

The COVID-19 Pandemic and the Surgical Workload of the UPR-affiliated Hospitals

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Objective: To evaluate how the COVID-19 pandemic (declared in March 2020) affected our surgical workload.

Method: Using the University of Puerto Rico Department of Surgery database, we evaluated the number of surgical cases and their characteristics for the years 2019 through 2021. The variables examined included age, sex, American Society of Anesthesiology classification, type of surgery (elective/emergency), whether the patient had been admitted or was an outpatient, and outcome.

Results: The total number of surgical cases decreased 30%, falling from 5,040 in 2019 to 3,564 in 2020, but then increasing about 10% to 3,935 in 2021. The number of elective surgery cases dropped 33%, going from 4,383 in 2019 to 2,924 in 2020. The number of emergency surgeries had a minor decrease of 16%, diminishing from 650 to 546 between 2019 and 2020, inclusive. Patients undergoing elective surgery during 2020 were found to be older, were more frequently men, and required inpatient admission more often. Three significant periods were identified and correlated to the number of surgical cases, the first being the COVID-19 lockdown (March 2020) and the second and third being the increases in infections caused by the Delta and Omicron variants of the virus (July 2021 and December 2021, respectively).

Conclusion: The COVID-19 pandemic resulted in a significant decrease in the number of surgical cases. Two years after the pandemic, we have not recovered and continue to have fewer surgical cases than we did in 2019. [*PR Health Sci J* 2023;42(3):249-253]

Key words: COVID-19, Surgery, Surgical workload, Hospitals

On March 11, 2020, alarmed by the rapid spread and growing incidence of COVID-19, the World Health Organization declared the outbreak to be a pandemic (1). On the island of Puerto Rico, a lockdown was declared on March 15, 2020 (2). By executive order, most of the business were requested to close, people were instructed to stay at home, a 9:00 PM curfew was instituted, and the use of face masks was made mandatory. Health care institutions had to attend to the large number of COVID patients, and a large number of services across many industries - including health care - had to downscale their usual work. Temporarily discontinuing elective surgeries in anticipation of a COVID-19 surge proved to be a formidable task. The objective of this study was to identify what effect the lockdown restrictions had on the workload of the surgical services of the 6 participating institutions (2 academic centers and 4 community hospitals) that are affiliated to the University of Puerto Rico (UPR). Our hypothesis was that the COVID-19 pandemic decreased the surgical workload at our institutions. The number of cases and their characteristics before, during, and after the lockdown (2019, 2020, and 2021, respectively) were evaluated.

Methods

We compared the number of surgical cases and their characteristics from January 1, 2019, through December 31,

2021. This 3-year period included the year preceding the COVID-19 pandemic (2019), the beginning of the pandemic in 2020, and the year that followed (2021). For this study, the information was obtained from the UPR General Surgery database. This database, previously described in 2018 (3), obtains the information from surgical cases performed at the UPR-affiliated hospitals. There are 6 participating institutions that contribute to the UPR General Surgery database, of which 2 are academic centers and 4 are community hospitals. The aggregated data does not include personal identifiers. The database is secure, confidential, and compliant with the Health Insurance Portability and Accountability Act.

The variables examined included age, sex, American Society of Anesthesiology (ASA) classification, type of surgery (elective or emergency), type of admission (outpatient or inpatient), and outcome.

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For the year 2020, our number of surgical cases per month was compared to that reported by 2 non-participating hospitals: the Trauma Hospital and the San Juan Veterans Administration Hospital.

Statistical analyses were performed with the software program SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, version 22.0. Armonk, NY: IBM Corp.). Quantitative variables were expressed as means plus or minus standard deviations. Categorical variables were presented as frequencies and percentages. An analysis of variance was used to compare quantitative variables among the groups. Differences among the proportions were compared using a chi-squared test. Results were considered significant when the P value was less than .05.

This study was approved by the Institutional Review Board of the UPR Medical Sciences Campus.

Results

The UPR General Surgery database collected the information of 12,539 surgical cases that were performed between January 1, 2019, and December 31, 2021, inclusive. The mean age of the patients was 50 (± 23) years. The distribution of sex indicated that 56% of the patients were women and 44% were men.

