

Surgical oncology operative experience at a high-volume safety-net hospital during the COVID-19 pandemic

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Funding information

National Cancer Institute,
Grant/Award Numbers: K12CA226330, T32CA211034

Abstract

Background: The coronavirus (COVID-19) pandemic led to disruptions in operative and hospital capabilities as the country triaged resources and canceled elective procedures. This study details the operative experience of a safety-net hospital for cancer-related operations during a 3-month period at the height of the pandemic.

Methods: Patients operated on for or diagnosed with malignancies of the abdomen, breast, skin, or soft-tissue (September 3, 2020–September 6, 2020) were identified from operative/clinic schedules. Sociodemographics, tumor and treatment characteristics, and COVID-19 information was identified through retrospective chart review of a prospectively maintained database. Descriptive statistics were calculated.

Results: Fifty patients evaluated within this window underwent oncologic surgery. Median age was 61 (interquartile range: 53–68), 56% were female, 86% were White, and 66% were Hispanic. The majority (28%) were for colon cancer. Only two patients tested positive for COVID-19 preoperatively or within 30 days of their operation. There were no mortalities during the 1-year study period.

Conclusion: During the COVID-19 pandemic, many hospitals and operative centers limited interventions to preserve resources, but oncologic procedures continued at many large-volume academic cancer centers. This study underscores the importance of continuing to offer surgery during the pandemic for surgical oncology cases at safety-net hospitals to minimize delays in time-sensitive oncologic treatment.

KEYWORDS

clinical outcomes, coronavirus, surgical oncology

1 | INTRODUCTION

The novel coronavirus (COVID-19) caused by the Sars-Cov-2 virus has led to disruptions in all aspects of life, perhaps most notably in the healthcare system.¹ As cases surged at the beginning of the pandemic, and hospital systems prepared for a heavy influx of patients, many elective and non-emergent surgical procedures were canceled or postponed in an effort to preserve personal protective equipment and decrease inpatient hospital volume.² Emergency and life-preserving procedures (e.g., trauma surgery, transplantation surgery, and other

emergent procedures) continued without interruption, but mixed guidance was issued regarding oncologic and cancer-related operations.³

Patients undergoing cancer treatment often have a cancer and stage-specific multidisciplinary treatment plan based on National Comprehensive Cancer Network (NCCN) guidelines.⁴ During the pandemic, however, many of these guideline-based treatments were disrupted or altered to accommodate limited hospital resources or a push for decreased in-person hospital and clinic visits.⁵ Innovative strategies to cancer care began to arise including prolonged neoadjuvant chemotherapy treatment and radiation and endocrine therapy

to serve as a bridge to definitive surgery.⁶ In many centers, however, surgical oncology care was prioritized, and many cancer-related operations were able to continue as scheduled.⁷

The prioritizing of surgical oncology procedures was part of an effort to decrease risk of cancer progression during the pandemic.⁸ As discussed, these patients often have a carefully designed treatment regimen, and a delay in definitive surgical resection could have potentially negative implications in survival and other clinically relevant parameters.⁴ This study aims to detail the surgical oncology experience of a high-volume safety-net hospital (SNH) during a three-month period at the beginning of the pandemic. While this experience has previously been described in the literature for other institutions, it has yet to be described in a SNH system, which is essential to minimizing further health disparities already noted in this population.^{9–12}

2 | METHODS

2.1 | Data source and patient selection

Institutional review board approval for this study was obtained waiving the need for individual patient consent, as this was a retrospective chart review. Physician and operating room schedules were used to identify patients for inclusion within the study (September 3, 2020–September 6, 2020). Patients operated on at the SNH during the study period were included. The United States Department of Health and Human Services defines a SNH as one where providers organize and deliver a significant level of both healthcare and other health-related services to the uninsured, Medicaid, and other vulnerable populations.¹³ Uninsured patients who provided proof of residence within the county were eligible to receive county tax-funded care within the SNH system based on an income-adjusted fee for service scale. Patients with an income at or below 300% of the federal poverty level were also eligible for full or partial coverage of services, depending on annual income.¹⁴

2.2 | Patient selection

Inclusion criteria were any patients treated at the SNH who were greater than 18 years old, had a pathologic diagnosis of cancer, and had surgery during the study period. Specifically, patients with biopsy confirmed cancers of the appendix, breast, colon, esophagus, liver, pancreas, rectum, skin, soft-tissue, and stomach were included.

