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Brief Opinion

Guidelines to Reduce Hospitalization Rates for Patients Receiving Curative-Intent Radiation Therapy During the COVID-19 Pandemic: Report From a Multicenter New York Area Institution

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Abstract

As the coronavirus disease 2019 pandemic spreads around the globe, access to radiation therapy remains critical for patients with cancer. The priority for all radiation oncology departments is to protect the staff and to maintain operations in providing access to those patients requiring radiation therapy services. Patients with tumors of the aerodigestive tract and pelvis, among others, often experience toxicity during treatment, and there is a baseline risk that adverse effects may require hospital-based management. Routine care during weekly visits is important to guide patients through treatment and to mitigate against the need for hospitalization. Nevertheless, hospitalizations occur and there is a risk of nosocomial severe acute respiratory syndrome coronavirus-2 spread. During the coronavirus disease 2019 pandemic, typical resources used to help manage patients, such as dental services, interventional radiology, rehabilitation, and others are limited or not at all available. Recognizing the need to provide access to treatment and the anticipated toxicity of such treatment, we have developed and implemented guidelines for clinical care management with the hope of avoiding added risk to our patients. If successful, these concepts may be integrated into our care directives in nonpandemic times.

Introduction

In December 2019, cases of pneumonia of unknown etiology were first reported in Wuhan City, Hubei Province of China.[1] These cases have since been linked to a novel enveloped RNA beta coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2),[2] which causes the associated coronavirus disease 2019 (COVID-19). COVID-19 has caused a global pandemic, resulting in considerable morbidity, mortality, and health care resource strain.[3] As of April 11, 2020, 10:00AM central European time, 1,610,909 global cases of COVID-19 and 99,690 global deaths had been reported to the World Health Organization.[4] The New York metropolitan area has been one of the most severely affected regions, with 160,349 confirmed cases and 8078 deaths thus far within New York City and surrounding Nassau, Suffolk,

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and Westchester counties, accounting for 30% of U.S. cases and 38% of U.S. deaths.[5]

Our institution, Northwell Health, is the largest health care provider in New York State and is based in the aforementioned counties. Most of our hospitals have similarly seen a surge of COVID-19 cases, and throughout our health system, all non-emergent surgeries and procedures have temporarily been cancelled to provide capacity for COVID-19–related hospital admissions. Early data from Asia and Europe showed an increased rate of SARS-CoV-2 infection and COVID-19 morbidity among patients with cancer.[6-12] In an effort to reduce exposure to patients with cancer and conserve health system resources, oncology societies and institutions have crafted working guidelines regarding cancer treatments.[13-17] However, the majority of cancer cases require timely treatment, and we continue to provide curative and palliative treatments to hundreds of patients daily throughout the Northwell Health Cancer Institute.

Radiation oncologists are well aware that several disease sites, such as head and neck, result in high unanticipated hospital admission rates during or soon after radiation therapy.[18,19] As a department, we decided that we must intensify our current on-treatment care protocols to ensure timely completion of therapy and drastically reduce the chance of complications requiring hospital admission. Therefore, the faculty developed consensus-driven, experience-based guidelines for intensive on-treatment management for disease sites that often require concurrent radiation and chemotherapy for curative treatment and historically have higher rates of emergency department (ED) or hospital usage. In this report, we outline our departmental disease-site specific guidelines to reduce hospitalization rates during the COVID-19 pandemic.

Methods

Quality and safety are critically important to the delivery of radiation therapy and are cornerstones of our previously reported Smarter Radiation Oncology program.[20,21] As part of our departmental culture, new patient radiation cases are peer-reviewed in prospective daily contouring rounds before treatment planning begins.[22,23] Our departmental quality assurance program also tracks data on patient hospitalization and discontinuation of radiation therapy.[24]

In March 2020, as the effect of the COVID-19 pandemic upon our health system intensified, we established 2 overriding principles: (1) to maintain the safety of all staff and (2) to maintain access for those patients requiring radiation therapy services.

First, as care providers from radiation medicine and other departments were being redeployed throughout the health system to help manage the pandemic, we purposefully sought to decrease staff density and machine utilization, thereby decreasing staff and patient exposure to and risk of SARS-CoV-2 infection. A priority level was assigned to each case to determine which patients might safely avoid treatment or have treatment deferred, attempting to balance the risk of SARS-CoV-2 infection versus potential adverse outcomes of deferring treatments. Faculty met virtually on 2 separate occasions to prospectively determine the urgency and priority of all pending cases, including pending simulations and treatment starts. Group consensus was required to assign each patient's priority.

