# Radiation Therapy amidst the COVID-19 Pandemic in the Philippines: When Guidelines are Not Enough

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## ABSTRACT

**Background.** To respond to the pandemic, many societies, including the American Society for Radiation Therapy (ASTRO), the United Kingdom's National Institute for Health and Care Excellence (NICE), and the Philippine Radiation Oncology Society (PROS), recommended guidelines to allow for continued safe delivery of oncologic services. Yet, the delivery of radiotherapy during the COVID-19 pandemic remains a challenge.

**Objective.** To describe the situation of radiotherapy delivery in Metro Manila (NCR) during the COVID-19-related quarantine. Specifically, the objectives were to determine: (1) how the radiotherapy providers implemented the recommended changes, (2) if these implemented changes allowed the hospitals to operate with pre-COVID capacities, and (3) the causative factors of treatment interruptions if these were present. Additionally, in the face of treatment interruptions, the authors sought to put forth recommendations to decrease treatment interruptions.

**Methods.** Investigators gathered data on the prevailing situation of RT services in their respective institutions during the strictest period of quarantine — Enhanced Community Quarantine (ECQ). Patients aged 18-70 years old who missed at least one fraction during the ECQ from March 16 – April 15, 2020, were invited to participate in a phone survey to determine factors contributing to treatment interruptions.

**Results.** All the institutions implemented global recommendations to adapt to the pandemic, including infection control measures, telemedicine, and modification of RT plans. Despite this, most institutions had increased treatment interruptions during ECQ. The percentage of patients with interruptions was also much higher during the ECQ (66.37%) than during the pre-COVID month (30.56%). Among 142 patients unable to continue treatment, there were no significant differences in demographic variable and oncologic profile rates. The majority were more worried about getting COVID-19 than missing RT. The most common factor for treatment interruptions was transportation, followed by fear of getting COVID-19.

**Conclusion.** Compliance with global recommendations is not enough to ensure that the patients who require radiotherapy will receive it. Based on institutional and patient results, the causative factors of interruptions included suspension of services, lack of transportation, and anxiety of patients and staff. Especially in low-resource settings, recommendations are to use available resources as efficiently as possible by having an organized referral system, providing transportation or nearby accommodation for patients and staff, and communicating effectively to reassure patients that radiotherapy can be continued safely.

*Keywords: radiotherapy, radiation therapy, radiation oncology, pandemic, COVID-19, ECQ, quarantine, global recommendations, guidelines implementation, radiotherapy services*

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## INTRODUCTION

Like other countries, the Philippines was forced to redirect most of its health resources to the COVID-19 pandemic from when Enhanced Community Quarantine (ECQ) was declared on 16 March 2020. ECQ implies the strictest of quarantines where everyone was remanded to their homes except for health care workers and the military.[1] Delivery of cancer care became a challenge in many institutions.[2,3]

According to the National Health Service England, oncologic patients are among the most vulnerable groups with an increased risk for serious disease or death if infected.[4] It is difficult to balance this risk of harm from being infected and the risk of delaying treatment for cancer, mainly radiotherapy (RT).

All over the world, radiotherapy facilities had to implement strategies to ensure continuity of services.

First, there was the prioritization of treatments. Recommendations from different groups have a common theme: patients with rapidly progressing, potentially curable tumors with little margin for delay are the highest priority. They should continue treatment, whereas patients with benign tumors or those whose therapy is unlikely to offer tumor control or influence long-term survival are the lowest priority.[4–8] Though delaying treatment for favorable biology might seem preferable, and a global discussion noted that it might result in an unmanageable surge in activity after this crisis.[9]

Second, several groups (from the UK, US, Singapore, Puerto Rico, etc.) have recommended using hypofractionated regimens when appropriate.[9–14]

Third, infrastructure and operational adaptations were made, including strengthening telemedicine, disinfection of facilities, and using personal protective equipment (PPE).[5,10,15]

All these strategies are summarized in the RADS framework—**R**emote visits, **A**void RT if it is of little or no benefit, **D**efer RT if clinically appropriate, and **S**horten, advocated by the United Kingdom's National Institute for Health and Care Excellence (NICE) and the American Society for Radiation Oncology (ASTRO).[14,16]

Locally, the Philippine Radiation Oncology Society (PROS) also followed these global recommendations – prioritize, hypofractionated when able, and hold virtual clinics. These were done with the hope of having the least disruptions in cancer treatment.[17]

The PROS guidelines also indicate "radiation treatment must not be interrupted as much as possible." This study describes how the pandemic has affected RT institutions in the National Capital Region (NCR) / Metro Manila and their patients, particularly those who could not continue regular treatment. Factors that caused the treatment interruptions and possible solutions to make the health systems for RT more capable of dealing with future pandemics are discussed.

