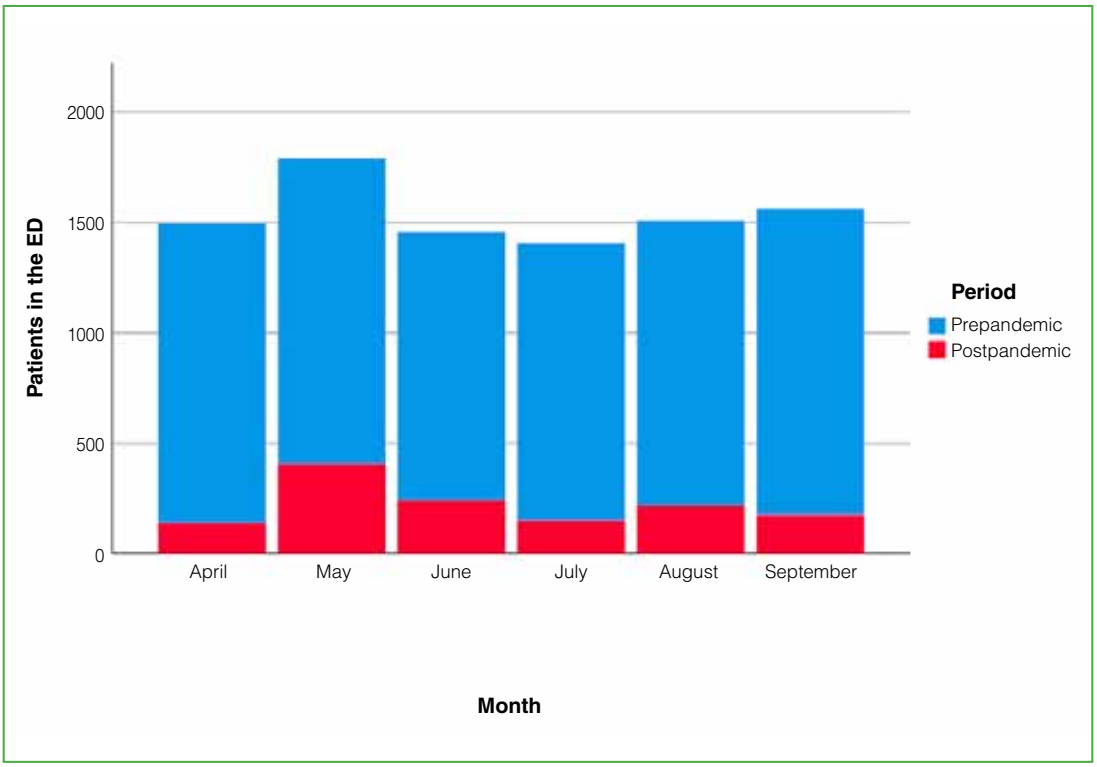

Figure 3. Distribution of ED patients by month and period.

Likewise, it was associated with a much lower demand for outpatient care, as 19% of appointments (both scheduled and spontaneous) were assigned, compared to the pre-pandemic period (pre-pandemic: n = 8688; average = 1448, SD ± 115); pandemic: n = 1640; average = 273, SD ± 162; p = 0.002) (Figure 4).

Figure 4. Distribution of outpatient consultations by month and period.

Non-trauma activities

During the pandemic, the participation of traumatologists in non-trauma areas was required, which involved: triage at hospital admission according to the reason for consultation, care of 673 patients in the Febrile Emergency Units, and carrying out 326 swab tests of suspected cases (Table 3). Only staff traumatologists participated in these tasks. By protocol, the residents and ED traumatologists performed routine nasopharyngeal swabs upon admission in Units 10 and 11 during the pandemic, but this number was not considered in our records (Figure 5).

DISCUSSION

During the adaptation of the clinical-surgical activity of the Service to the contingency of the COVID-19 pandemic, our main objective was to continue treating emergencies in Orthopedics and Traumatology. However, the epidemiological context in trauma care was markedly different.

As described in the results, the pandemic was significantly associated with reduced surgical activity. The decrease in the total rate of surgeries and the rate of ward/ED surgeries could be related to the lower admission of patients in the ED (consultations and traffic accidents) and outpatient clinics. However, it could also be related to a lower availability of surgical shifts per day (decrease in the average number of surgeries per assigned surgical day) and other variables not evaluated, such as the availability of anesthesiologists and beds in the intensive care unit for the postoperative period. Other similar publications reported a reduction in the number of surgeries by 44.2-62.7%; in our case, it was 81.5%. Elective surgeries were suspended following the guidelines of the contingency plan defined by the Ministry of Health of the Autonomous City of Buenos Aires. Given the epidemiological context, during the first wave of cases it was not necessary to opt for early outpatient management of surgical patients or to modify hospitalization criteria.

