



## Research Report

# The impact of the ban on elective surgery in New York City during the coronavirus outbreak on gynecologic oncology patient care<sup>☆</sup>

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## ARTICLE INFO

## Keywords:

Covid-19  
Surgical delay  
Elective surgery ban  
Pandemic  
Patterns of care

## ABSTRACT

**Introduction:** Elective surgical procedures were suspended during the coronavirus disease pandemic (COVID-19) in New York City (NYC) between March 16 and June 15, 2020. This study characterizes the impact of the ban on surgical delays for patients scheduled for surgery during this first wave of the COVID-19 outbreak.

**Methods:** Patients who were scheduled for surgical treatment of malignant or pre-invasive disease by gynecologic oncologists at three NYC hospitals during NYC's ban on elective surgery were included. Outcomes of interest were the percentage of patients experiencing surgical delay and the nature of delays. Kruskal-Wallis, chi-square, and logistic regression tests were performed with significance set at  $p < 0.05$ .

**Results:** Of the 145 patients with malignant or pre-invasive diseases scheduled for surgery during the ban on elective surgery, 40% of patients experienced one or more surgical delays, 10% experienced two or more and 1% experienced three surgical delays. Of patients experiencing an initial delay, 77% were hospital-initiated and 11% were due to known or suspected personal COVID-19. Overall, 81% of patients completed their planned treatment, and 93% of patients underwent their initially planned surgery. Among patients for whom adjuvant therapy was recommended, 67% completed their planned treatment, and the most common reasons for not completing treatment were medically indicated followed by concerns regarding COVID-19.

**Conclusion:** During the ban on elective surgery in NYC during the first outbreak of the COVID-19 pandemic, many patients experienced minor surgical delays, but most patients obtained appropriate, timely care with either surgery or alternative treatment.

## 1. Introduction

The syndrome of coronavirus disease (COVID-19) was first described in Wuhan, China as early as December 2019. The cause was later identified as the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) as it spread globally (Lu et al., 2020). In the United States, New York City (NYC) was one of the first epicenters of the pandemic; as of February 2022, there have been 1,913,641 confirmed cases in NYC, with 158,050 hospitalizations, and 33,398 confirmed deaths (Health NYC, 2022). From February 29 to June 1, 2020, NYC experienced a surge of COVID-19 cases that led to a peak hospitalization rate of 1,566 hospitalizations daily (Thompson et al., 2020). As part of the public health COVID-19 response to assure space for a surge of inpatients,

elective surgical procedures were paused on March 18, 2020 in New York State, as supported by the Center for Medicare and Medicaid Services (CMS), the Society of Gynecologic Oncology (SGO), the American College of Obstetricians and Gynecologists (ACOG), and the American College of Surgeons (ACS) (Services CfMaM, 2020; Oncology SoG, 2020; Surgeons ACo, 2020). These restrictions caused gynecologic oncology practitioners to augment management strategies, often with limited evidence to support clinical decisions (Schrag et al., 2020). During this surgical ban, a limited number of procedures were able to proceed, including some cancer surgeries. Limited data from prostate, breast, colon, lung, and pancreatic cancer provided guidance on patients for whom surgery can be safely delayed (Fligor et al., 2020; Ginsburg et al., 2020; Johnson et al., 2021; Rygalski et al., 2021; Sud et al., 2020).

<sup>☆</sup> This poster was presented at the Society of Gynecologic Oncology Annual Meeting, virtual, March 2021.

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<https://doi.org/10.1016/j.gore.2022.100997>

Received 7 March 2022; Received in revised form 1 May 2022; Accepted 3 May 2022

Available online 10 May 2022

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On June 6, 2020, general restrictions on elective surgery ended in New York (Surgeons Aco, 2020). Factors including COVID-19, patients' fear of hospitals, administrative burdens, and alternative medical plans may have contributed to ongoing delays and impacted medical care of those affected by the ban on elective surgery. The objective of this study was to characterize the impact of the ban on elective surgery on surgical delays for patients who were scheduled for surgery with a gynecologic oncologist during the first COVID-19 outbreak in New York City.