The number of surgical cases, per month, performed by the UPR-affiliated hospitals in 2020 as compared to the number performed by the Trauma Hospital and the San Juan Veterans Administration Hospital in the same year is shown in Figure 1. All the hospitals had decreases in their workloads in April 2020, following the enforced lockdown on March 15, 2020.

Three significant periods were identified and correlated to the increases and decreases in the number of surgical cases: the first being the COVID-19 lockdown (March 2020) and the second and third being the increases in infections caused by the Delta and Omicron variants of the virus (July 2021 and December 2021, respectively), as can be seen in Figure 2.

The number of surgical cases and their characteristics during the 3-year period of the study are shown in Table 1. Comparing the pre-lockdown and lockdown groups, there was an overall decrease of 30% in the total number of surgical cases performed (5,040 vs. 3,564). When the elective and emergency surgical cases were separated, it was noted that the number of elective cases decreased by 33% (4,383 vs. 2,924) but that the number of emergency cases decreased by only 16% (650 vs. 546). The mean age of patients undergoing elective surgery increased in 2020 and 2021 (Table 1). The distribution of sex showed an increase in men (Table 1). When the types of admission

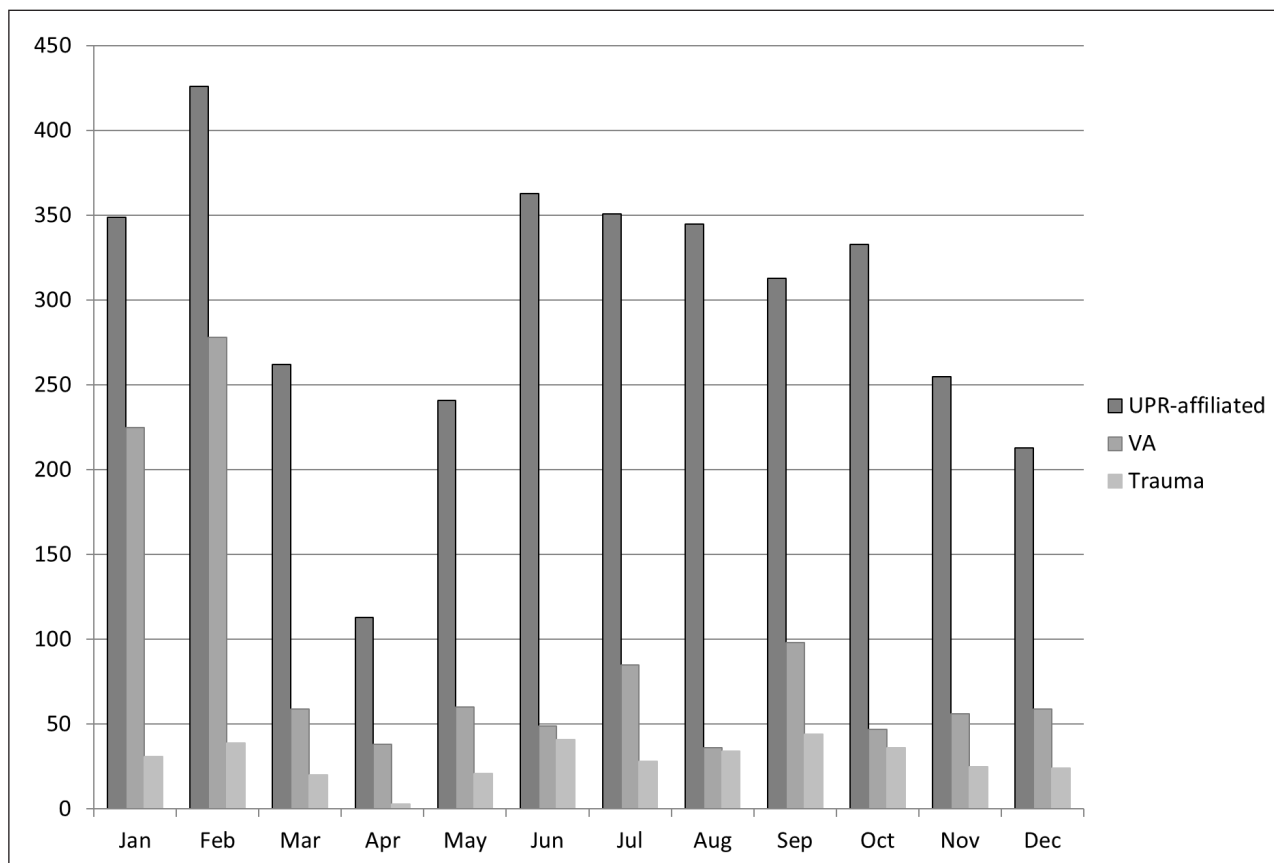


Figure 1. Number of surgical cases performed per month in 2020. University of Puerto Rico (UPR)-affiliated hospitals, the San Juan VA Medical Center, and the Trauma Hospital.