The provision of radiotherapy in the Philippines is limited by the number of available linear accelerators and trained staff. It is important to consider that a patient's choice of a facility is influenced by proximity to their home, the institution where other diagnostics and treatment (i.e., chemotherapy or surgery) were done, and treatment costs. There have been no reports about RT in the Philippines during the pandemic until this study.

## OBJECTIVE

The study's primary objective was to describe the situation of radiotherapy delivery in Metro Manila (NCR) during the initial period of COVID-19-related quarantine. Specifically, the objectives were to determine: (1) how the radiotherapy providers implemented the recommended changes, (2) if these implemented changes allowed the hospitals to operate with pre-COVID capacities, and (3) the causative factors of treatment interruptions if these were present. Additionally, in the face of treatment interruptions, the authors sought to put forth recommendations to decrease treatment interruptions.

## METHODS

This operations/process research includes surveys of both institutions and patients, both done via phone. It was approved by the Department of Health – Research Ethics Board and Institutional Research Ethics Committees.

Investigators attempted to gather data on the radiotherapy situation during the ECQ from all radiotherapy facilities in the NCR of the Philippines. For comparison, patient counts and treatment interruption rates for March 2020 and for February 2020 for comparison were requested.

The institutional survey form included guide questions on suspension of services, problems in staffing and equipment, and measures done in response to the crisis. Each clinical investigator answered the survey for a respective institution as a practicing radiation oncologist. (See Appendix 1 for the Institutional Survey Form.)

Invited to join the patient survey were patients aged 18-70 years old, receiving radiation therapy who missed at least one fraction during the ECQ (from March 16 – April 15, 2020). Patients unreachable through the phone were excluded. Among those included, their demographic data—patient information, tumor data, and treatment characteristics—was collected and tabulated. Patients were asked what factors caused the treatment interruption and how worried they were about the disruption, and about getting COVID-19 using a 3-point scale.[18] (See Appendix 2 for the Patient Survey Form.)

Data was after that consolidated and analysed. Descriptive statistics, including frequency and percentages, were used in analysing data.