## 2. Methods

A cohort study of patients scheduled to undergo surgery during the ban on elective surgery between March 16, 2020, and June 15, 2020 by a gynecologic oncologist at three NYC metropolitan area hospitals was conducted. The hospitals included were a 1,639-bed quaternary referral academic medical center in Manhattan, a 388-bed tertiary academic medical center in a community setting in Brooklyn, and a 591-bed tertiary academic medical center in Long Island. Though within the same umbrella institution, each campus is independently governed based on each hospital's acute needs and the patient populations it serves, with practice pattern variations in response to the pandemic. From March to May 2020, each of our campuses had approximately 1,500 admissions for COVID-19, with admissions for each campus reaching its peak in April 2020. During the ban on elective surgery, a formal process for surgical scheduling was instituted: each division reviewed proposed cases weekly, prioritized cases based on acuity, and then submitted the prioritized cases to a central governing board of each hospital for approval. The hospital would then approve or request a delay based on the acuity of the pandemic, the surgical capacity, and availability of hospital resources. Minimally invasive cases were encouraged to reduce the burden of admitted postoperative patients, and medically appropriate non-surgical alternative treatment regimens were considered.

Patients were included if they were scheduled to undergo surgery for a known malignancy, suspected malignancy, or a premalignant condition by a gynecologic oncologist between March and June of 2020. Patients with suspected benign conditions were excluded as these cases could generally be safely postponed for longer periods without serious consequences. The initial proposed date of surgery was used as a reference for delay time and was obtained from a surgical schedule that is circulated weekly to the department at one hospital, and by a prospective database of patients who experienced COVID-19 related surgical delays at two of the hospital sites.

Facility-level data at the department level were extracted to determine trends in surgeries performed by gynecologic oncologists. Patient-level data including demographics, clinical characteristics, perioperative characteristics, cancer treatment, and outcomes were collected from the electronic medical record. Patients with known or suspected malignancy were compared to patients with premalignant disease across demographic and clinical characteristics. Time to proposed or actual surgical date was defined as days from the date of the preoperative consultation visit to the proposed or actual date of surgery. Length of delay was defined as days between proposed surgical and actual surgical date, if applicable. Postoperative complications were graded according to the Clavien-Dindo scale for postoperative complications (Clavien et al., 2009). Patients who underwent surgery for confirmed malignancy and required adjuvant therapy were further investigated to see if the physician recommended adjuvant therapy was completed. For patients who did not complete the recommended treatment, the reason for lack of completion was recorded. Patient charts were reviewed until April 2022 to allow time for surgical re-scheduling and completion of treatment plans. Patients who were scheduled but never underwent surgery were additionally reviewed to determine alternative treatments and reasons for postponement.

For patients who experienced surgical delays, delays were classified as hospital-initiated (e.g., ban on elective surgery, physician-initiated), COVID-19-suspected or confirmed illness of patient (e.g., patient

symptomatically ill, screened positive for COVID-19), or patient-initiated not related to a personal history of COVID-19 (e.g., patient preference, patient caring for family, personal scheduling conflicts without a documented COVID-19 diagnosis). Up to three total delays were captured. Patients were deemed to have a COVID-19 infection if reported on chart review (e.g., documented positive lab test, evidence of IgG antibodies, or written documentation of SARS-CoV-2 infection by provider).

Descriptive statistics, Kruskal-Wallis, and chi-square test of independence were performed with significance set at  $p < 0.05$ . Logistic regression was performed to ascertain factors associated with surgical delay, with results reported as adjusted odds ratios (aOR) and 95% confidence intervals (CI). IBM SPSS (Armonk, NY) version 25 was used for all analyses. This study was approved by the Institutional Review Board.

## 3. Results

From March to June of 2020, the Department of Obstetrics and Gynecology at our three hospitals, of which the Division of Gynecologic Oncology is a part, performed 1,446 surgeries, representing only 47% of surgeries performed during the same time period in 2021. In April 2020, each of the hospitals had over 1,500 admissions to the hospitals due to the COVID-19 pandemic; during this month, only 95 total surgeries were performed, compared to 763 surgeries in April 2021. During the ban on elective surgery, cases performed by the Division of Gynecologic Oncology comprised 30% of all surgical cases compared to 25% of all surgical cases in the department in 2021 ( $p = 0.019$ ). Fig. 1 describes the patterns of surgeries at our three hospitals before, during, and after the ban on elective surgery.

