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

William C. Chen, MD,a,b,* Sewit Teckie, MD,a,b Gayle Somerstein, RN, OCN,a Nilda Adair, RTT,a and Louis Potters, MD, FASTROa,b

aDepartment of Radiation Medicine, Northwell Health Cancer Institute, Lake Success, New York and bZucker School of Medicine at Hofstra/Northwell, Hempstead, New York

Received 13 April 2020; accepted 13 April 2020

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. These cases have since been linked to a novel enveloped RNA beta coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes the associated coronavirus disease 2019 (COVID-19). COVID-19 has caused a global pandemic, resulting in considerable morbidity, mortality, and healthcare resource strain. As of April 11, 2020, 10:00 AM central European time, 1,610,909 global cases of COVID-19 and 99,690 global deaths had been reported to the World Health Organization. The New York metropolitan area has been one of the most severely affected regions, with 160,349 confirmed cases and 8,078 deaths thus far within New York City and surrounding Nassau, Suffolk,
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
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 1 | Prioritization of radiation treatment start date based on treatment indication |
|---------|--------------------------------------------------------------------------------|
| Priority | Description |
| 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. |
| 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. |
| 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. |

Abbreviation: SRS = stereotactic radiosurgery.

| 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 |
| Disease site       | Pretreatment                                                  | Acute CTCAE to manage | Suggested interventions                                                                 |
|-------------------|---------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------|
| Anal cancer       | Health system resources potentially unavailable:             |                       | • Twice weekly OTV after second wk                                                       |
|                   | • Home care/wound care services                               |                       | • Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management       |
|                   |                                                                |                       | • CBC monitoring, weekly MedOnc visits (neutropenia/anemia)                              |
|                   |                                                                | Dermatitis Desquamation Pain Diarrhea Dehydration cytopenias | • Consider treatment break*                                                              |
| Rectal cancer —  | Consider induction chemotherapy as part of total neoadjuvant   |                       | • Twice weekly OTV after third wk                                                        |
| advanced, low-lying | therapy to delay start of radiation                         |                       | • Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management       |
| Esophageal cancer — | Health system resources potentially unavailable:             |                       | • CBC monitoring, weekly MedOnc visits                                                 |
| advanced           | • Nonemergent procedures (eg, esophageal dilation, stent      |                       | Early                                                                                  |
|                   | placement, feeding tube placement)                           |                       | • Twice weekly OTV after second wk                                                       |
|                   |                                                                |                       | • Early use of: PPI twice daily, oral steroids, Carafate, pain medications, dietary       |
|                   |                                                                |                       | evaluation, nutritional supplement shakes                                               |
|                   | Consider perioperative chemotherapy to defer radiation        |                       | Hospital avoidance                                                                       |
| Lung cancer —     | Consider induction chemotherapy (particularly for small cell) |                       | • IV fluid hydration by MedOnc                                                          |
| advanced           | Consider deferring adjuvant RT start date for: consolidative  |                       |   • If MedOnc unavailable, IV fluid hydration within RadMed department                   |
|                   | RT or PCI for SCLC, postop N2 NSCLC                           |                       |   • NG-tube placement (may be difficult, particularly if obstructive symptoms)          |
|                   |                                                                | Cough Dyspnea Esophagitis Weight loss Cytopenias | • Evaluate for O₂ need (nocturnal, ambulatory, at rest)                                 |
| Head and neck cancers | Health system resources potentially unavailable:             |                       | • Twice weekly OTV after second wk                                                       |
|                   | • Dental evaluation                                           |                       | • Early use of: oral steroids, PPI, Carafate, pain medications, nutritional supplement    |
|                   | • Feeding tube placement                                      |                       |   shakes                                                                                |
|                   | • Speech/swallow evaluation                                   |                       | • Aggressive management of esophagitis: PPI twice daily, gabapentin, dietary evaluation  |
|                   | • Home care/wound care services                               |                       | Early                                                                                  |
|                   |                                                                | Mucositis Odynophagia Dysphagia Dehydration Weight loss Cytopenias | • Twice weekly OTV                                                                       |
|                   | Consider weekly cisplatin dosing for fit candidates (30-40 mg/m²) instead of bolus cisplatin. |                       | • Review CBC taken by MedOnc weekly                                                      |
|                   | If borderline candidate for systemic therapy, do not use.     |                       | • Early use of: pain medication/management, gabapentin, mouth rinses, nutritional        |
|                   | Consider altered fractionation to compensate for lack of      |                       |   supplement shakes, dietary evaluation                                                 |
|                   | systemic therapy.                                             |                       | Hospital avoidance                                                                       |
|                   | For elderly patients, consider hypofractionation and no      |                       | • When dysphagia begins, start IV fluid hydration by MedOnc (otherwise fluid bolus via PEG if available) twice weekly during chemoradiation |
|                   | chemotherapy.                                                 |                       |   • 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 ≥ 3                     |
|                   |                                                                |                       | • Consider treatment break for refractory grade 3 symptoms (<1 wk)                      |
|                   |                                                                |                       | Early                                                                                  |
|                   |                                                                | Headaches Nausea      | • Twice weekly OTV after second wk                                                       |
| High-grade glioma  | Standard fractionation vs hyopfractionation for elderly/poor  |                       | (continued on next page)                                                                |

