

# Advances in Radiation Oncology

## 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 --Manuscript Draft--

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<b>Abstract:</b>	<p>As the COVID-19 pandemic spreads around the globe, access to radiation therapy remains critical for cancer patients. 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 amongst 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 SARS-CoV-2 spread. During the COVID-19 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 non-pandemic times.</p>

**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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Reducing hospitalization rates during COVID-19 pandemic

**Abstract**

As the COVID-19 pandemic spreads around the globe, access to radiation therapy remains critical for cancer patients. 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 amongst 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 SARS-CoV-2 spread. During the COVID-19 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 non-pandemic times.

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4 **Introduction**  
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6 In December 2019, cases of pneumonia of unknown etiology were first reported in Wuhan City, Hubei Province of  
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8 China.<sup>1</sup> These cases have since been linked to a novel enveloped RNA betacoronavirus named severe acute  
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10 respiratory syndrome coronavirus 2 (SARS-CoV-2)<sup>2</sup> which causes an associated coronavirus disease (COVID-19).  
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12 COVID-19 has caused a global pandemic, resulting in considerable morbidity, mortality, and health care resource  
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14 strain.<sup>3</sup> As of April 11, 2020, 10:00 CET, 1,610,909 global cases and 99,690 global deaths of COVID-19 had been  
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16 reported to the World Health Organization.<sup>4</sup> The New York metropolitan area has been one of the most severely  
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18 affected regions, with 160,349 confirmed cases and 8,078 deaths thus far within New York City and surrounding  
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20 Nassau, Suffolk, and Westchester counties, accounting for 30% of US cases and 38% of US deaths.<sup>5</sup>  
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26 Our institution, [XXX], is the largest health care provider in New York State and based in the aforementioned  
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28 counties. Most of our hospitals have similarly seen a surge of COVID-19 cases, and throughout our health system,  
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30 all non-emergent surgeries and procedures have temporarily been cancelled in order to provide capacity for  
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32 COVID-19 related hospital admissions. Early data from Asia and Europe showed an increased rate of SARS-CoV-2  
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34 infection and COVID-19 morbidity among cancer patients.<sup>6-12</sup> In an effort to reduce cancer patient exposure and  
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36 conserve health system resources, oncology societies and institutions have crafted working guidelines regarding  
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38 cancer treatments.<sup>13-17</sup> However, the majority of cancer cases require timely treatment, and we continue to  
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40 provide curative and palliative treatments to hundreds of patients daily throughout the [XXXX].  
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45 Radiation oncologists are well aware that several disease sites, such as head-and-neck cancer, have high  
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47 unanticipated hospital admission rates during or soon after radiotherapy.<sup>18,19</sup> As a department, we decided that we  
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49 must intensify our current on-treatment care protocols to ensure timely completion of therapy and drastically  
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51 reduce the chance of complications requiring hospital admission. Therefore, the faculty developed consensus-  
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53 driven, experience-based guidelines for intensive on-treatment management for disease sites that often require  
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55 concurrent radiation and chemotherapy for curative treatment, and historically have higher rates of emergency  
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57 department or hospital usage. In this report, we outline our departmental disease-site specific guidelines to reduce  
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59 hospitalization rates during the COVID-19 pandemic.  
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6 **Methods**  
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8 Quality and safety are critically important to the delivery of radiation therapy and are cornerstones of our  
9 previously reported Smarter Radiation Oncology® program.<sup>20,21</sup> As part of our departmental culture, new patient  
10 radiation cases are peer-reviewed in prospective daily contouring rounds before treatment planning begins.<sup>22,23</sup>  
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12 Our departmental quality assurance program also tracks data on patient hospitalization and discontinuation of  
13 radiation therapy.<sup>24</sup>  
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21 In March 2020, as the impact of the COVID-19 pandemic upon our health system intensified, we established two  
22 over-riding principles: (1) to maintain the safety of all staff, and (2) to maintain access for those patients requiring  
23 radiotherapy services.  
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29 Firstly, as care providers from Radiation Medicine and other departments were being redeployed throughout the  
30 health system to help manage the pandemic, we purposefully sought to decrease staff density and machine  
31 utilization, thereby decreasing staff and patient exposure to and risk of SARS-CoV-2 infection. A priority level was  
32 assigned to each case to determine which patients might safely avoid treatment or have treatment deferred,  
33 attempting to balance the risk of SARS-CoV-2 infection versus potential adverse outcomes of deferring treatments.  
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35 Faculty met virtually on two separate occasions to prospectively determine the urgency and priority of all pending  
36 cases, including pending simulations and treatment starts. Group consensus was required to assign each patient's  
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49 Secondly, there was a desire from providers and patients to minimize SARS-CoV-2 exposure by limiting evaluation  
50 or interventions within the emergency department or hospital, where possible. To that end, additional  
51 management of adverse events during outpatient treatments should be carried out within the ambulatory  
52 radiation medicine clinic or patient home. Given the hospital strain during the pandemic, resource availability for  
53 non-emergent procedures was also limited. This included, but was not limited to, decreased operating room  
54 availability for cancer surgery, percutaneous endoscopic gastrostomy placement, esophageal dilation/stent  
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4 placement, dental evaluation and extraction, infusion services, physical and occupational therapy, and home care  
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6 services. Management of adverse effects would therefore need to be more proactive than reactive, and require  
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8 more intensive management by fewer care providers.  
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12 Therefore, our goals required that we create a framework for clinical practice and resource management which  
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14 may be applied to the current and future resource-constrained settings. Key questions included:  
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- 16 1. Who benefits from increased support during treatment (health system resource utilization)?
- 17 2. What health system resources and/or services may be limited or unavailable?
- 18 3. How can we provide intensified support to reduce hospitalization rates and prevent strain on other  
19 departments?  
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- 21 4. When should interventions be implemented to reduce the severity of adverse treatment effects?  
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29 To address these questions and create a consensus guideline, a team of physicians, advanced care providers, and  
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31 administrators within our Radiation Medicine service line convened to review pertinent literature and practice  
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33 guidelines to establish recommendations for management of patients undergoing radiation treatments during this  
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35 pandemic.  
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#### 41 **Results/Recommendations**