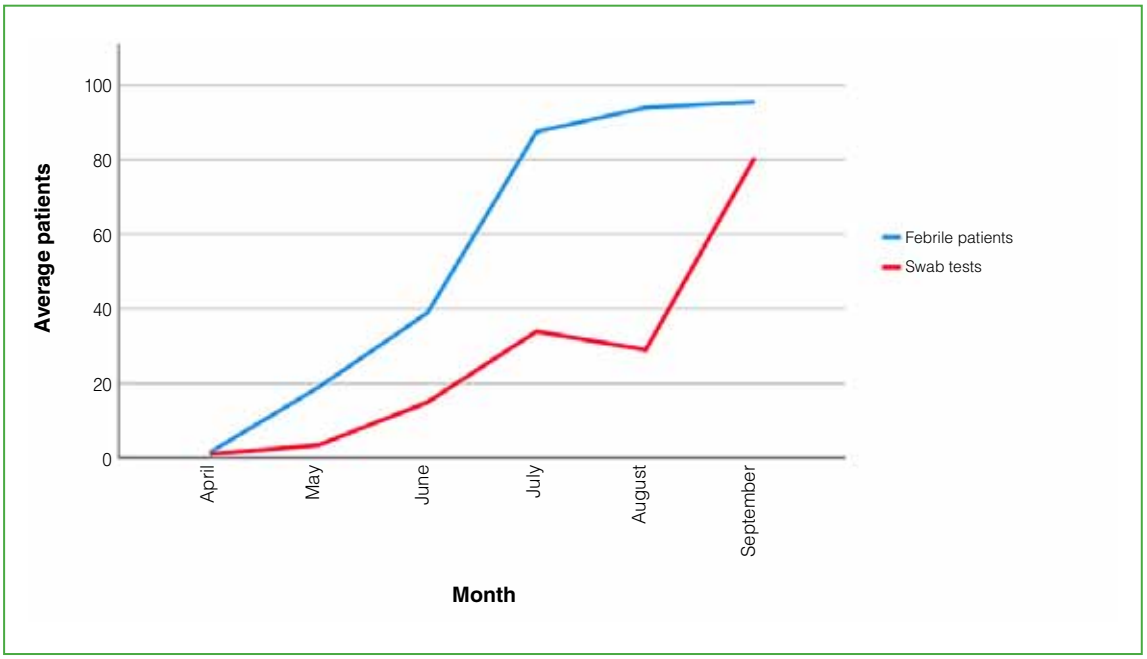

Figure 5. Distribution of swab tests and consultations of febrile patients performed by traumatologists according to month and period.

Admissions in the Emergency Service decreased significantly: less cases of traffic accidents, surgical procedures, and consultations. This could be related, following the reasoning of similar international experiences,[18-22] with the decrease in circulation due to the mandatory lockdown and its progressive opening, the fear of consultation due to the risk of contagion, and the lower face-to-face work activity.

The demand in outpatient clinics was much lower because spontaneous appointments were suspended and schedules were restricted. This was done in a staggered manner; the initial restriction was maximum, the personal timetables of subspecialties were closed, and general attention appointments were arranged. Consultations were limited to the follow-up of recently operated and urgent patients. After the first months of the pandemic, the Government of the Autonomous City of Buenos Aires established as a complement a teleconsultation service system not included in our registry. Other epidemiological reports describe similar strategies and events and a 29% decrease in outpatient consultations;[23,24] we observed a much greater reduction, as we received only 19% of regular consultations.

Our Service ceased to be an inpatient unit for Orthopedics and Traumatology predominantly, to allow the admission of patients "without COVID" from other specialties. This fact was reflected in the lower number of trauma admissions in our Units and the significant increase in the transfers from the ED and other specialties. Given the epidemiological context described, and although the percentage of occupancy in our hospital rooms increased, our care capacity remained at reasonable levels, which allowed us to assist, hospitalize, and operate on patients with emergency conditions.

Although it does not represent the main objective of our work, a higher mortality rate was estimated during hospitalization in the pandemic period. This difference was not statistically significant and is biased by the additional hospitalization of non-trauma patients during the study period.

