

BRIEF REPORT

Cross-Sectional Study of the Impact of a Natural Disaster on the Delivery of Gynecologic Oncology Care

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ABSTRACT

Objective: We aimed to compare access to gynecologic oncology care at a private and a city hospital, both of which closed for a period of time because of Hurricane Sandy.

Methods: This was a cross-sectional study of gynecologic oncology chemotherapy, radiotherapy, and surgical patients from October 29, 2012 (the eve of the storm), to February 7, 2013 (the reopening of the city hospital). New referrals during this time were excluded. Delays in chemotherapy, radiotherapy, and surgery were compared.

Results: Analysis included 113 patients: 59 private patients (52.2%) and 54 city patients (47.8%). Of the private patients, 33/59 received chemotherapy (55.9%), 1/59 received radiotherapy (1.7%), and 28/59 had planned surgery (47.5%). Of the city patients, 40/54 received chemotherapy (74.1%), 7/54 received radiotherapy (12.3%), and 18/54 had planned surgery (33.3%). The mean delay in chemotherapy was 7.6 days at the private hospital and 21.7 days at the city hospital ($P = 0.0004$). The mean delay in scheduled surgery was 14.2 days at the private hospital and 22.7 days at the city hospital ($P = 0.3979$). The mean delay in radiotherapy was 0.0 days at the private hospital and 25.0 days at the city hospital ($P = 0.0046$). Loss to follow-up rates were 3/59 of the private patients (5.1%) and 3/54 of the city patients (5.6%).

Conclusions: Gynecologic oncology care was maintained during a natural disaster despite temporary closure and relocation of services. Disparity in care was in access to chemotherapy. (*Disaster Med Public Health Preparedness*. 2015;9:605-608)

Key Words: delivery of health care, hurricane, natural disasters, patient transfer, quality of health care

Hurricane Sandy, the most destructive hurricane of the 2012 Atlantic hurricane season, devastated New York City and its surrounding areas on October 29, 2012, causing an estimated \$50 billion in damages. Three major hospitals along Manhattan's East River closed and evacuated thousands of patients. Two of those hospitals, New York University Langone Medical Center (NYULMC) and Bellevue Hospital Center (BHC), the oldest hospital in New York City and the flagship of the Health and Hospitals Corporation (HHC) of New York, have active gynecologic oncology services. Unique to these hospitals was the fragmented care of the gynecologic cancer patients who suffered delays in chemotherapy, radiation therapy, and scheduled surgeries as a consequence of Hurricane Sandy.

The evacuation of patients and the resumption of patient care services at NYULMC and BHC were

staggered. NYULMC evacuated inpatients on the evening the storm hit, with 3 gynecologic oncology inpatients transferred to 2 nearby Manhattan hospitals. Outpatient offices, the chemotherapy infusion suite, and the radiation therapy suite for NYULMC gynecologic oncology patients resumed services 7 days after the storm, and inpatient facilities reopened by 35 days after the storm. During the closure, scheduled surgeries were performed at Lenox Hill Hospital, where emergency privileges were provided to house staff and attending physicians. BHC evacuated inpatients 2 days after the hurricane with no gynecologic oncology inpatients requiring transfer. Outpatient clinics, the chemotherapy infusion suite, and surgical services for BHC gynecologic oncology patients were relocated to Woodhull Hospital, an HHC hospital 5 miles outside of the borough of Manhattan, where services were resumed 10 days after the storm. All BHC facilities reopened on February 7, 2013, 98 days after Hurricane Sandy made its impact.

Great efforts were made by both hospitals to maintain patient care during and after the devastating storm. However, it is possible that the preexisting dichotomy of private and public hospitals that has been described in the oncology literature contributed to the distinct responses to the hurricane. Such differences have been reported as disruptions in oncology care in colorectal cancer treatment as the result of low levels of reimbursement resulting in limited resources¹ and lack of specialty surgeons performing surgery for ovarian cancer patients in public hospitals.² On the contrary, there are data to suggest that there is no impact on ovarian cancer treatment outcomes between private and public hospitals managed by the same attending and house staff teams.³

In the extreme circumstance of a natural disaster, the relationship between private and public hospitals has not been examined in the gynecologic oncology patient population. The aim of this study was to compare access to gynecologic oncology care in the face of a natural disaster between NYULMC, a private hospital, and BHC, a city hospital.