(continued on next page)
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. National policy initiatives have aimed to reduce acute hospital encounters among cancer patients through improved care coordination. 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

| Disease site       | Pretreatment                                                                 | Acute CTCAE to manage | Suggested interventions                           |
|--------------------|-------------------------------------------------------------------------------|-----------------------|--------------------------------------------------|
| Vulvar cancer      | Health system resources potentially unavailable:                             | Vomiting, Seizures    | • Steroid management, perhaps more antiepileptic use than normal Hospital avoidance |
|                    | • Decreased OR availability increased utilization of definitive chemoradiation |                       | • If progressive neurologic symptoms, consider outpatient MRI, evaluation by neuro-oncology/neurosurgery |
|                    | • 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 CB 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) 98-1126 allowed 10 day break as needed; in RTOG 0529, 27 breaks were mostly due to neutropenia.

1 Total neoadjuvant therapy approach added to 2015 version of NCCN guidelines as an acceptable option.

2 Perioperative chemotherapy is an alternative option to chemoradiation for distal esophagus and EGI.
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.

References

1. World Health Organization. Pneumonia of unknown cause—China. Available at http://www.who.int/csr/don/05-january-2020-pneumonia-of-unknown-cause-china/en/. Accessed April 9, 2020.
2. Guan W, Ni Z, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020;382:1708-1720.
3. World Health Organization. WHO director-general’s opening remarks at the media briefing on COVID-19 - 11 March 2020. Available at https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020. Accessed April 9, 2020.
4. Novel coronavirus (2019-nCoV) situation reports. Available at https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports. Accessed April 12, 2020.
5. COVID-19 map. Johns Hopkins Coronavirus Resource Center. Available at https://coronavirus.jhu.edu/map.html. Accessed April 12, 2020.
6. Liang W, Guan W, Chen R, et al. Cancer patients in SARS-CoV-2 infection: A nationwide analysis in China. Lancet Oncol. 2020;21: 335-337.
7. Wang H, Zhang L. Risk of COVID-19 for patients with cancer. Lancet Oncol. 2020;21:e181.
8. Xia Y, Jin R, Zhao J, Li W, Shen H. Risk of COVID-19 for patients with cancer. Lancet Oncol. 2020;21, e180.
9. Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. JAMA. 2020;323:1775-1776.
10. Remuzzi A, Remuzzi G. COVID-19 and Italy: What next? Lancet. 2020;395:1225-1228.
11. Sidaway P. COVID-19 and cancer: what we know so far. Nat Rev Clin Oncol. 2020;17:336.
12. Yu J, Ouyang W, Chua MLK, Xie C. SARS-CoV-2 transmission in patients with cancer at a tertiary care hospital in Wuhan, China [pub ahead of print]. JAMA Oncol. https://doi.org/10.1001/jamaoncol.2020.0980. Accessed April 12, 2020.
13. Papachristofilou A, Finazzi T, Kohler G, Dott C, Zimmermann F. Contingency plans in a radiation oncology department amid the 2019-nCoV outbreak in Switzerland. Adv Radiat Oncol. 2020;5: 577-581.
14. Braunstein LZ, Gillespie EF, Hong L, et al. Breast radiotherapy under COVID-19 pandemic resource constraints — approaches to defer or shorten treatment from a comprehensive cancer center in the United States. Adv Radiat Oncol. 2020;5:582-588.
15. Yerramilli D, Xu AJ, Gillespie EF, et al. Palliative radiotherapy for oncologic emergencies in the setting of COVID-19: Approaches to balancing risks and benefits. Adv Radiat Oncol. 2020; 5:589-594.
16. Zaorsky NG, Yu JB, McBride SM, et al. Prostate cancer radiotherapy recommendations in response to COVID-19. Adv Radiat Oncol. 2020;5:659-665.