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43 As of April 10, 2020, there were 3,402 COVID-19 inpatients within the 23 hospitals of the health care system, 27%  
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45 of whom were being managed within an intensive care unit setting and 821 on ventilators. All available space in  
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47 the hospitals such as post-anesthesia care units, endoscopy suites, labor and delivery rooms, as well as  
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49 auditoriums and lobbies have been converted to intensive care units or COVID wards.  
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#### 54 *Prioritization of Cases*

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56 A tiered system of prioritization (**Table 1**) was developed and utilized to stagger radiation starts and purposefully  
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58 reduce machine treatment volume. We classified cases as those in which patients need treatment immediately,  
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4 within 30 days, or may be delayed beyond 30 days. As a result, we reduced the volume of patients on-treatment  
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6 within the Radiation Medicine to approximately 70% of usual capacity.  
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10 Of the 307 cases identified and discussed among the faculty, 188 (61%) were classified Priority 1, 84 (27%) were  
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12 Priority 2, and 35 (11%) were Priority 3. Among the 188 Priority 1, 36 were head-and-neck, 26 were lung, 22 were  
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14 gynecologic, 19 were brain, 17 were gastrointestinal, and 34 were bone metastases (**Table 2**). The majority of  
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16 cases in Priority 1 were curative-intent, treated with concurrent chemoradiation. These treatments are often  
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18 associated with moderate to significant adverse treatment effects.  
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### 23 *Guidelines for Pre-Treatment Considerations and On-Treatment Management*

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

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36 The global COVID-19 pandemic has caused considerable health system strain as a result of dramatically higher  
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38 inpatient admissions and illness among clinical staff.<sup>25</sup> Clinical practices have had to adapt quickly in order to meet  
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40 demands for inpatient care while maintaining the safety of staff and non-infected patients. The vast majority of  
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42 oncology treatments must proceed in a timely fashion. At [XXX], we are caring for many of the New York region  
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44 COVID-19 cases and have had to quickly adjust our oncology patient management in order to keep our patients  
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46 and staff safe, and reduce hospital utilization. Our multicenter radiation department spans across teaching and  
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48 community hospitals as well as outpatient centers. The current pandemic is having a profound impact on  
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50 healthcare resources, thereby changing the routine practice of cancer treatments. The multidisciplinary aspect of  
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52 cancer care—inclusive of but not limited to surgical oncology, medical oncology, radiation oncology, diagnostic  
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54 radiology, pathology, clinical trials, genetic testing, social work, anesthesia, nutrition, occupational and physical  
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56 therapy, pain and palliative care—is significantly limited based on the needs for care of COVID-19 patients. What  
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58 was routine as recently as 4 weeks ago has been transformed radically.  
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6 Fortunately, we have been able to continue providing patients advanced, high-quality radiotherapy and for the  
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8 most part, concurrent chemotherapy. Despite social distancing, use of telehealth, conversion to shorter  
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10 fractionation schedules, and deferment of some treatments, there are numerous patient touchpoints with the  
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12 radiation care team. By nature of radiation treatments, patients are physically present within the department and  
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14 interacting with team members often on a daily basis. Especially as other members of the patient's  
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16 multidisciplinary care team reduce in-person interactions, the radiation care team has become the main point of  
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18 interaction. This proximity should be leveraged to aggressively and preemptively manage patients during  
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20 treatment.  
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26 Unplanned acute hospital encounters during or soon after radiation therapy rates may differ across cancer  
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28 diagnoses, but have been reported between 20-36% with approximately half of acute encounters in the  
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30 emergency department and half inpatient admissions.<sup>18,26,27</sup> National policy initiatives have aimed to reduce acute  
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32 hospital encounters among cancer patients through improved care coordination.<sup>28-30</sup> The importance of these  
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34 initiatives are underscored during this crisis.  
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39 Given the impact of treatment delay or morbidity upon prognosis, a broader macro view of healthcare outcomes  
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41 during this pandemic recognizes that changes in routine care need to be usurped by a need for intense clinical  
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43 management of cancer patients to avoid complications that may require ED visits or hospitalizations. Therefore, as  
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45 a faculty, we decided that a proactive, intensive approach to on-treatment management of at-risk patients was  
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47 necessary to maintain excellent disease outcomes while avoiding health system strain. We developed these  
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49 guidelines using our combined experience, knowledge of the literature, and consensus. We have implemented  
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51 these on-treatment guidelines in our clinics beginning April 13, 2020.  
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56 We expect that these clinical guidelines, which advocate for more intensive on-treatment management, will  
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58 reduce rates of hospitalization and treatment breaks. We recognize that these recommendations represent a  
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60 resource shift in the department toward more hands-on clinical care while one is otherwise trying to limit excess  
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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 was an otherwise busy and packed clinical space.