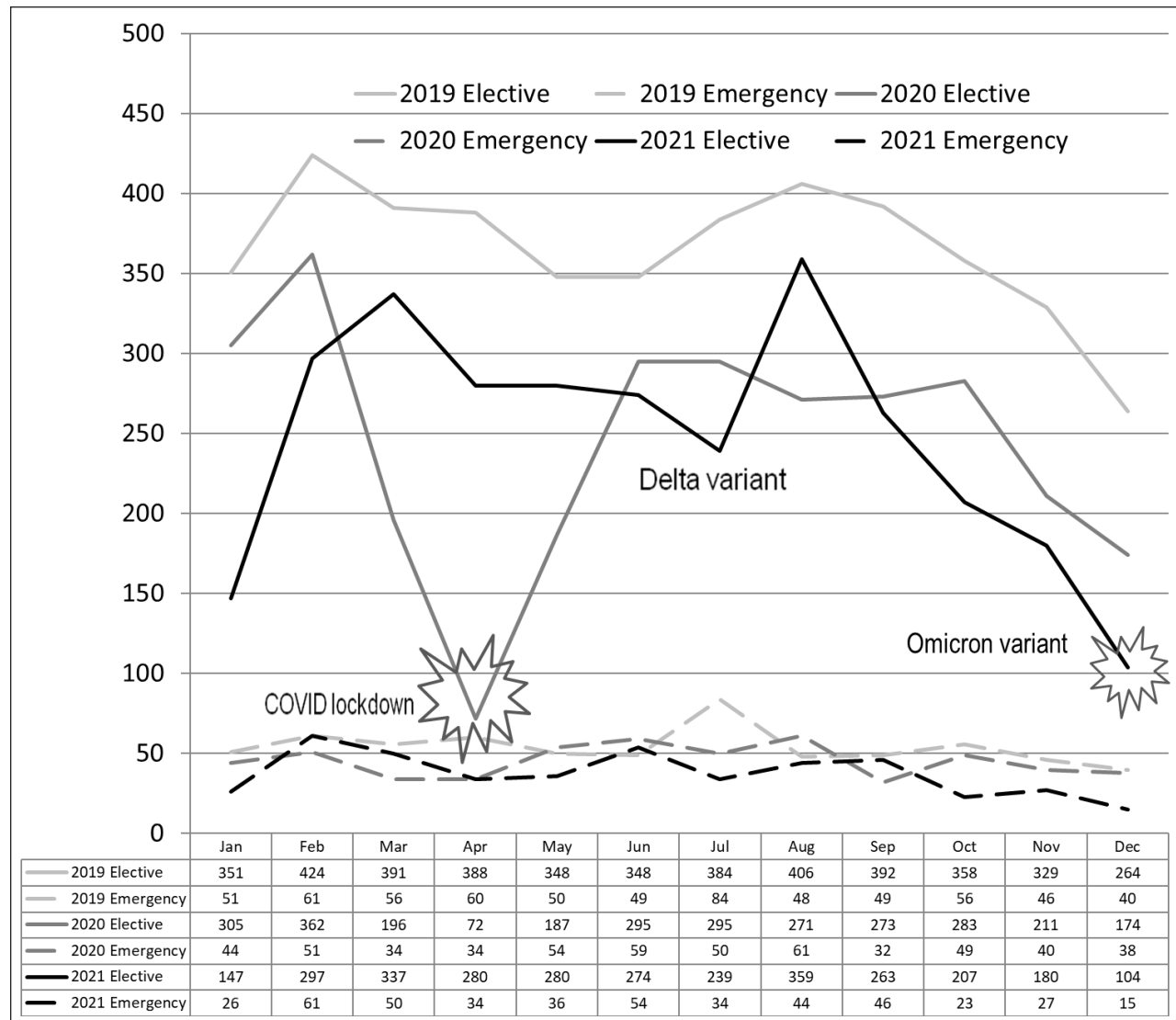


Figure 2. Elective and emergency surgical cases per month (2019–2021).