METHODS

We conducted a cross-sectional study of active gynecologic oncology chemotherapy, radiation therapy, and surgical patients from October 29, 2012 (the eve of the storm), to February 7, 2013 (the date BHC reopened). All patients actively receiving gynecologic oncology care at both hospitals during this time period were included. New referrals and patients not receiving gynecologic oncology care at NYULMC or BHC were excluded. The NYULMC Institutional Review Board approved the study protocol.

Electronic medical records and paper charts of the NYULMC Cancer Center and BHC were searched for patients meeting our inclusion criteria. Office and clinic schedules, surgical scheduling calendars, chemotherapy infusion schedules, and radiation therapy schedules were utilized to identify all patients receiving gynecologic oncology care during the time the hurricane hit and through its aftermath. Information obtained for each patient included type of gynecologic malignancy, date of last chemotherapy infusion and/or date of last radiation therapy prior to the storm, date of planned surgery, date chemotherapy and/or radiation therapy resumed after the hurricane, date surgery was rescheduled after the hurricane, and date of last follow-up.

Delays in chemotherapy, radiation therapy, and surgery were compared between NYULMC and BHC. Delay in care was calculated on the basis of the difference (in days) between the original date of surgery and the actual date of surgery, and the dates of the next scheduled chemotherapy or radiation and the actual date the patient received treatment. Loss to follow-up rates were also compared. Statistical analysis included Student's t-test, Fisher's exact test, and chi-squared test, using R (v2.15.3, 2013).

RESULTS

A total of 113 active patients were identified during the time Hurricane Sandy hit and its aftermath: 59 NYULMC patients (52.2%) and 54 BHC patients (47.8%). Table 1 provides demographic information for the patient population, and Table 2 describes the patient population of both hospitals by type of therapy received, planned surgery, and rates of surgical cancellations. When we compared both hospitals' mean delay in all chemotherapy, mean delay in scheduled surgery, and mean delay in radiation therapy, we found a statistically significant difference in the mean delay in chemotherapy at NYULMC (7.6 days) compared with BHC (21.7 days; $P = 0.0004$). Additionally, there was a significant difference in mean delay in radiation therapy between the hospitals: 0 days' delay at NYULMC compared with 25 days' delay at BHC ($P = 0.0046$); however, NYULMC had only one patient receiving radiation therapy. There was no significant difference in mean delay in scheduled surgery between the hospitals: 14.2 days at NYULMC and 22.7 days at BHC ($P = 0.3979$). Exploratory analyses of the chemotherapy patients were performed, which revealed a statistically significant difference in the mean delay in chemotherapy for patients on their second-line or greater chemotherapy regimen at NYULMC (7.9 days) compared to BHC (30.9 days; $P = 0.0014$). There was no significant difference in the mean delay in chemotherapy for patients receiving primary chemotherapy: 5.5 days at NYULMC and 10.3 days at BHC ($P = 0.1545$). Nor was there a significant difference

TABLE 1

Demographics of the Patient Population ^a			
	NYULMC (n = 59), n (%)	BHC (n = 54), n (%)	P value
Age at time of hurricane, years			
Median	62	60	0.433
Range	28-87	32-85	
Race/Ethnicity			
Caucasian	44 (75)	7 (13)	<0.001
African American	2 (3)	12 (22)	
Hispanic	5 (8)	21 (39)	
Asian	5 (8)	13 (24)	
Other	3 (6)	1 (2)	
Insurance type			
Medicaid	1 (2)	54 (100)	<0.001
Private insurance	58 (98)	0 (0)	
Disease site			
Benign	9 (15)	2 (4)	0.001
Cervical cancer	2 (3)	9 (17)	
Ovarian cancer	27 (46)	19 (35)	
Uterine cancer	13 (22)	22 (41)	
Vaginal cancer	0 (0)	1 (2)	
Vulvar cancer	0 (0)	1 (2)	
Undiagnosed	8 (14)	0 (0)	

^aAbbreviations: BHC, Bellevue Hospital Center; NYULMC, New York University Langone Medical Center.