2.3 | Variables

Sociodemographic (e.g., age, gender, race, ethnicity, and operative/treatment institutions), tumor characteristics (e.g., size, lymph node status, stage), treatment characteristics (e.g., neoadjuvant

chemotherapy, radiation, endocrine therapy), surgical course (e.g., urgency of surgery, surgical intent, type of anesthesia, surgical approach, and preoperative chest radiograph or computer tomography [CT] chest results, COVID-19 information [e.g., screening, positivity rate, modality of diagnosis, changes in treatment due to the pandemic]), and postoperative disposition was collected from electronic medical health records. Additionally, COVID-19 positivity information was obtained 1 year after the study.

2.4 | Statistical analysis

Descriptive statistics were calculated for the above parameters. Additionally, a subgroup analysis was conducted for patients who had a diagnosis of COVID-19. Statistical analysis was performed using SPSS version 25 (IBM Corporation, copyright 2017).

3 | RESULTS

3.1 | Sociodemographics

A total of 50 patients met the inclusion criteria. Median age was 61 (interquartile range [IQR]: 53–68) and 56% were female (Figure 1 and Table 1). The majority were White (86%), 14% were Black, and 66% were Hispanic.

3.2 | Malignancy information

The majority of patients (28%) were operated on for colon cancer, but other malignancies included cancers of the appendix, breast, esophagus, liver, pancreas, rectum, skin, and stomach (Table 1). Additionally, soft-tissue and bony sarcomas represented 10% of the operative interventions. Most patients (94%) had non-metastatic disease.

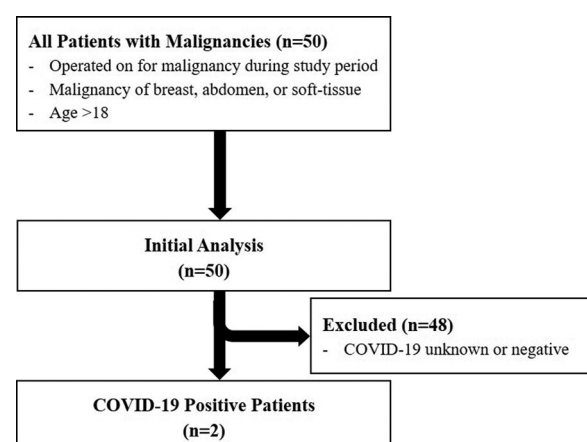


FIGURE 1 Patient selection with inclusion and exclusion criteria

TABLE 1 Sociodemographics and malignancy information

Demographics	(n = 50), n (%)
Age (median, 95% CI)	61 (53–68)
Gender	
Female	28 (56)
Male	22 (44)
Race	
Asian	0 (0)
Black	7 (14)
White	43 (86)
Ethnicity	
Hispanic	33 (66)
Not Hispanic	17 (34)
BMI (median, 95% CI)	26.4 (24.4–29.8)
US citizen	19 (38)
Health insurance	
Hospital card	8 (16)
Medicaid	1 (2)
Medicare	10 (20)
Private	29 (58)
Uninsured	2 (4)
Malignancy information	
Type of cancer	
Breast	10 (20)
Colon	14 (28)
Esophagus	7 (14)
Gastric	6 (12)
Liver	1 (2)
Melanoma	1 (2)
Pancreatic	4 (8)
Rectal	2 (4)
Sarcoma	5 (10)
T-category (clinical)	
T1	5 (10)
T2	8 (16)
T3	8 (16)
T4	6 (12)
N-category (clinical)	
N0	11 (22)
N1	8 (16)
N2	7 (14)

(Continues)

TABLE 1 (Continued)

Demographics	(n = 50), n (%)
M-category (clinical)	
M0	47 (94)
M1	3 (6)

Abbreviations: BMI, body mass index, CI, confidence interval.

3.3 | Operative information

Most (82%) of the procedures were elective, and 41 (82%) had curative intent procedures (Table 2). Procedures were predominately performed under general anesthesia (98%) with an open approach (64%). Pre-operative pain-film radiographs were performed in 12% of the patients, and CT scans were performed in 22% of the patients. Abnormal pre-operative chest imaging was noted in 10% of the patients.

3.4 | COVID-19 related information

Most of the patients (66%) were screened for COVID-19 before operative intervention (Table 2). Two (4%) of patients were diagnosed with COVID-19 of which one patient was diagnosed via laboratory polymerase chain reaction test and the other was diagnosed on CT chest. Two (4%) of patients had changes to their treatment course due to the COVID-19 pandemic. There were no postoperative deaths. An additional four (8%) patients tested positive for COVID-19 within 1 year for a total of six (12%) of the cohort. A total of eight faculty members performed the surgical procedures, and one developed COVID-19 (with minimal symptoms including malaise).