17. Achard V, Tsoutsou P, Zilli T. Radiotherapy in the time of the coronavirus pandemic: When less is better [pub ahead of print]. Int J Radiat Oncol Biol Phys. https://doi.org/10.1016/j.ijrobp.2020.03.008. Accessed April 12, 2020.
18. Waddle MR, Chen RC, Arastu NH, et al. Unanticipated hospital admissions during or soon after radiation therapy: Incidence and predictive factors. Pract Radiat Oncol. 2015;5:e245-e253.
19. Terzo L, Fleming M, Yechoor A, et al. Reducing unplanned admissions: Focusing on hospital admissions and emergency department visits for patients with head and neck cancer during radiation therapy. Clin J Oncol Nurs. 2017;21:363-369.
20. Potters L, Kapur A. Implementation of a “no fly” safety culture in a multicenter radiation medicine department. Pract Radiat Oncol. 2012;2:18-26.
21. Potters L, Bloom B. Our pledge to achieve safety. Int J Radiat Oncol Biol Phys. 2012;82:1310-1311.
22. Cox BW, Kapur A, Sharma A, et al. Prospective contouring rounds: A novel, high-impact tool for optimizing quality assurance. Pract Radiat Oncol. 2015;5:e431-e436.
23. Cox BW, Teckie S, Kapur A, Chou H, Potters L. Prospective peer review in radiation therapy treatment planning: Long-term results from a longitudinal study [pub ahead of print]. Pract Radiat Oncol. https://doi.org/10.1016/j.prro.2019.10.008. Accessed April 12, 2020.
24. Puckett LL, Luitweiler E, Potters L, Teckie S. Preventing discontinuation of radiation therapy: Predictive factors to improve patient selection for palliative treatment. JOP. 2017; 13:e782-e791.
25. Common Terminology Criteria for Adverse Events (CTCAE). 2017:147. Available at: https://ctep.cancer.gov/protocolDevelopment/electronic_applications/ctc.htm. Accessed April 13, 2020.
26. Ajani JA, Winter KA, Gunderson LL, et al. Fluorouracil, mitomycin, and radiotherapy vs fluorouracil, cisplatin, and radiotherapy for carcinoma of the anal canal: A randomized controlled trial. JAMA. 2008;299:1914-1921.
27. Mitra D, Hong TS, Horick N, et al. Long-term outcomes and toxicities of a large cohort of anal cancer patients treated with dose-painted IMRT per RTOG 0529. Adv Radiat Oncol. 2017;2: 110-117.
28. National Comprehensive Cancer Network. Rectal cancer (Version 2.2020). Available at https://www.nccn.orgprofessionals/physician_gls/pdf/rectal.pdf. Accessed April 11, 2020.
29. National Comprehensive Cancer Network. Esophageal and esophageal cancer junction cancers (Version 1.2020). Available at https://www.nccn.orgprofessionals/physician_gls/pdf/esophageal.pdf. Accessed April 11, 2020.
30. Al-Batran S-E, Homann N, Pauligk C, et al. Perioperative chemotherapy with fluorouracil plus leucovorin, oxaliplatin, and docetaxel versus fluorouracil or capecitabine plus cisplatin and epirubicin for...
locally advanced, resectable gastric or gastro-oesophageal junction adenocarcinoma (FLOT4): A randomised, phase 2/3 trial. *Lancet.* 2019;393:1948-1957.

31. Team IC-19 health service utilization forecasting, Murray CJ. Forecasting COVID-19 impact on hospital bed-days, ICU-days, ventilator-days and deaths by US state in the next 4 months [pub ahead of print]. *medRxiv.* https://doi.org/10.1101/2020.03.27.20043752. Accessed April 12, 2020.

32. Marar M, Gabriel P, Hwang W-T, et al. Acute hospital encounters in cancer patients treated with definitive radiation therapy. *Int J Radiat Oncol Biol Phys.* 2018;101:935-944.

33. Moore ZR, Pham N-L, Shah JL, et al. Risk of unplanned hospital encounters in patients treated with radiotherapy for head and neck squamous cell carcinoma. *J Pain Symp Manage.* 2019;57:738-745.

34. Brooks GA, Hoverman JR, Colla CH. The Affordable Care Act and cancer care delivery. *Cancer J.* 2017;23:163-167.

35. Schleicher SM, Wood NM, Lee S, Feeley TW. How the Affordable Care Act has affected cancer care in the United States: Has value for cancer patients improved? *Oncol.* 2016;30:468-474.

36. Brown J, Grudzen C, Kyriacou DN, et al. The emergency care of patients with cancer: Setting the research agenda. *Ann Emer Med.* 2016;68:706-711.