CONCLUSIONS

Under the guidelines indicated by the national and regional contingency plan for the pandemic, orthopedic disease and musculoskeletal trauma care was notoriously lower than our usual performance. The epidemiological context was characterized by a decrease in the frequency of accidents, a lower demand of patients, and the suspension of scheduled treatments by the City Government's protocol. According to our records, we worked without suffering the collapse of our care capacity, as we were able to include non-trauma support tasks. In this way,

we conclude that, given the current local and global concern for the adaptation of our performance, it is vitally important to reconstruct with data what has been done to provide feedback and redefine strategies. Therefore, in our case, we believe that, although we responded adequately to the emergencies of our specialty, the possibility of stratifying and considering types of patients with diseases that can be treated gradually during the pandemic remains pending.

Acknowledgements

To all the members of the health team of the Division of Orthopedics and Traumatology and the Emergency Service of our institution, who carried out the healthcare activities during the study period on which this work was carried out.

Conflict of interest: The authors have no conflicts of interest to declare.

F. Locaso ORCID ID: https://orcid.org/0000-0003-2248-5582
M. A. Pérez ORCID ID: https://orcid.org/0000-0002-2163-0680
S. Soto Arriaga ORCID ID: https://orcid.org/0000-0002-0201-6394
S. Scalambro ORCID ID: https://orcid.org/0000-0002-7478-0041
A. A. Salinas ORCID ID: https://orcid.org/0000-0002-3137-2048
M. Riva ORCID ID: https://orcid.org/0000-0003-2494-8456
A. Elorza ORCID ID: https://orcid.org/0000-0002-4877-3083
D. Mansilla ORCID ID: https://orcid.org/0000-0002-0025-1251
F. Molina ORCID ID: https://orcid.org/0000-0002-3747-044X
J. Urrica ORCID ID: https://orcid.org/0000-0001-5939-4014
G. Ricciardi ORCID ID: https://orcid.org/0000-0002-6952-7260
S. Manterola ORCID ID: https://orcid.org/0000-0003-4194-1563
I. G. Garfinkel ORCID ID: https://orcid.org/0000-0001-9557-0740
G. G. Carrioli ORCID ID: https://orcid.org/0000-0003-4160-9712
D. O. Ricciardi ORCID ID: https://orcid.org/0000-0002-1396-9115

REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al, China Novel Coronavirus Investigating and Research Team. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382(8):727-33. https://doi.org/10.1056/NEJMoa2001017
2. World Health Organization Press Conference. The World Health Organization (WHO) has officially named the disease caused by the novel coronavirus as COVID-19. [Consulted: 11 February 2020] Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019
3. Emergencia Sanitaria. Decree 260/2020 DECNU-2020-260-APN-PTE - Coronavirus (COVID-19). Boletín Oficial de la República Argentina (Official Gazette of the Argentine Republic), edition Nº 34.327, First Section, Thursday, March 12th, 2020. Available at: https://www.boletinoficial.gob.ar/detalleAviso/primera/5217883/20200312?suplemento=1
4. Chang Liang Z, Wang W, Murphy D, Po Hui JH. Novel coronavirus and orthopaedic surgery: early experiences from Singapore. *J Bone Joint Surg Am* 2020;102(9):745-9. https://doi.org/10.2106/JBJS.20.00236
5. Rodrigues-Pinto R, Sousa R, Oliveira A. Preparing to perform trauma and orthopaedic surgery on patients with COVID-19. *J Bone Joint Surg Am* 2020;102(11):946-50. https://doi.org/10.2106/JBJS.20.00454
6. Ashford RU, Nichols JS, Mangwani J. Annotation: The COVID-19 pandemic and clinical orthopaedic and trauma surgery. *J Clin Orthop Trauma* 2020;11(3):504-5. https://doi.org/10.1016/j.jcot.2020.04.002
7. Liang ZC, Ooi S. COVID-19: A Singapore orthopedic resident's musings in the Emergency Department. *Acad Emerg Med* 2020;27(4):349-50. https://doi.org/10.1111/acem.13970
8. Massey PA, McClary K, Zhang AS, Savoie FH, Barton RS. Orthopaedic surgical selection and inpatient paradigms during the coronavirus (COVID-19) pandemic. *J Am Acad Orthop Surg* 2020;28(11):436-50. https://doi.org/10.5435/JAAOS-D-20-00360
9. Randelli PS, Compagnoni R. Management of orthopaedic and traumatology patients during the coronavirus disease (COVID-19) pandemic in northern Italy. *Knee Surg Sports Traumatol Arthrosc* 2020;28(6):1683-9. https://doi.org/10.1007/s00167-020-06023-3
10. Prada C, Chang Y, Poolman R, Johal H, Bhandari M. Best practices for surgeons -COVID-19 evidence-based scoping review. A unifying report of global recommendations. [Consulted: 4 April 2020] Available at: https://aaot.org.ar/wp-content/uploads/2020/04/OE-Best-Practices-for-Surgeons-COVID-19-Evidence-Based-Scoping-Review.pdf_compressed1.pdf