TABLE 2

Treatment Characteristics of the Patient Population^a

Patient Characteristics	NYULMC, n/total n (%)	BHC, n/total n (%)	P value
Planned surgical cases	28/59 (47.5)	18/54 (33.3)	0.1794
Rate of surgical cancellations	5/28 (1.8)	7/18 (3.9)	0.1703
Receiving radiotherapy	1/59 (1.7)	7/54 (12.3)	0.0268
Receiving chemotherapy	33/59(55.9)	40/54 (74.1)	0.0509
Curative intent CT	6/33 (18.2)	15/40 (37.5)	0.118
Palliative intent CT	24/33 (72.7)	20/40 (50)	0.0828
Neoadjuvant CT	3/33 (9.1)	5/40 (12.5)	0.7218
Second-line recurrence	7/33 (21.2)	12/40 (30)	0.434
Third-line recurrence	17/33 (52)	8/40 (20)	0.0199

^aAbbreviations: BHC, Bellevue Hospital Center; CT, chemotherapy; NYULMC, New York University Langone Medical Center.

for patients receiving neoadjuvant chemotherapy: 3.6 days at NYULMC and 6.6 days at BHC ($P = 0.4045$). There was a high retention rate at each hospital with only 3/59 NYULMC patients (5.1%) and 3/54 BHC patients (5.6%) lost to follow-up during Hurricane Sandy.

DISCUSSION

In the wake of a devastating natural disaster, gynecologic oncology care was maintained at both a private and a city hospital despite temporary closure and relocation of outpatient, inpatient, and surgical services. Our data revealed no significant differences in delays to surgery; however, the disparity in care revealed was in access to chemotherapy. Our results showed a difference in access to radiation therapy but conclusions cannot be made because of the sample size of one patient in the NYULMC cohort. Although our analysis did not include baseline rates of access to chemotherapy and radiation therapy, prior review of our experience is that there was no difference between the 2 hospitals before Hurricane Sandy. Therefore, we hypothesize that the reason for the disparity in access to chemotherapy was likely due to relocation of the BHC outpatient chemotherapy suite to a smaller institution, which led to limited resources. The results from Table 1 support this hypothesis, because the 100% Medicaid insurance plans of the BHC patients limited them from possibly transferring their care to non-HHC facilities where they could have avoided a limited resources setting. The significant delay in chemotherapy for patients receiving their second-line or greater chemotherapy regimen also supports the hypothesis that relocation to the smaller institution with limited resources contributed to the disparity revealed in this study. With the downsizing of the BHC outpatient chemotherapy suite from a 30-patient/day infusion suite that was always at maximum capacity to an 18-patient/day infusion suite, patients receiving first-line chemotherapy (curative intent) were most likely prioritized, resulting in the delays seen in the patients receiving second-line or greater

chemotherapy (palliative intent). This delay was not seen at NYULMC because the chemotherapy suite was not downsized. Other factors that were not analyzed and that could be confounders to our results were the distance traveled by BHC patients versus NYULMC patients, socioeconomic factors other than insurance, time to reopening of the hospitals, availability of second-line chemotherapeutic agents, delay in evacuating BHC, and delay in reopening outpatient services. Although disparity was revealed in time to resumption of chemotherapy, continuity of care was maintained as evidenced by the close to 100% patient retention rate at each hospital.