3.5 | Subgroup analysis

The two patients with COVID-19 diagnoses were evaluated in a subgroup analysis. Median age was 62 (IQR: 53–70), and one (50%) was female (Table 3). The diagnosis was made before surgery in one patient and postoperatively in the other patient. Symptoms were minimal in both patients, and only one patient had abnormal findings on CT chest.

4 | DISCUSSION

The COVID-19 pandemic has caused disruptions to many facets of life, including the healthcare system. However, we were able to continue complex surgical oncology care at a high-volume SNH. Procedures performed were for cancers of the appendix, breast, colon, esophagus, liver, pancreas, rectum, skin, soft-tissue, and stomach. Operations were continued with minimal COVID positivity rates for patients (two patients were diagnosed with COVID-19 before or within 30 days after the operation), providers, and no postoperative complications secondary to

TABLE 2 Operative, postoperative, and COVID-19 related information

	(n = 50), n (%)
<i>Operative information</i>	
Urgency of surgery	
Elective	41 (82)
Emergent	4 (8)
Urgent	5 (10)
Surgical intent	
Curative	41 (82)
Palliative	9 (18)
Anesthesia type	
General	49 (98)
Local	1 (2)
Approach	
Minimally invasive	18 (36)
Open	30 (60)
Converted to open	2 (4)
Preoperative chest X-ray	
Yes: Abnormal	0 (0)
Yes: Normal	6 (12)
Not performed	44 (88)
Preoperative chest CT	
Yes: Abnormal	5 (10)
Yes: Normal	6 (12)
Not performed	39 (78)
COVID-related information	
COVID-19 suspected	1 (2)
COVID-19 screening performed	33 (66)
COVID-19 positive	2 (4)
COVID-19 positive diagnostic test	
CT chest	1 (50)
Laboratory test	1 (50)
Changes in treatment due to COVID-19	
Neoadjuvant chemotherapy longer	1 (2)
Neoadjuvant radiation not usually indicated	1 (2)
No changes to pre-COVID-19	48 (96)
<i>Postoperative information</i>	
Patient status 30 days postoperatively	
Alive, discharged to home	49 (98)
Alive, discharged to rehabilitation	1 (2)
Deceased	0 (0)

TABLE 3 Patient information for COVID-19 positive patients

Demographics	(n = 2), n (%)
Age (median, IQR)	62 (53-70)
Gender	
Female	1 (50.0)
Male	1 (50.0)
Race	
Asian	0 (0.0)
Black	0 (0.0)
White	2 (100.0)
Ethnicity	
Hispanic	0 (0.0)
Not Hispanic	2 (100.0)
BMI (median, IQR)	31.3 (24.4-38.3)
US Citizen	1 (50.0)
Health insurance	
Hospital card	0 (0.0)
Medicaid	0 (0.0)
Medicare	0 (0.0)
Private	2 (100.0)
Uninsured	0 (0.0)
Primary healthcare delivery	
Private Hospital	1 (50.0)
Safety-Net Hospital	1 (50.0)
Diagnosis and symptoms	
When was COVID-19 diagnosed	
Before surgery	1 (50.0)
Postoperatively (within 30 days)	1 (50.0)
COVID-19 symptoms	
Abdominal pain	0 (0.0)
Cough	0 (0.0)
Dyspnea	0 (0.0)
Diarrhea	0 (0.0)
Fatigue	0 (0.0)
Fever	0 (0.0)
Hemoptysis	0 (0.0)
Myalgia	0 (0.0)
Nausea/vomiting	0 (0.0)
Sputum	0 (0.0)
Preoperative chest X-ray	
Yes: Abnormal	0 (0.0)

TABLE 3 (Continued)

Demographics	(n = 2), n (%)
Yes: Normal	0 (0.0)
Not performed	2 (100.0)
Preoperative chest CT	
Yes: ground glass opacity	1 (50.0)
Yes: normal	0 (0.0)
Not performed	1 (50.0)

Abbreviations: BMI, body mass index; CT, computer tomography; IQR, interquartile range.

COVID-19, suggesting the importance of continuing surgical oncology operations during the COVID-19 pandemic at SNH.