Table 1. Number of surgical cases (2019–2021) and their characteristics.

Year	2019		2020		2021		P Value	
Number of surgical cases	5,040		3,564		3,935			
Type of surgery	Elective	Emergency	Elective	Emergency	Elective	Emergency	Elective	Emergency
Number/ percentage of cases	4,383 87%	650 13%	2,924 84%	546 16%	2,967 87%	450 13%	<.001	<.001
Age (mean±SD)	50.76±22.30	46.60±23.08	51.78±24.32	46.28±25.12	51.93±20.48	41.67±26.08	.05	.02
Age (<65)	3,014 (70%)	478 (73.8%)	1,964 (67.9%)	393 (72.4%)	2,013 (68.0%)	346 (77.1%)	.48	.23
Age (≥65)	1,351 (31.0%)	170 (26.2%)	930 (32.1%)	150 (27.6%)	948 (32.0%)	103 (22.9%)	.48	.23
Male	1,872 (42.8%)	324 (49.9%)	1,298 (44.6%)	266 (48.7%)	1,210 (40.8%)	246 (54.7%)	.02	.15
Female	2,499 (57.2%)	325 (50.1%)	1,614 (55.4%)	280 (51.3%)	1,754 (59.2%)	204 (45.3%)	.02	.15
Inpatient	2,557 (58.6%)	479 (73.8%)	1,736 (59.7%)	462 (85.1%)	1,583 (53.4%)	440 (97.8%)	<.001	<.001
Outpatient	1,803 (41.4%)	170 (26.2%)	1,174 (40.3)	81 (14.9%)	1,379 (46.6%)	10 (2.2%)	<.001	<.001
ASA (<3)	2,521 (60.7%)	368 (60.0%)	1,559 (60.5%)	262 (60.8%)	1,741 (63.0%)	219 (53.5%)	.10	.06
ASA (≥3)	1,632 (39.3%)	245 (40.0%)	1,018 (39.5%)	169 (39.2%)	1,024 (37.0%)	190 (46.5%)	.10	.06
Minor morbidity	53 (1.2%)	20 (3.1%)	33 (1.1%)	16 (2.9%)	27 (0.9%)	13 (2.9%)	.58	.36
Major morbidity	16 (0.4%)	18 (2.8%)	12 (0.4%)	16 (2.9%)	19 (0.6%)	20 (4.4%)	.58	.36
Mortality	8 (0.2%)	10 (1.5%)	6 (0.2%)	6 (1.1%)	5 (0.2%)	12 (2.7%)	.58	.36

(inpatient vs. outpatient) were evaluated, it was noticed that the number of inpatient admissions increased (Table 1). No significant differences between the groups were found in terms of ASA score or surgical outcome.

Discussion

The UPR-affiliated hospitals had a 30% reduction in surgical case volume during the COVID-19 pandemic. This decrease in surgical workload resulted from the need to reduce elective surgeries during the COVID surge that occurred in March of 2020. Regarding the reduction in elective surgery (which ranged from 26% to 43%, worldwide), our experience was similar to those that were reported by other health care institutions (4–9). The number of trauma surgeries was also reported to have decreased because the number of motor vehicle accidents was lower. During the lockdown, the population was advised to stay at home and the roads were relatively empty. A report indicated that road traffic accidents were reduced 53% (4); the Trauma Hospital reported a decrease from 39 cases in January 2020 to only 3 cases in April 2020, at the height of the pandemic.

Some hospitals were overwhelmed with COVID cases and halted all elective surgery. This practice resulted in delays in the surgical management of cancer patients, as reported by Larson (10). Head and neck cancer patients were also reported to have received suboptimal care during the pandemic, with tumor resections reduced to half the usual number (11). Delays in cancer screening which were frequent during the pandemic can lead to more complicated cases for surgeons and to the progression of disease; in addition, such delays can adversely affect outcomes. According to the reports of several vascular surgery services, during the pre-pandemic period (2019), the most frequently performed procedures were endovascular surgeries; in 2020, amputations were the most frequent (12).