**Conclusion**

The COVID-19 global pandemic has had a dramatic impact on New York area hospitals and practices. [XXX] 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 those undergoing curative-intent radiation therapy with concomitant chemotherapy. We believe these experience-driven and consensus-based guidelines will reduce adverse events that require emergency department usage and hospitalization rates among radiation medicine patients.

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

<b>Priority</b>	<b>Description</b>	<b>Example cases</b>
Priority I	Cases where a delay of treatment may result in a loss of life, progression of disease or a permanent loss of neurological or other function.	<ol style="list-style-type: none"> <li>1. Oncologic Emergencies</li> <li>2. Advanced Head and Neck</li> <li>3. Advanced Gastrointestinal</li> <li>4. Advanced Gynecologic</li> <li>5. Advanced Lung</li> </ol>
	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 impact a patient's prognosis.	<ol style="list-style-type: none"> <li>1. Early stage Head and Neck</li> <li>2. Early stage Lung</li> <li>3. Lymphoma</li> <li>4. Brain SRS of benign diseases</li> </ol>
	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 impact a patient's prognosis.	<ol style="list-style-type: none"> <li>1. Early stage Prostate</li> <li>2. Early stage Breast</li> <li>3. Prostate on androgen deprivation</li> </ol>
	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 with follow up as needed.	

**Table 2. Patient characteristics**

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

**Table 3. Consensus Guidelines for Intensive Treatment Management to reduce Hospitalization and Adverse Events.**

<b>Disease Site</b>	<b>Pre-treatment</b>	<b>Acute CTCAE<sup>31</sup> to manage</b>	<b>Suggested Interventions</b>
Anal Cancer	Health system resources potentially unavailable: <ul style="list-style-type: none"> <li>• Home care / wound care services</li> </ul>	Dermatitis Desquamation Pain Diarrhea Dehydration Cytopenias	<ul style="list-style-type: none"> <li>• Twice weekly OTV after 2<sup>nd</sup> week</li> <li>• Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management</li> <li>• CBC monitoring, weekly MedOnc visits (neutropenia/anemia)</li> <li>• Consider treatment break<sup>a</sup></li> </ul>
Rectal Cancer – advanced, low-lying	Consider induction chemotherapy as part of total neoadjuvant therapy to delay start of radiation <sup>b</sup>	Dermatitis Desquamation Pain Diarrhea	<ul style="list-style-type: none"> <li>• Twice weekly OTV after 3<sup>rd</sup> week</li> <li>• Early use of: Silvadene, sitz baths, anti-diarrheal, pain medication/management</li> <li>• CBC monitoring, weekly MedOnc visits</li> </ul>
Esophageal Cancer – advanced	Health system resources potentially unavailable: <ul style="list-style-type: none"> <li>• Non-emergent procedures (e.g., esophageal dilation, stent placement, feeding tube placement)</li> </ul> <p>Consider perioperative chemotherapy to defer radiation<sup>c</sup></p>	Esophagitis Weight loss Cough Dyspnea	<p>Early</p> <ul style="list-style-type: none"> <li>• Twice weekly OTV after 2<sup>nd</sup> week</li> <li>• Early use of: PPI twice daily, oral steroids, Carafate, pain medications, dietary evaluation, nutritional supplement shakes</li> </ul> <p>Hospital avoidance</p> <ul style="list-style-type: none"> <li>• IV fluid hydration by MedOnc <ul style="list-style-type: none"> <li>○ If MedOnc unavailable, IV fluid hydration within RadMed department</li> </ul> </li> <li>• NG-tube placement (may be difficult, particularly if obstructive symptoms)</li> </ul>

<sup>a</sup> RTOG 98-11<sup>32</sup> allowed 10 day break as needed; in RTOG 0529<sup>33</sup>, breaks were mostly due to neutropenia.