Given the vulnerable population served by SNHs, the impetus to continue oncologic care is particularly important. The COVID-19 pandemic has been shown to disparately affect those of lower socioeconomic status as well as racial/ethnic minorities.^{15,16} This population of patients is a similar population to those served at our institution, a population that often is subjected to various healthcare disparities.¹⁷ The continuation of surgery minimized further disparities in this vulnerable group of patients by delivering comprehensive oncologic care without delay to patients in the community. More than 10% of the patients operated on during the pandemic where racial minorities and more than 60% were ethnic minorities. Additionally, only about 38% of the patients were documented as US citizens in the medical record. This vulnerable subset of patients relies on SNHs for oncologic care, and this commitment must be upheld even in challenging times such as the COVID-19 pandemic.

As awareness spread of the need for elderly patients and patients with pre-existing conditions to decrease gathering, many patients with malignancies heeded to local and national health officials and remained at home, only leaving their residence for medical care or essential activities, these patients sheltered themselves from the spread of the virus.¹⁸⁻²⁰ This underlines yet another potential disparity noted in the pandemic. Patients of lower socioeconomic status, even those with malignancies, may not be able to remain safely at home. Still, it is reassuring that so few patients contracted the virus.²¹ Within 1 year after surgical treatment, however, an additional four patients did test positive for the virus for a total positivity rate of 12% in the cohort, a rate similar to the average positivity rate in the study location throughout the pandemic.²² We must remain vigilant throughout the remainder of the pandemic to limit the exposure of our vulnerable patients to this deadly virus.

In addition to the challenges patients face when entering hospitals or clinics during the pandemic, physicians and hospital staff face risks as well, including potential exposure to the Sars-Cov-2 virus. Precautions were taken by all hospital staff, physicians, and residents to minimize exposure to the virus.²³ Once adequate testing resources became available, all patients were tested for COVID-19 before undergoing an operation. Before beginning the operation, only essential members of the intubation

team (e.g., anesthesia personnel, critical nursing staff, etc.) remained in the operating room to decrease exposure to the aerosolizing procedure of intubation.^{24,25} Once a patient's airway was secured, appropriate personal protective equipment was required for all team members in the operating room.²⁶ Postoperatively, COVID-19 positive patients were housed in dedicated negative-pressure units.²⁷ All COVID-19 negative patients were housed in separate floors, but appropriate precautions were taken when checking in on them. Even with all these precautions, one attending physician did contract COVID-19. This underlines the importance of extreme caution when caring for COVID-19 positive patients.

For patients in this cohort who had delayed operative interventions due to the pandemic, changes in their treatment plan were implemented. For example, chemotherapy regimens were adjusted (often prolonged) for patients who elected to delay surgical intervention.²⁸ Additionally, patients underwent neoadjuvant radiation treatments for some malignancies that do not usually require these treatments (e.g., pancreatic).²⁹ While these regimens were detailed by the Society of Surgical Oncology society guidelines, unique treatment modalities were designed for each patient to minimize delays in care.^{30,31} In the ensuing few months and years, we will continue to monitor these patients to identify if these changes in treatments affected long-term oncologic outcomes (e.g., pathologic response, recurrence-free survival, overall survival, etc.).

Finally, it is important to discuss a need for continued innovation and careful planning to care for these patients. As discussed above, each treatment regimen in the COVID-19 pandemic has been carefully crafted to meet the needs of the individual patients.³² As we continue through this pandemic, providers must work with patients and their families to accommodate the many facets of their lives that are continuously in motion during this difficult time. As the virus continues to move through the population, there may continue to be spikes in COVID-19 cases that arise.³³ While our SNH center has already traversed a large spike in cases, it is conceivable that another could happen in the future.³⁴ We must remain vigilant as clinicians and healthcare workers to always provide the most appropriate and equitable care to all patients served. As a country and a medical community, we will make it through this difficult period, but we hope to make it through without compromising the surgical oncologic care provided to our vulnerable patients in SNHs.

5 | CONCLUSION

The COVID-19 pandemic has reshaped many facets of life throughout the United States and the world, but the need for oncologic surgical care has remained. This study details the experience of a large-volume SNH as it continued to provide surgical interventions to the vulnerable population served. As we continue to work through the current pandemic and develop contingency plans for future national emergencies, the strategies and efforts to continue providing oncologic surgery will serve as a model for institutions to follow. Institutions must always strive to provide exceptional and equitable care to all patients served.

ACKNOWLEDGEMENT

This study was supported by the National Institute of Health under a training grant T32CA211034 and K12 K12CA226330.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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How to cite this article: Kronenfeld JP, Collier AL, Choi S, et al. Surgical oncology operative experience at a high-volume safety-net hospital during the COVID-19 pandemic. *J Surg Oncol.* 2021; 124:983-988. <https://doi.org/10.1002/jso.26616>