

Brief Opinion

# Radiation Oncology Strategies to Flatten the Curve During the Coronavirus Disease 2019 (COVID-19) Pandemic: Experience From a Large Tertiary Cancer Center



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## Abstract

During the coronavirus disease 2019 pandemic, minimizing exposure risk for patients with cancer and health care personnel was of utmost importance. Here, we present steps taken to date to flatten the curve at the radiation oncology division of a tertiary cancer center with the goal of mitigating risk of exposure among patients and staff, and optimizing resource utilization. Response to the coronavirus disease 2019 pandemic in this large tertiary referral center included volume reduction, personal protective equipment recommendations, flexible clinic visit interaction types dictated by need and risk reduction, and numerous social distancing strategies. We hope these outlined considerations can assist the wider radiation oncology community as we collectively face this ongoing challenge.

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## Introduction

In December 2019, severe respiratory cases detected in Wuhan, China, were found to be associated with the novel coronavirus disease 2019 (COVID-19), severe acute respiratory syndrome coronavirus-2. This outbreak quickly escalated into an international health care emergency. The World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic on March 11, 2020; the United States declared a national emergency on March 13, 2020. A multi-institutional retrospective study<sup>1</sup> from Wuhan found that 18 of 1590 patients with COVID-19 had a history of cancer. These patients were at higher risk for being admitted to the intensive care unit, requiring ventilation, and death (39% versus 8%) compared with noncancer patients. Although this early report was limited by small sample size, oncologists have found themselves weighing the urgency of treating patients with cancer against risk of exposure to COVID-19.

During this pandemic, minimizing exposure risk for patients with cancer and health care personnel was of utmost importance. Radiation therapy (RT) is an integral component of many patients' oncologic treatment. RT typically involves daily sessions over several weeks with numerous exchanges at an individual level between patients, physicians, nurses, radiation therapists (RTTs), and more. Each weekday at our large tertiary cancer center, the division of radiation oncology (RO) treats approximately 450 patients on 17 machines at our main campus, 105 patients on 5 machines at our proton center, and 175 patients on 9 machines at 4 regional locations. Given this volume, a well-coordinated approach based on a factual communication and full engagement of personnel was and remains essential to implement "social distancing" effectively during the COVID-19 pandemic to reduce exposure to patients and staff.

On March 4, 2020, an interdisciplinary taskforce was formed within the division of RO with the goal of mitigating risk of exposure among patients and staff and optimizing resource utilization and allocation. Disease-site specific section chiefs, center medical directors, quality officers, nursing staff, RTTs, physicists, and administrative leadership met daily via teleconference to develop policies based on facts gathered from the institution, state, and official medical organizations, with final approval by the division head. This critical information was disseminated to individual sections and groups through smaller daily "team huddles." Here, we present steps taken to date to flatten the curve at a tertiary cancer center (Fig 1).

## Reducing On-Treatment Patient Volume

An intentional plan was made to reduce the on-treatment patient volume (OTPV). The taskforce felt

that reducing OTPV would help the division operate in a sustainable manner, in anticipation of potential staff shortages owing to illness or quarantine. Also, decreasing OTPV would reduce exposure to patients, RTTs, and clinic staff. These steps were taken to reduce patient volume:

- Hypofractionation was encouraged when clinically appropriate, such as single fraction treatments for palliation of bone metastases<sup>2,3</sup> or short course RT in 5 fractions for preoperative treatment of rectal cancer.<sup>4-8</sup> Each section developed disease-site specific evidence-based guidelines on hypofractionation.
- Patients with no immediate oncologic need for RT were deferred, after approval from a multidisciplinary team.
- Patients were distributed between the main campus and the institution's regional locations when feasible to standardize reduced treatment hours across all centers and most acutely reduce patient numbers at the main hospital campus.
- Out-of-state patients were encouraged to receive treatments locally when feasible.
- To lower patient throughput, the interval between simulation and RT start was set at a minimum of 2 weeks, with exceptions for clinically urgent situations. The next available treatment start was also limited by available time slots within established treatment hours.

Our efforts to decrease OTPV were complemented by similar efforts by other cancer specialties. The OTPV was reduced by more than 25% over 2 weeks and was projected to decrease further in the coming weeks (as of this writing) in anticipation of the expected local COVID-19 peak.

## Social Distancing

Policies were established at the institutional and divisional levels to minimize patient-staff and staff-staff interactions. These efforts were aided by a "stay home, work safe" order for the county issued on March 24, 2020, and echoed by an order from the state governor on March 31, 2020. Steps for social distancing included:

- Visitors were prohibited from accompanying patients to clinic/RT areas.
- Multidisciplinary conferences and administrative meetings occurred through teleconferences.
- In-person meetings of >5 people were prohibited, and individuals were expected to be >6 feet apart for any person-to-person interactions.