A total of 195 patients were scheduled to undergo a surgical procedure during the ban on elective surgery by our Gynecologic Oncology Division. Of those, 145 (74.4%) met inclusion criteria (Manhattan- 34, 23.4%, Brooklyn- 57, 39.3%, and Long Island- 54, 37.2%). There were 61 (42.1%) malignant, 55 (37.9%) suspected malignant, and 29 (20.0%) premalignant disease patients. Patients with known malignancies were more likely to be older compared to patients with suspected malignancy or premalignant disease (median age at surgical consultation: 60 vs 57 vs 42,  $p = 0.002$ ). Patients with known or suspected malignancy had a shorter time between surgical consultation and initially planned surgery compared to patients with pre-invasive disease (20 vs 34.5 days,  $p = 0.002$ ), and had a shorter time from surgical consultation to the actual date of surgery (23 days vs 64 days,  $p = 0.008$ ). There were no differences in length of stay, unplanned conversion to open surgery, intra-operative or postoperative complications between these groups. Additional demographic and perioperative characteristics are described in Table 1.

Among patients initially scheduled to undergo surgery during the surgical ban, 57 patients (39.3%) experienced surgical delays. The majority of these patients (43 of 57, 75.4%) had either known or suspected malignancy, and there were no differences between patients with known, suspected, or premalignant disease in the percentage of delays or the types of delays. Fourteen patients (9.7%) experienced a second surgical delay, and two patients (1.4%) experienced three separately documented surgical delays. The majority of first surgical delays were hospital initiated (44 of 57, 77.2%). A minority of initial surgical delays were patient-initiated, not related to COVID-19 (7 of 57, 12.3%), and 6 of 57 (10.5%) were delayed due to personal COVID-19-related reasons. While there were no differences in rates of surgical delays by race, black patients were less likely to undergo delays due to hospital-initiated factors compared to non-black patients (7 of 12, 58.3% vs 37 of 45, 82.2%), and black patients were more likely to experience delays due to COVID-19 related reasons (4 of 12, 33.0% vs 2 of 45, 4.4%,  $p = 0.015$ ). These delays are described in Table 2.

For patients experiencing a second surgical delay, there were no differences according to disease category ( $p = 0.838$ ). Seven patients

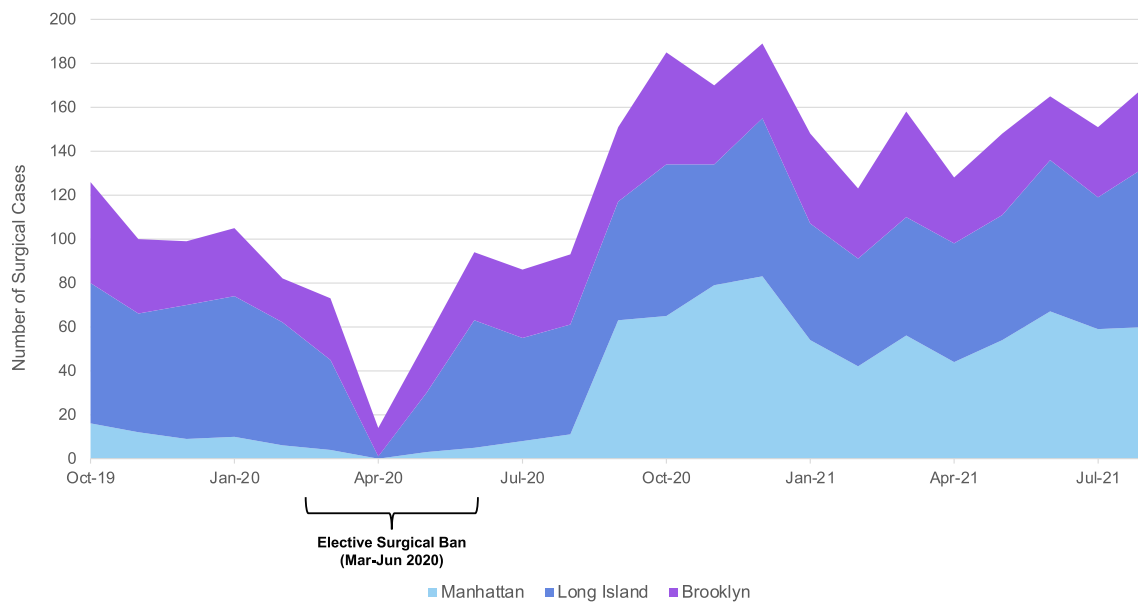


Fig. 1. Surgical volume by site from October 2019 through July 2021.