Second, there was a desire from providers and patients to minimize SARS-CoV-2 exposure by limiting evaluation or interventions within the ED or hospital, where possible. To that end, additional management of adverse events during outpatient treatments should be carried out within the ambulatory radiation medicine clinic or the patient's home. Given the hospital strain during the pandemic, resource availability for nonemergent procedures was also limited. This included, but was not limited to, operating room availability for cancer surgery, percutaneous endoscopic gastrostomy placement, esophageal dilation/stent placement, dental evaluation and extraction, infusion services, physical and occupational therapy, and home care services. Management of adverse effects would therefore need to be more proactive than reactive and require more intensive management by fewer care providers.

Therefore, our goals required that we create a framework for clinical practice and resource management that may be applied to the current and future resource-constrained settings. Key questions included:

1. Who benefits from increased support during treatment (health system resource utilization)?
2. What health system resources and/or services may be limited or unavailable?
3. How can we provide intensified support to reduce hospitalization rates and prevent strain on other departments?
4. When should interventions be implemented to reduce the severity of adverse treatment effects?

To address these questions and create a consensus guideline, a team of physicians, advanced care providers, and administrators within our radiation medicine service line convened to review pertinent literature and practice guidelines to establish recommendations for management of patients undergoing radiation treatments during this pandemic.

Results and Recommendations

As of April 10, 2020, there were 3402 COVID-19 inpatients within the 23 hospitals of the health care

Table 1 Prioritization of radiation treatment start date based on treatment indication

Priority	Description	Example cases
Priority I	Cases where a delay of treatment may result in a loss of life, progression of disease, or a permanent loss of neurologic or other function These patients are to be assessed and managed accordingly.	1. Oncologic emergencies 2. Advanced head and neck 3. Advanced gastrointestinal 4. Advanced gynecologic 5. Advanced lung
Priority II	Cases that may be delayed for up to 4 weeks, and delay in treatment is unlikely to result in a loss of life or negatively affect a patient's prognosis If a patient's treatment is deferred, waiting lists should be created for priority II patients requiring treatment. These waiting lists will be reviewed at least weekly depending on the overall situation and the availability of treatment slots.	1. Early stage head and neck 2. Early stage lung 3. Lymphoma 4. Brain SRS of benign diseases
Priority III	Cases that may be delayed for 30 days or more, where such delay in radiation treatment is unlikely to result in a loss of life or negatively affect a patient's prognosis. If a patient's treatment is deferred, waiting lists should be created for priority III patients requiring treatment. These waiting lists will be reviewed for pending treatment accordingly and the patients contacted for follow-up as needed.	1. Early stage prostate 2. Early stage breast 3. Prostate on androgen deprivation

Abbreviation: SRS = stereotactic radiosurgery.

system, 27% of whom were being managed within an intensive care unit setting and 821 on ventilators. All available space in the hospitals such as postanesthesia care units, endoscopy suites, labor and delivery rooms, as well as auditoriums and lobbies have been converted to intensive care units or COVID wards.

Prioritization of cases

A tiered system of prioritization (Table 1) was developed and used to stagger radiation starts and purposefully reduce machine treatment volume. We classified cases as those in which patients need treatment immediately, within 30 days, or may be delayed beyond 30 days. As a result, we reduced the volume of patients on treatment within radiation medicine to approximately 70% of usual capacity.

Of the 307 cases identified and discussed among the faculty, 188 (61%) were classified priority 1, 84 (27%) were priority 2, and 35 (11%) were priority 3. Among the 188 priority 1, 36 were head and neck, 26 were lung, 22 were gynecologic, 19 were brain, 17 were gastrointestinal, and 34 were bone metastases (Table 2). The majority of cases in priority 1 were curative-intent, treated with concurrent chemoradiation. These treatments are often associated with moderate to significant adverse treatment effects.

Guidelines for pretreatment considerations and on-treatment management

Table 3 summarizes the guidelines we created to help manage potential adverse events based on disease site and/or treatment.[25-30] It is important to note that these recommendations apply only to patients who are not positive for SARS-CoV-2 and are not symptomatic from COVID-19.