This is the first study to describe the impact of a natural disaster on gynecologic oncology care and to compare the response of a private hospital with that of a city hospital. However, other natural disasters impacting cancer care have been described in the literature. The impact of Hurricane Katrina revealed severely fractured oncologic services, especially for minority-based and underinsured populations.⁴ Additionally, some oncology practices with paper records had no means of reaching their patients or continuing treatment plans, and oncology patients affected by Hurricane Katrina did not have the means to seek alternative cancer care owing to limited transportation and access to other facilities.^{5,6}

In our experience, the electronic medical record systems were restored after the affected parts of the city regained electricity and the merged record keeping of the HHC system provided us an advantage that differed from the events of Hurricane Katrina. In the response phase of Hurricane Sandy, the main difference in each hospital's response was timing. It is possible that the extra day's delay in evacuating BHC and extra 3 days' delay in establishing outpatient services for BHC patients is accountable for the disparity in care described. However, there are several other contributing factors not accounted for in this study; therefore, such conclusions cannot be made. A key similarity between both hospitals was successful maintenance of continuity of care. Along with their patients, both hospitals transferred ancillary staff, nurses, and physicians to their respective relocation sites, which allowed for preservation of excellent patient care and safety. This strategy brought the advantages of continuity of care, patient familiarity, patient and family member trust, and decreased burden on the receiving hospital.⁷ Specific to the BHC relocation effort was the transfer of outpatient services to a fellow HHC hospital with the same electronic medical record system, allowing for improved resumption of care once the site started receiving patients.

The limitations of this study were that it was a descriptive study without outcomes data, had a small sample size, and did not include definitive information on reasons for delays in care, thus limiting conclusions. Additionally, owing to confounders that were not controlled for, definitive conclusions cannot be drawn on the disparity revealed between the hospitals.

CONCLUSIONS

From this study we can glean important lessons on disaster preparedness when caring for a vulnerable population of gynecologic cancer patients. In the face of a natural disaster, hospital systems must utilize their resources effectively and develop strategies to maintain care and limit disparity of care. This is especially important in the gynecologic oncology patient population with evidence that delay in radiation therapy negatively impacts pelvic tumor control and cause-specific survival in cervical cancer.⁸ Such strategies include early planning for resource allocation, early evacuation, and, as exemplified by NYULMC and BHC, transfer to hospitals with linked electronic medical records systems, which allows for the maintenance of continuity of care.^{7,9,10}

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REFERENCES

1. Rhoads KF, Ngo JV, Ma Y, et al. Do hospitals that serve a high percentage of Medicaid patients perform well on evidence-based guidelines for colon cancer care? *J Health Care Poor Underserved*. 2013;24:1180-1193.
2. Boyd LR, Novetsky AP, Curtin JP. Ovarian cancer care for the underserved: are surgical patterns of care different in a public hospital setting? *Cancer*. 2011;117:777-783.
3. Pua TL, Arslan AA, Curtin JP, et al. Outcomes of patients with epithelial ovarian cancer in a private versus public hospital setting. *Gynecol Oncol*. 2008;108:S152-S152.
4. Harmon RE, Boulmay BC. Restoration of medical oncology services at LSU Interim Public Hospital in New Orleans after Hurricane Katrina: a two-year experience of LSUHSC. *Journal of Louisiana State Medical Society*. 2011;163(3):144-147.
5. Ullman K. Cancer Care During Natural Disasters. *J Natl Cancer Inst*. 2011;103(24):1819-1820. doi:10.1093/jnci/djr527.
6. Loen B, Pou AM, Nuss DW, et al. Factors affecting access to head and neck cancer care after a natural disaster: a post-Hurricane Katrina survey. *Head Neck*. 2011;33(1):37-44. doi: 10.1002/hed.21393.
7. Rosen Y, Yakubov N. Hurricane Sandy: lessons learned from the severely damaged Coney Island Hospital. *Prehosp Disaster Med*. 2013; 28:643.
8. Perez CA, Grigsby PW, Castro-Vita H, et al. Carcinoma of the uterine cervix. I. Impact of prolongation of overall treatment time and timing of brachytherapy on outcome of radiation therapy. *Int J Radiat Oncol Biol Phys*. 1995;32:1275-1288.
9. Powell T, Hanfling D, Gostin LO. Emergency preparedness and public health: the lessons of Hurricane Sandy. *JAMA*. 2012;308: 2569-2570.
10. Abramson DM, Redlener I. Hurricane sandy: lessons learned, again. *Disaster Med Public Health Prep*. 2012;6:328-329.