were delayed due to hospital-initiated factors, five due to non-COVID-19 related patient-initiated factors, and two patients due to personal COVID-19-related factors. The two patients who experienced a third surgical delay both had known malignancy; one of these patients experienced this delay due to patient-initiated non-COVID-19 related factors, and the other due to COVID-19. Of patients who did not experience surgical delays, the median time from consultation to surgery was 20 days (range 1–80 days) versus 79 days (range 15–247 days) for patients who did experience surgical delays. In a logistic regression analysis, age, race, ethnicity, preoperative diagnosis (known or suspected malignant, premalignant), and COVID-19 status were not associated with surgical delays (Table 3). Undergoing surgery at the Brooklyn campus was associated with decreased odds of surgical delays (aOR 0.32, 95% CI 0.12–0.87).

Ten patients (7.0%) who were initially scheduled for surgery during the surgical ban never underwent surgery within two years of their proposed surgical date (Table 4). All of these patients cancelled their surgery due to the surgical ban or subsequent patient-requested cancellations due to fear of the ongoing COVID-19 pandemic. Four patients had confirmed or suspected malignancies; one patient with elevated CA-125 and adnexal mass was lost to follow up, with unknown vital status. Two patients with grade 1 endometrioid endometrial cancer were treated with hormonal management and these patients remained with no evidence of disease during our follow-up period. One patient with vulvar cancer underwent radiation therapy instead of surgery. One patient with endometrial intraepithelial neoplasia underwent hormonal management instead of surgery. The remaining patients had pre-invasive disease, diagnostic, or risk-reducing indications for surgery.

In our cohort, 30 (20.7%) patients tested positive for SARS-CoV-2 during our study period inclusive of the follow-up period through April 2022. Of these patients, four required hospital admission. There were no COVID-19-related intensive care unit admissions or deaths in our cohort. Twelve patients contracted COVID-19 during the surgical ban and seven of those patients experienced surgical delays. However, in our multivariate regression, COVID-19 infection was not associated with surgical delays when adjusting for age, race, diagnosis, and the treating hospital (aOR 1.92, 95% CI 0.58–6.36).

Treatment modifications were common, especially for patients with ovarian and endometrial cancer. Of the twelve patients with ovarian cancer, seven patients underwent neoadjuvant chemotherapy, and four patients received six cycles of neoadjuvant chemotherapy to delay

interval debulking due to the ban on elective surgery. Of 23 patients with confirmed or suspected endometrial cancer, six patients received hormonal therapy as a bridge to definitive surgical management, two patients were managed medically with hormones indefinitely, and one patient was managed medically as she desired fertility.

Postoperative adjuvant therapy was recommended to fifty patients: 19 were prescribed adjuvant chemotherapy, 19 adjuvant radiation therapy, and 12 were prescribed combination chemotherapy and radiation. Of these patients, 33 (66.7%) completed adjuvant treatment. Reasons for not undergoing or completing adjuvant treatment were: medical limitations/ personal illness, 4; declined due to COVID-19 related concerns, 3; preferred single modality when dual-modality adjuvant therapy was recommended, 3; lost to follow up, 3; social/ financial reasons, 2; transferred care to an outside hospital due to distance from treating facility, 1; and postoperative death, 1. The median time to the start of adjuvant treatment was 53 days from surgery (range 6–118 days). There was no association between experiencing a surgical delay and adjuvant therapy completion ( $p = 0.624$ ).

Overall, 118 of 145 (81.4%) completed their initial planned treatment for malignant or preinvasive disease during the surgical ban throughout the surge of the initial wave of the pandemic in NYC. Of the patients who completed their planned treatment, 42 (35.6%) experienced a delay in their initial surgery, compared to 15 of 27 (55.6%) patients who did not complete their treatment ( $p = 0.055$ ). Race, ethnicity, treating hospital, and type of disease were not associated with treatment completion. There were no differences in time to initiation of adjuvant therapy between patients who did or did not experience an initial surgical delay (mean days from surgery date to start of adjuvant therapy: 54 vs 60 days,  $p = 0.414$ ). Fifteen patients with cancer had recurrence or progression of disease during our follow up, and 14 of these patients did not experience any surgical delays.