Discussion

The global COVID-19 pandemic has caused considerable health system strain as a result of dramatically higher inpatient admissions and illness among clinical staff.[30] Clinical practices have had to adapt quickly to meet demands for inpatient care while maintaining the safety of staff and noninfected patients. The vast majority of oncology treatments must proceed in a timely fashion. At Northwell Health, we are caring for many of the New

Table 2 Patient characteristics

Characteristics	No. of patients (n = 307)	%
Priority I	188	61.2
Brain	19	
Breast	21	
Gastrointestinal	17	
Genitourinary	8	
Gynecologic	22	
Head and neck	36	
Lung	26	
Palliative bone	34	
Other	5	
Priority II	84	27.4
Priority III	35	11.4

Table 3 Consensus guidelines for intensive treatment management to reduce hospitalization and adverse events

Disease site	Pretreatment	Acute CTCAE[25] to manage	Suggested interventions
Anal cancer	Health system resources potentially unavailable: • Home care/wound care services	Dermatitis Desquamation Pain Diarrhea Dehydration cytopenias	• Twice weekly OTV after second wk • Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management • CBC monitoring, weekly MedOnc visits (neutropenia/anemia) • Consider treatment break*
Rectal cancer – advanced, low-lying	Consider induction chemotherapy as part of total neoadjuvant therapy to delay start of radiation†	Dermatitis Desquamation Pain Diarrhea	• Twice weekly OTV after third wk • Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management • CBC monitoring, weekly MedOnc visits
Esophageal cancer – advanced	Health system resources potentially unavailable: • Nonemergent procedures (eg, esophageal dilation, stent placement, feeding tube placement) Consider perioperative chemotherapy to defer radiation‡	Esophagitis Weight loss Cough Dyspnea	Early • Twice weekly OTV after second wk • Early use of: PPI twice daily, oral steroids, Carafate, pain medications, dietary evaluation, nutritional supplement shakes Hospital avoidance • IV fluid hydration by MedOnc ○ If MedOnc unavailable, IV fluid hydration within RadMed department • NG-tube placement (may be difficult, particularly if obstructive symptoms)
Lung cancer – advanced	Consider induction chemotherapy (particularly for small cell) Consider deferring adjuvant RT start date for: consolidative RT or PCI for SCLC, postop N2 NSCLC	Cough Dyspnea Esophagitis Weight loss Cytopenias	• Evaluate for O_2 need (nocturnal, ambulatory, at rest) • Twice weekly OTV after second wk • Early use of: oral steroids, PPI, Carafate, pain medications, nutritional supplement shakes • Aggressive management of esophagitis: PPI twice daily, gabapentin, dietary evaluation
Head and neck cancers	Health system resources potentially unavailable: • Dental evaluation • Feeding tube placement • Speech/swallow evaluation • Home care/wound care services Consider weekly cisplatin dosing for fit candidates (30-40 mg/m^2) instead of bolus cisplatin. If borderline candidate for systemic therapy, do not use. Consider altered fractionation to compensate for lack of systemic therapy. For elderly patients, consider hypofractionation and no chemotherapy.	Mucositis Odynophagia Dysphagia Dehydration Weight loss Cytopenias	Early • Twice weekly OTV • Review CBC taken by MedOnc weekly • Early use of: pain medication/management, gabapentin, mouth rinses, nutritional supplement shakes, dietary evaluation Hospital avoidance • When dysphagia begins, start IV fluid hydration by MedOnc (otherwise fluid bolus via PEG if available) twice weekly during chemoradiation ○ If MedOnc unavailable, consider IV fluid hydration within RadMed department • NG-tube placement if weight loss otherwise meeting criteria for PEG placement • Low threshold to stop chemotherapy if patient develops CTCAE $\geq$ 3 • Consider treatment break for refractory grade 3 symptoms (<1 wk)
High-grade glioma	Standard fractionation vs hyopfractionation for elderly/poor	Headaches Nausea	Early • Twice weekly OTV after second wk

(*continued on next page*)

Table 3 (*continued*)

Disease site	Pretreatment	Acute CTCAE[25] to manage	Suggested interventions
	performance status vs palliative	Vomiting Seizures	• Steroid management, perhaps more antiepileptic use than normal Hospital avoidance • If progressive neurologic symptoms, consider outpatient MRI, evaluation by neuro-oncology/neurosurgery
Vulvar cancer	Health system resources potentially unavailable: • Decreased OR availability → increased utilization of definitive chemoradiation • Home care/wound care services	Pain Dermatitis Desquamation Diarrhea Dehydration Cytopenias	• Twice weekly OTV after 2nd week • Early use of: Silvadene, sitz bath, pain medication/management, antidiarrheal • CBC monitoring, urinalysis, weekly MedOnc visits • Consider treatment break (goal < 1 wk)