<b>Reduce On-Treatment Patient Volume</b>	<ul style="list-style-type: none"> <li>• Evidence-based hypofractionated RT</li> <li>• Deferment of RT when appropriate</li> <li>• Planned delays for RT starts</li> <li>• Redistribution of patients between main campus and regional locations</li> </ul>
<b>Social Distancing</b>	<ul style="list-style-type: none"> <li>• Visitors not allowed to accompany patients</li> <li>• Teleconference meetings</li> <li>• Work from home</li> <li>• Non-overlapping RTT and clinic teams</li> </ul>
<b>Safety of Patients and Workforce</b>	<ul style="list-style-type: none"> <li>• Screening of patients and hospital staff at entry points</li> <li>• All employees and patients required to wear surgical mask</li> <li>• Additional PPE* based on institutional and CDC guidelines</li> <li>• Tracer team</li> <li>• 14-day home quarantine for out-of-state patients</li> </ul>
<b>Outpatient Clinics</b>	<ul style="list-style-type: none"> <li>• Consultations that do not require immediate input deferred for 2 months</li> <li>• Follow ups rescheduled by 2-6 months, unless immediate evaluation needed</li> <li>• Weekly see visits using telemedicine platform</li> </ul>
<b>Inpatient Consultations</b>	<ul style="list-style-type: none"> <li>• Hypofractionated RT for oncologic emergencies and palliation</li> <li>• Deferment of RT when appropriate</li> <li>• Recommendations based on electronic medical review for COVID-19 positive patients and PUI</li> </ul>
<b>Management of Patients during RT</b>	<ul style="list-style-type: none"> <li>• For patients with community risk of COVID-19 infection, RT proceeds</li> <li>• For PUI, treatment delayed until patient tests negative.</li> </ul>
<b>Treatment of COVID-19 Positive Patients</b>	<ul style="list-style-type: none"> <li>• Specific treatment machine designated for COVID-19 positive patients</li> <li>• PPE training of RTTs, nurses, and physicians delivering RT</li> <li>• Oversight panel to determine if patient is appropriate for RT</li> </ul>
<b>Communication</b>	<ul style="list-style-type: none"> <li>• Virtual daily section huddles</li> <li>• Institutional and divisional town halls</li> </ul>

**Figure 1** Considerations and strategies in radiation oncology to flatten the curve during the COVID-19 pandemic. \*For example, consider additional PPE for RTTs such as goggles when at increased risk of particulate exposure from handling of head and neck immobilization devices (mask, stents, bite-blocks, etc). *Abbreviations:* CDC = Center for Disease Control and Prevention; COVID-19 = coronavirus disease 2019; PPE = personal protective equipment; PUI = persons under investigation; RT = radiation therapy; RTT = radiation therapist.

- RTTs significantly reduced cross-coverage of treatment machines, and a plan for rotating therapist coverage was implemented.
- Work from home: Administrative and research staff currently work exclusively from home (as of this writing). Physicians, physicists, advanced practice providers, nurses, dosimetrists and patient schedule coordinators work in the hospital only on certain weekdays. All site-specific services and regional centers have developed a “doctor-of-the-day” model with 1 to 2 physicians providing all clinical coverage. Trainees work from home, except when covering night/weekend calls and brachytherapy cases. As of April 3, 2020, of >1000 employees in the RO division, 49% work from home, 27% work part-time at home and on-

site, and 24% work full-time on-site. Technical support was provided to enable work from home. All bench research laboratories were closed at the institutional level.

## Patients and Workforce Safety

### Screening

At an institutional level, entry points for patients and employees were separated. Before entering the institution, patients and employees were required to attest that they did not have symptoms associated with COVID-19. They had to have their temperature taken and then were asked to wear a mask and clean their hands.

## Personal protective equipment (PPE)

All employees and patients were required to wear a surgical mask at all times while on campus. Additionally, RTTs were required to wear goggles when at increased risk of particulate exposure from handling of head and neck immobilization devices. These approaches went beyond the Center for Disease Control and Prevention guidelines, but they were felt to be necessary to protect patients and the workforce. Employees were required to wear additional PPE, such as gowns, gloves, respirator masks, and goggles, as needed based on institutional and Center for Disease Control and Prevention guidelines.

## Tracer team

Within the RO division, a tracer team was established. This team had daily virtual meetings to monitor persons under investigation (PUI) for COVID-19, trace these patients' points of contact with clinical staff, facilitate referrals to employee health, and execute guideline-based quarantine measures when required.

## Out-of-state patients

At the institutional level, out-of-state patients were required to undergo a 14-day home quarantine before being seen or treated. These patients were instructed not to leave the state on weekends, as they might have to re-quarantine, leading to RT interruption. Travel to Houston, Texas by air/land was allowed within the 14-day period. Exceptions to the 14-day quarantine requirement were allowed for oncologic emergencies.

## Outpatient Clinics

A planned effort was made to reduce the volume of patients in clinics to protect patients and clinical staff from exposure.