#### 4. Discussion

The ban on elective surgery due to the COVID-19 pandemic caused changes in practice patterns with potential lasting impacts on patient care during a time of uncertainty. In this cohort study of patients planned to undergo surgery during the NYC ban on elective surgery during the first wave of the COVID-19 pandemic, 40% of patients experienced surgical delays which were primarily hospital-initiated, and 93% of patients eventually underwent their initially scheduled surgery. Surgical

**Table 1**  
Demographic and perioperative characteristics of patients by presurgical disease category.

	Known malignant (N = 61)	Suspected malignant (N = 55)	Premalignant (N = 29)	All (N = 145)	P-value
Age at consultation in years (Median, range)	63 (30–89)	57 (24–82)	42 (26–71)	57 (24–89)	0.002
Body mass index in kg/m <sup>2</sup> (Median, range)	28 (18–45)	29 (20–53)	31 (20–54)	29 (18–54)	0.16
Race					0.659
White	35 (57.4)	39 (70.9)	20 (69.0)	94 (64.8)	
Black	10 (16.4)	8 (14.5)	5 (17.2)	23 (15.8)	
Asian	10 (16.4)	6 (10.9)	3 (10.3)	19 (13.1)	
Other	6 (9.8)	2 (3.6)	1 (3.4)	9 (6.2)	
Ethnicity					0.799
Hispanic	15 (24.6)	14 (25.5)	9 (31.0)	38 (26.2)	
Non-Hispanic	46 (75.4)	41 (74.5)	20 (69.0)	107 (73.8)	
Route of surgery					<0.001
Laparoscopy/robotic	41 (70.7)	28 (56.0)	8 (29.6)	77 (57.0)	
Vaginal	7 (12.1)	14 (28.0)	19 (70.4)	40 (29.6)	
Open	10 (17.2)	8 (16.0)	0 (0.0)	18 (13.3)	
Type of surgery					<0.001
Diagnostic procedure (cancer diagnosis with no staging and benign/premalignant histology)	4 (6.9)	42 (84.0)	24 (88.9)	70 (51.9)	
Ovary	7 (12.1)	5 (10.0)	0 (0.0)	12 (8.9)	
Uterine	33 (56.9)	3 (6.0)	2 (7.4)	38 (28.1)	
Cervix/vulvar	10 (17.2)	0 (0.0)	1 (3.7)	11 (8.1)	
Recurrence	4 (6.9)	0 (0.0)	0 (0.0)	4 (3.0)	
Operative time in minutes (Median, range)	147.5 (16–555)	97.5 (14–300)	46 (14–365)	103 (14–555)	0.008
Length of stay in days (Median, range)	0 (0–20)	0 (0–30)	0 (0–2)	0 (0–30)	0.381
Final pathology					<0.001
Ovarian malignancy	11 (19.0)	7 (14.0)	0 (0.0)	18 (13.3)	
Uterine malignancy	35 (60.3)	12 (24.0)	0 (0.0)	47 (34.8)	
Cervical/vulvar/vaginal malignancy	12 (85.7)	0 (0.0)	2 (7.4)	14 (10.4)	
Benign	0 (0.0)	29 (53.7)	25 (46.3)	54 (40.0)	
Other	0 (0.0)	2 (4.0)	0 (0.0)	2 (1.5)	
Unplanned conversion to open	0 (0)	0 (0)	1 (3.4)	1 (0.7)	0.102
Intraoperative complications					0.229
None	55 (94.8)	47 (94.0)	25 (92.6)	127 (94.1)	
Injury	0 (0.0)	2 (4.0)	2 (7.4)	4 (3.0)	
Hemorrhage	3 (5.2)	1 (2.0)	0 (0.0)	4 (3.0)	
Postoperative complications	9 (15.5)	5 (10.0)	0 (0.0)	14 (10.4)	0.091
None	49 (84.5)	45 (90.0)	27 (22.3)	121 (89.6)	
1	0	0	0	0	
2	6	4	0	10	
3A	1	1	0	2	
3B	1	0	0	1	
4A	1	0	0	1	

\*Premalignancy, suspected malignancy, or confirmed malignancy procedure other than staging/debulking included in this category.