Abbreviations: CBC = complete blood count; CTCAE = Common Terminology Criteria for Adverse Events; EGJ = esophagogastric junction; IV = intravenous; MRI = magnetic resonance imaging; NCCN = National Comprehensive Cancer Network; NG = nasogastric; NSCLC = nonsmall cell lung cancer; OR = operating room; OTV = on-treatment visit; PCI = prophylactic cranial irradiation; PEG = percutaneous endoscopic gastrostomy; PPI = proton-pump inhibitor; RT = radiation therapy; SCLC = small cell lung cancer.

* Radiation Therapy Oncology Group (RTOG) 98-11[26] allowed 10 day break as needed; in RTOG 0529,[27] breaks were mostly due to neutropenia.

† Total neoadjuvant therapy approach added to 2015 version of NCCN guidelines as an acceptable option.[28]

‡ Perioperative chemotherapy is an alternative option to chemoradiation for distal esophagus and EGJ.[29,30]

York region COVID-19 cases and have had to quickly adjust our oncology patient management to keep our patients and staff safe and reduce hospital utilization. Our multicenter radiation department spans across teaching and community hospitals as well as outpatient centers. The current pandemic is having a profound effect on health care resources, thereby changing the routine practice of cancer treatments. The multidisciplinary aspect of cancer care—including but not limited to surgical oncology, medical oncology, radiation oncology, diagnostic radiology, pathology, clinical trials, genetic testing, social work, anesthesia, nutrition, occupational and physical therapy, pain and palliative care—is significantly limited based on the needs for care of patients with COVID-19. What was routine as recently as 4 weeks ago has been transformed radically.

Fortunately, we have been able to continue providing patients advanced, high-quality radiation therapy and for the most part, concurrent chemotherapy. Despite social distancing, use of telehealth, conversion to shorter fractionation schedules, and deferment of some treatments, there are numerous patient touchpoints with the radiation care team. By nature of radiation treatments, patients are physically present within the department and interacting with team members often on a daily basis. Especially as other members of the patient's multidisciplinary care team reduce in-person interactions, the radiation care team has become the main point of interaction. This proximity should be leveraged to aggressively and pre-emptively manage patients during treatment.

Rates of unplanned acute hospital encounters during or soon after radiation therapy may differ across cancer diagnoses, but have been reported between 20% to 36%, with approximately half of acute encounters in the ED and half inpatient admissions.[18,31,32] National policy initiatives have aimed to reduce acute hospital encounters among cancer patients through improved care coordination.[33-36] The importance of these initiatives are underscored during this crisis.

Given the effect of treatment delay or morbidity upon prognosis, a broader macro view of health care outcomes during this pandemic recognizes that changes in routine care need to be usurped by a need for intense clinical management of patients with cancer to avoid complications that may require ED visits or hospitalizations. Therefore, as a faculty, we decided that a proactive, intensive approach to on-treatment management of at-risk patients was necessary to maintain excellent disease outcomes while avoiding health system strain. We developed these guidelines using our combined experience, knowledge of the literature, and consensus. We have implemented these on-treatment guidelines in our clinics beginning April 13, 2020.

We expect that these clinical guidelines, which advocate for more intensive on-treatment management, will reduce rates of hospitalization and treatment breaks. We recognize that these recommendations represent a resource shift in the department toward more hands-on clinical care while one is otherwise trying to limit excess patient-facing care during the COVID-19 pandemic. By

establishing a prioritization system to defer some patients, we have counterbalanced the volume of interactions throughout the department on any given day. Thus, the new management recommendations should not overburden what is an otherwise busy and packed clinical space.

Conclusions

The COVID-19 global pandemic has had a dramatic effect on New York area hospitals and practices. Northwell Health is currently managing thousands of New York's inpatient cases, and elective procedures are on hold until the regional rates of infection slow considerably. In this resource-constrained environment, we must adapt our management of radiation patients to reduce their risk of hospitalization. Our faculty convened to set priorities for patient treatment and to develop consensus guidelines for intensive on-treatment management of at-risk disease sites, typically in patients undergoing curative-intent radiation therapy with concomitant chemotherapy. We believe these experience-driven and consensus-based guidelines will reduce adverse events that require ED usage and hospitalization among radiation medicine patients.

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