11. Vaccaro AR, Getz CL, Cohen BE, Cole BJ, Donnally CJ 3rd. Practice management during the COVID-19 pandemic. *J Am Acad Orthop Surg* 2020;28(11):464-70. https://doi.org/10.5435/JAAOS-D-20-00379
12. SECOT. Recomendaciones generales de la Sociedad Española de Cirugía Ortopédica y Traumatología frente a la COVID-19. 2020. [Consulted: 24 March 2020] Available at: https://www.secot.es/media/docs/covid19
13. NHS England and NHS Improvement. Clinical guide for the management of trauma and orthopaedic patients during the coronavirus pandemic. [Consulted: 14 April 2020] Available at: https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/C0274-Specialty-guide-Orthopaedic-trauma-v2-14-April.pdf
14. British Orthopaedic Association. Management of patients with urgent orthopaedic conditions and trauma during the coronavirus pandemic. [Consulted: 13 April 2020] Available at: https://www.boa.ac.uk/resources/covid-19-boasts-combined.htm
15. COVID-19 Guidelines for Triage of Orthopaedic Patients. American College of Surgeons. [Consulted: 4 April 2020] Available at: https://www.facs.org/covid-19/clinical-guidance/elective-case/orthopaedics
16. Guidance for surgeons working during the COVID-19 pandemic from the Surgical Royal Colleges of the United Kingdom and Ireland. [Consulted: 20 March 2020] Available at: https://www.rcseng.ac.uk/coronavirus/joint-guidance-for-surgeons-v1/
17. Ricciardi GA, Pérez MA, Scalambro S, Ricciardi G, Carrioli GG, Locaso F, et al. Propuesta para formular una estrategia de contingencia en Ortopedia y Traumatología frente a la pandemia de COVID-19. *Rev Asoc Arg Ortop Traumatol* 2020;85(3):283-94. https://doi.org/10.15417/issn.1852-7434.2020.85.3.1106
18. Andreozzi V, Marzilli F, Museli M, Previ L, Cantagalli MR, Princi G, et al. The impact of COVID-19 on orthopaedic trauma: A retrospective comparative study from a single university hospital in Italy. *Orthop Rev* 2021;12(4):8941. https://doi.org/10.4081/or.2020.8941
19. Battiato C, Berdini M, Luciani P, Gigante A. Impact of coronavirus disease 2019 (COVID-19) on the epidemiology of orthopedics trauma in a region of central Italy. *Injury* 2020;51(12):2988-9. https://doi.org/10.1016/j.injury.2020.09.044
20. Maniscalco P, Poggiali E, Quattrini F, Ciatti C, Magnacavallo A, Caprioli S, et al. The deep impact of novel CoVID-19 infection in an Orthopedics and Traumatology Department: the experience of the Piacenza Hospital. *Acta Biomed* 2020;91(2):97-105. https://doi.org/10.23750/abm.v91i2.9635
21. DiFazio LT, Curran T, Bilaniuk JW, Adams JM, Durling-Grover R, Kong K, e t al. The impact of the COVID-19 pandemic on hospital admissions for trauma and acute care surgery. *Am Surg* 2020;86(8):901-3. https://doi.org/10.1177/0003134820939904
22. Alyami AH, Alyami AA, AlMaeen BN. Impact of COVID-19 on orthopedic surgery: Experience from Saudi Arabia. *Ann Med Surg (Lond)* 2020;56:61-3. https://doi.org/10.1016/j.amsu.2020.05.048
23. Maryada VR, Mulpur P, Guravareddy AV, Pedamallu SK, Vijay Bhasker B. Impact of COVID-19 pandemic on orthopaedic trauma volumes: a multi-centre perspective from the State of Telangana. *Indian J Orthop* 2020;54(Suppl 2):1-6. https://doi.org/10.1007/s43465-020-00226-z
24. Wong J, Cheung K. Impact of COVID-19 on Orthopaedic and Trauma Service: An epidemiological study. *J Bone Joint Surg Am* 2020;102(14):e80. https://doi.org/10.2106/JBJS.20.00775