**Table 2**  
Reasons for surgical delays by presurgical disease condition.

	Known malignant (N = 61)	Suspected malignant (N = 55)	Premalignant (N = 29)	All (N = 145)	P-value
Days from initial consultation to proposed procedure (Median, range)	19.5 (1–54)	20 (0–79)	34.5 (6–143)	21 (0–143)	0.004
Days from initial consultation to actual surgery (Median, range)	23 (1–247)	26 (1–188)	64 (6–215)	27 (1–215)	0.008
Length of delay in days (Median, range)	0 (0–196)	0 (0–441)	0 (0–154)	0 (0–441)	0.346
First delay	18 (29.5)	25 (45.5)	14 (48.3)	57 (39.3)	0.116
Hospital initiated	13 (72.2)	19 (76.0)	12 (85.7)	44 (77.2)	0.783
Patient initiated (non-COVID)	2 (11.1)	4 (16.0)	1 (7.1)	7 (12.3)	
COVID-related	3 (16.7)	2 (8.0)	1 (7.1)	6 (10.5)	
Second delay	6 (9.8)	6 (10.9)	2 (6.9)	14 (9.7)	0.838
Hospital initiated	2 (3.3)	4 (7.3)	1 (3.4)	7 (4.8)	0.691
Patient initiated (non-COVID)	2 (3.3)	2 (3.6)	1 (3.4)	5 (3.4)	
COVID-related	2 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	
Third delay	2 (3.3)	0 (0.0)	0 (0.0)	2 (1.4)	0.248
Hospital initiated	0	0	0	0	
Patient initiated (non-COVID)	1	0	0	0	
COVID-related	1	0	0	0	

\*Reason given for second delay.

\*\*Reason given for third delay.

**Table 3**  
Regression Analysis for Predictors of Surgical Delay.

	Univariate		Multivariate	
	OR	95% CI	OR	95% CI
<b>Age</b>	1.00	0.97–1.02	1.00	0.97–1.03
<b>Race</b>				
White	Reference		Reference	
Black	1.68	0.67–4.20	1.93	0.65–5.71
Asian	0.55	0.18–1.66	0.64	0.19–2.21
Other	0.77	0.18–3.27	1.76	0.33–9.41
<b>Ethnicity</b>				
Hispanic	Reference		Reference	
Non-Hispanic	1.85	0.83–4.11	1.82	0.68–4.89
<b>Diagnosis</b>				
Premalignant	Reference			
Suspected malignant	0.89	0.36–2.20	1.06	0.38–2.96
Known malignant	0.45	0.18–1.12	0.50	0.17–1.50
<b>COVID-19 positivity</b>	1.43	0.51–3.96	1.92	0.58–6.36
<b>Hospital</b>				
Manhattan	Reference		Reference	
Brooklyn	0.37	0.15–0.94	0.32	0.12–0.87
Long Island	1.47	0.62–3.48	1.46	0.58–3.70

OR: Odds ratio; CI: Confidence Interval.

delays were necessary for the healthcare system to absorb large numbers of acute inpatients suffering from COVID-19. Two-thirds of patients completed their recommended adjuvant therapy. Despite these barriers to care, 80% of patients completed their planned surgical and adjuvant treatment, with no differences by race, ethnicity, or treatment hospital.

The surge of the SARS-CoV-2 virus posed unprecedented challenges to the surgical management of patients. Personnel challenges including maintaining a healthy workforce, the shortage of personal protective equipment, and the scarcity of medical resources such as ventilators required for general anesthesia for the operating room and hospital beds for patients admitted postoperatively were in critical shortage during this initial wave of the pandemic. Many physician, trainee, nursing, and support staff teams were restructured and reallocated to various services to care for critically ill COVID-19 patients which resulted in unmet staffing needs.

Data from other epicenters add to the evidence that the COVID-19 pandemic has had practice implications for cancer care delivery. During the COVID-19 pandemic in the United Kingdom, there were fewer cytoreductive surgeries for ovarian cancer and laparoscopic procedures,