## Consultations

Consultations that did not require immediate input from RO were deferred for 2 months, for example, for a patient who would receive induction chemotherapy before planned RT initiation, or for disease sites with data suggesting no harm in delay.<sup>9</sup> Consultations were cancelled for patients for whom RT would not be recommended based on multidisciplinary discussion. Patients who could be treated locally were referred to local centers.

## Follow-ups

Follow-ups were rescheduled by 2 to 6 months, unless immediate evaluation was felt to be necessary for assessment of treatment response or toxicity. These appointments could occur in-person. In select cases, patients were asked to follow-up with their local oncologists.

## Weekly sees

Patient were seen for weekly see visits (on-treatment visits) via a telemedicine platform to limit provider-patient contact. In-person evaluations were conducted when clinically necessary. During weekly see visits, vital signs were collected only when requested by physicians, rather than routinely, to reduce provider-patient contact time. Nursing education on symptom management was provided by phone in most cases.

## Brachytherapy

The brachytherapy program was consolidated into 2 locations, with gynecologic brachytherapy performed in the operating room and prostate brachytherapy in the RO computed tomography suite. As of April 6th, 2020, all patients were tested for COVID-19 and confirmed to be negative before anesthesia.

## Inpatient Consultations

RT is effective in treating painful bone metastases and several oncologic emergencies such as cord compression,<sup>10</sup> brain metastases,<sup>11,12</sup> superior vena cava syndrome/airway obstruction,<sup>13,14</sup> and bleeding.<sup>15-17</sup> During the COVID-19 pandemic, a full understanding of prognosis and goals of RT were especially emphasized for inpatients evaluated for RT. For patients who required RT while inpatient, a hypofractionated course of RT was strongly considered given many abbreviated regimens in the palliative setting have been found to be noninferior to multifractionated courses.

The taskforce developed guidelines for management of inpatient consults, based on exposure risk and need for treatment. For patients with known COVID-19 positive disease or PUI for COVID-19, evaluation and treatment recommendations were based on review of medical records and imaging, without conducting an in-person evaluation. Exceptions were considered for patients with rapidly progressing, life-threatening conditions where RT had significant likelihood of benefit. In these cases, there was both an expectation of rapid reversal of symptoms from RT and freedom from imminent death owing to cancer. If exposure risk was felt to be high or if RT was

not indicated, then recommendations were given based on data from medical records and imaging, without conducting an in-person evaluation. However, if exposure risk was deemed to be low and RT was indicated, then an in-person evaluation was conducted.

## Management of Patients During RT

For patients with community risk of acquiring COVID-19 infection, the taskforce recommended that treatment should proceed as indicated with PPE as described. For known COVID-19 positive patients, treatment was delayed until recovery from COVID-19, consistent with institutional protocol. For PUI, treatment was delayed while awaiting test results and was to resume if the test result returned negative. However, exceptions were considered for patients with rapidly progressing, life-threatening conditions where RT would have benefit. The tracer team, which tracked all patients undergoing testing for COVID-19, communicated daily with the treating physician and therapy teams to coordinate when treatments should be delayed and resumed.

## Treatment of COVID-19 Positive Patients

Known COVID-19 positive patients may require treatment with RT, and thus the development of thoughtful instructions was needed to identify if RT could be performed. An oversight panel was created to determine whether a COVID-19 positive patient would be appropriate for RT. A dedicated team of volunteers, consisting of RTTs, nurses, and physicians, was formed to navigate RT in the setting of COVID-19 positive patients. These volunteers were trained in appropriate PPE procedures. A specific treatment machine was designated for COVID-19 positive patients and infection control protocols were established. Given potential risks of exposure to other patients and clinic staff, the treatment of COVID-19 positive patients was limited to those who would benefit from RT under rapidly progressing, life-threatening conditions. These patients were considered for hypofractionation, in 1 to 5 fractions, sequestered to a single treatment machine, and given RT at the end of the business day so the room could be terminally disinfected.

## Communication

Institutional, twice daily calls were attended by the senior leaders and relayed to the divisional taskforce daily. Section leaders developed policies during daily calls and these were summarized on the taskforce calls. Taskforce guidelines were conveyed to clinical faculty and staff on daily section virtual huddles. In addition,

regular institutional and divisional town halls were instituted in early April.

## Conclusions

Response to COVID-19 spread in this large tertiary referral center included volume reduction, evolving PPE recommendations, flexible clinic visit interaction types dictated by need and risk reduction, and numerous social distancing strategies. Information was communicated to patients and the workforce expediently and effectively, and a supportive environment was fostered for all. The guiding emphasis underlying all policy changes was the use of evidence-based practices and discussion among clinical experts before implementation. The COVID-19 pandemic is likely to influence oncologic management in lasting ways. Although the strategies provided here may evolve over time, we hope these outlined considerations can assist the wider RO community as we collectively face this ongoing challenge.

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