In our study, the number of surgical cases experienced the greatest decline during the lockdown (March 2020), but this number was also affected by the surge of the Delta (13,14) variant of the virus in July 2021 and that of the Omicron (15,16) variant in December 2021. In January 2021, when the first COVID vaccine became available, the number of surgical cases increased. Our surgical caseload responds to what is happening in the community, decreasing during unfavorable conditions and increasing when the conditions are perceived as favorable (e.g., the COVID vaccine becoming available).

A measure of preoperative health, the ASA physical status classification of our patients did not show any significant differences between the years evaluated in our study. The ASA scores of 61% of our patients were below 3 (healthy or having only mild systemic disease); the scores of the other 39% were 3 or higher (severe systemic disease). Surgical outcomes were also similar for the periods before and after the lockdown. Major postoperative morbidity was reported in 0.4% of the elective and 2.8% of the emergency cases in 2019, and in 0.4% of the elective and 2.9% of the emergency cases in 2020. The postoperative

mortality rate for elective cases remained constant (0.2%) for 2019, 2020, and 2021. The emergency cases had a mortality rate of 1.1% for 2020 and 1.59% for 2019. Our study did not find any significant adverse effects in the postoperative outcomes or ASA classifications that could be linked to the COVID pandemic.

This study had several limitations. Primarily, the UPR-affiliated hospitals' experiences with both significantly decreased case volumes and with COVID-19 cases were unique and may not be comparable to those of other locations, thereby limiting the generalizability of our findings. The COVID-19 pandemic has continued beyond 2022, and the effect(s) of any new variants of the virus will require further evaluation.

Its retrospective design also limited this study.

Another possible explanation for the observed decrease of cases in 2020 and 2021 is that the decreasing population in PR—which decrease is associated with a high migration rate to the continental United States—is causing a correlative decrease in the overall surgical workload.

Though our data are not comprehensively representative of our general population, they nevertheless indicate that we experienced a significant decrease in the volume of surgical cases during the COVID-19 pandemic.

While the total surgical volume decreased 30% during the COVID-19 lockdown, most of the characteristics of the surgical patients remained the same. At the time of this writing, two years after the pandemic, we have not yet recovered and continue to have fewer surgical cases than we did in 2019. As new COVID variants spread and, consequently breakthrough infections in vaccinated individuals (17) become frequent, it is clear that we are not back to normal.

Conclusion

The impact of the COVID-19 pandemic resulted in a 30% decrease in the number of surgical cases. Elective surgery dropped 33%, while emergency surgery had a 16% decrease. However, the patient characteristics, such as ASA and outcome, remained unchanged.

Resumen

Objetivo: Evaluar como la pandemia de COVID-19 (declarada en marzo del 2020) afectó nuestros servicios quirúrgicos. **Métodos:** Utilizando el banco de datos del Departamento de Cirugía de la Universidad de Puerto Rico, evaluamos el número de casos quirúrgicos y sus características durante los años 2019 a 2021. Las variables examinadas incluyeron la edad, el género, la clasificación de la Sociedad Americana de Anestesiología, el tipo de cirugía (electiva/emergencia), si fue admitido o ambulatorio y el resultado de la cirugía. **Resultados:** El número total de casos quirúrgicos disminuyó 30% de 5,040 en el 2019 a 3,564 en el 2020, pero después aumentaron como un 10% a 3,935 en el 2021. Los casos de cirugía electiva bajaron un 33% de 4,383 en el 2019 a 2,924 en el 2020. La cirugía de emergencia solamente

tuvo una disminución de 16% de 650 a 546 casos entre el 2019 y 2020. Los pacientes quirúrgicos electivos durante el 2020 fueron significativamente más viejos, notando un porcentaje mayor de hombres que requirieron admisión con mayor frecuencia. Se identificaron 3 períodos significativos que correlacionaron con el número de casos: el cierre de emergencia (“lockdown”) por el COVID (marzo 2020), el aumento de infecciones por la variante Delta (julio 2021) y la variante Omicron (diciembre 2021). Conclusión: La pandemia de COVID-19 causó una disminución significativa en el número de casos quirúrgicos. Dos años después de la pandemia, aun no nos recuperamos del todo, y seguimos con menos casos que en el 2019.

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