**Table 4**  
Details on those patients who never underwent surgery.

Patient	Indication	Planned Surgery	Reason for cancellation	Alternative treatment	Status
1	Elevated tumor markers, adnexal mass	Abdominal hysterectomy, BSO, tumor debulking	Patient request due to COVID-19	None	Lost to follow up
2	G1 endometrioid endometrial cancer	D&C and IUD placement	Hospital initiated COVID-19 delay	IUD	NED
3	G1 endometrioid endometrial cancer	Robotic-assisted TLH, BSO, sentinel lymph node biopsy	Hospital initiated COVID-19 delay	Hormonal treatment	NED
4	Vulvar cancer	Vulvectomy	Change in medical management	Radiation therapy	Alive with disease
5	Endometrial intraepithelial neoplasia	D&C, hysteroscopy	Patient request due to COVID-19	None	NED
6	Endometrial intraepithelial neoplasia	Robotic-assisted TLH, BSO	Hospital initiated COVID-19 delay	Megace	NED
7	Endometrial intraepithelial neoplasia	Robotic-assisted TLH, BSO	Hospital initiated COVID-19 delay	None	NED
7	Genetic mutation	D&C, hysteroscopy	Patient request, unspecified reason	None	NED
8	Cervical dysplasia	Robotic-assisted TLH, BSO	Patient request, unspecified reason	None	Lost to follow up
10	Postmenopausal bleeding on Tamoxifen	D&C, hysteroscopy	Hospital initiated COVID-19 delay	None	NED

BSO: bilateral salpingo-oophorectomy; TLH: total laparoscopic hysterectomy; D&C: dilation and curettage; IUD: intrauterine device; NED: no evidence of disease; G1: grade 1.

and higher rates of postoperative complications compared to historical controls. There were no significant changes in caseload or throughput, though this was not a primary outcome of the study (Leung et al., 2021). In Italy, cancer diagnoses fell by 44.9% compared to historical controls, suggesting that the pandemic impacted access to care (Ferrara et al., 2021). A prior study on gynecologic oncology care in NYC during the first wave of the pandemic demonstrated that 38.7% of patients had a modification in their oncology care due to the pandemic, with 67.4% of those scheduled for surgery having a treatment modification in their surgical plan, with the most common modification being a delay in treatment (Frey et al., 2020). However, this study did not report reasons for treatment modifications. Our study adds to the descriptive experience of gynecologic oncology care in NYC during the COVID-19 first wave and shows that despite delays in care, the majority of patients were able to complete their intended treatment plan. Many patients still did not complete their adjuvant therapy, likely due to the ongoing impact of the pandemic beyond the initial surgical ban.

Reasons for surgical delays have been described in the literature before the COVID-19 pandemic and include poor access to surgical providers, delays in diagnosis, and delays in time from diagnosis to treatment (de Jager et al., 2019). Insurance and race have been well described as factors associated with a longer time between diagnosis and surgical treatment, even in the absence of a major global pandemic (Mosunjac et al., 2012; Silber et al., 2013; Wise et al., 2015). Racial and ethnic disparities in COVID-19 positivity and disease severity have also been well-established (Magesh et al., 2021). In our study, though there were no differences by race in undergoing surgical delays, there were differences in the reasons for surgical delays by race, with black patients more likely to undergo delays due to COVID-19 related factors. These differences noted in delays are multifactorial and complex, as the COVID-19 pandemic may have further compounded well-established disparities in access to and timeliness of care.

A strength of this study is that a diverse group of patients was captured in our cohort, spanning patients from three different hospitals in the greater New York City area. However, given the global spread and impact of the COVID-19 pandemic, the NYC experience may not be generalizable to other populations. Our study also reports a longer follow-up period than previously published studies, however, does not capture disease progression or overall survival as endpoints as not enough time has elapsed since the beginning of the pandemic for this to be a meaningful outcome. Future larger studies with longer follow-ups



are needed to ascertain the effects of the pandemic on cancer outcomes. This study also does not include patients who delayed initiation to cancer care, which may disproportionately affect disadvantaged patient populations with historical barriers to access to care.

The degree of stress on the healthcare system seen in the earliest months of the COVID-19 pandemic in NYC has not continued. However, the pandemic will undeniably impact oncology and possibly surgical practices in the future, as evident by the spread of new COVID-19 variants and the resultant increase in caseloads and mortality. Moreover, the full impact of the COVID-19 pandemic on cancer diagnoses and treatments remains unknown but is likely to have ripple effects. The measured and unmeasured long-term effects of the pandemic remain to be seen, and will likely continue to evolve as new phases of the pandemic are encountered. Delays or alterations in treatment plans are possible in the future, and when met with organization and preparedness can lead to coordinated delivery of gynecologic oncology care as evidenced in this series.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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