<sup>b</sup> Total neoadjuvant therapy approach added to 2015 version of NCCN guidelines as an acceptable option.<sup>34</sup>

<sup>c</sup> Perioperative chemotherapy is an alternative option to chemoradiation for distal esophagus and EGJ.<sup>35,36</sup>

<p>Lung Cancer – advanced</p>	<p>Consider induction chemotherapy (particularly for small cell)</p> <p>Consider deferring adjuvant RT start date for: consolidative RT or PCI for SCLC, post-op N2 NSCLC</p>	<p>Cough Dyspnea Esophagitis Weight loss Cytopenias</p>	<ul style="list-style-type: none"> <li>• Evaluate for O2 need (nocturnal, ambulatory, at rest)</li> <li>• Twice weekly OTV after 2<sup>nd</sup> week</li> <li>• Early use of: oral steroids, PPI, Carafate, pain medications, nutritional supplement shakes</li> <li>• Aggressive management of esophagitis: PPI twice daily, gabapentin, dietary evaluation</li> </ul>
<p>Head and Neck Cancers</p>	<p>Health system resources potentially unavailable:</p> <ul style="list-style-type: none"> <li>• Dental evaluation</li> <li>• Feeding tube placement</li> <li>• Speech/swallow evaluation</li> <li>• Home care / wound care services</li> </ul> <p>Consider weekly cisplatin dosing for fit candidates (30-40mg/m<sup>2</sup>) instead of bolus cisplatin.</p> <p>If borderline candidate for systemic therapy, do not use. Consider altered fractionation to compensate for lack of systemic therapy.</p> <p>For elderly patients, consider hypofractionation and no chemotherapy.</p>	<p>Mucositis Odynophagia Dysphagia Dehydration Weight loss Cytopenias</p>	<p>Early</p> <ul style="list-style-type: none"> <li>• Twice weekly OTV</li> <li>• Review CBC taken by MedOnc weekly</li> <li>• Early use of: pain medication/management, gabapentin, mouth rinses, nutritional supplement shakes, dietary evaluation</li> </ul> <p>Hospital avoidance</p> <ul style="list-style-type: none"> <li>• When dysphagia begins, start IV fluid hydration by MedOnc (otherwise fluid bolus via PEG if available) twice weekly during chemoradiation <ul style="list-style-type: none"> <li>○ If MedOnc unavailable, consider IV fluid hydration within RadMed department</li> </ul> </li> <li>• NG-tube placement if weight loss otherwise meeting criteria for PEG placement</li> <li>• Low threshold to stop chemotherapy if patient develops CTCAE ≥ 3</li> <li>• Consider treatment break for refractory grade 3 symptoms (&lt;1 week)</li> </ul>



High-Grade Glioma	Standard fractionation vs. hypofractionation for elderly/poor performance status vs. palliative	Headaches Nausea Vomiting Seizures	Early <ul style="list-style-type: none"> <li>Twice weekly OTV after 2<sup>nd</sup> week</li> <li>Steroid management, perhaps more anti-epileptic use than normal</li> </ul> Hospital avoidance <ul style="list-style-type: none"> <li>If progressive neurologic symptoms, consider outpatient MRI, evaluation by neuro-oncology / neurosurgery</li> </ul>
Vulvar Cancer	Health system resources potentially unavailable: <ul style="list-style-type: none"> <li>Decreased OR availability → Increased utilization of definitive chemoradiation</li> <li>Home care / wound care services</li> </ul>	Pain Dermatitis Desquamation Diarrhea Dehydration Cytopenias	<ul style="list-style-type: none"> <li>Twice weekly OTV after 2<sup>nd</sup> week</li> <li>Early use of: Silvadene, sitz bath, pain medication/management, anti-diarrheal</li> <li>CBC monitoring, urinalysis, weekly MedOnc visits</li> <li>Consider treatment break (goal &lt; 1 week)</li> </ul>

**Abbreviations:** CTCAE, Common Terminology Criteria for Adverse Events; OTV, on-treatment visit; CBC, complete blood count; PPI, proton-pump inhibitor; IV, intravenous; NG, nasogastric; RT, radiotherapy; PCI, prophylactic cranial irradiation; SCLC, small-cell lung cancer; NSCLC, non-small cell lung cancer; PEG, percutaneous endoscopic gastrostomy; MRI, magnetic resonance imaging; OR, operating room.