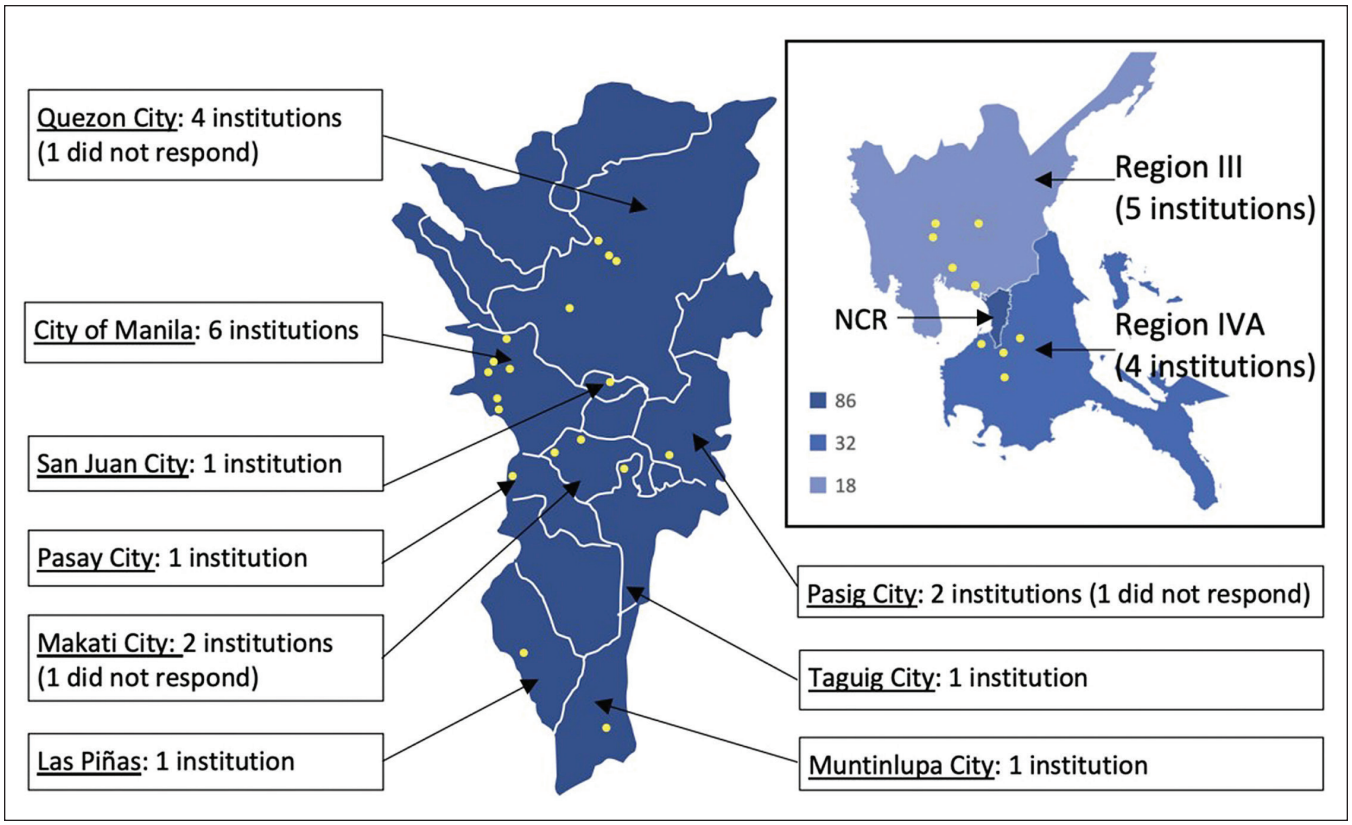


**Figure 1.** Map of RT institutions in NCR and number of patients with interruptions by place of residence per Region *(inset)*.

*Legend: III – Central Luzon Region, IVA – Calabarzon Region, NCR – National Capital Region). Not on the map: Two patients from North and one patient from an island province.*

## RESULTS

### Institutional Results

Sixteen of 19 institutions in NCR responded (Figure 1). Among these, 4 are government hospitals (Institutions C, D, G, and K).

Six centers are in the capital city of Manila, and three are in Quezon City. The remaining seven facilities are located in various other cities within NCR. All facilities had to alter operations by implementing infection control measures, such as using PPE and disinfection of machines and areas. Other efforts done to adapt to the pandemic included reasonable modification of treatment plans (93.8%), use of telemedicine (81.3%), stratification of patients into priority levels (75.0%), decreased work hours, working days, or both (31.3%), and referral to closer RT facilities (6.3%).

On an institutional level, 4 out of 16 (25%) institutions temporarily suspended all their services during the ECQ. The average length of the suspension was three weeks (1 - 5 weeks). These four hospitals represent 129 patients, 46.2% of patients.

Of the 12 facilities that continued providing radiotherapy services, many could not continue all their services; that is, they had to suspend some of their services temporarily. Three institutions were unable to accept new outpatients. Four out of 11 institutions discontinued brachytherapy.

Staffing also became a concern. Institutions K, C, and L reassigned 50%, 12%, and 10% of staff to COVID-areas, respectively. Institutions M, F, and O had RT staff members who were confirmed to have COVID-19 (10%, 14.3%, and 11.5%, respectively). Five institutions had to decrease staff working hours, treatment days, or both to 3 to 4 days a week.

Machine servicing was also hindered. Engineers reported difficulty going to the center. Some institutions had delayed treatments due to machine error, postponement of software upgrades, and delayed delivery of the radioactive source for brachytherapy.

Only Institution H did not feel the need to modify its RT plans. Among those institutions that rationally changed their treatment plans, four institutions allowed a delay in treatment for low-risk patients, eight institutions increased their use of hypofractionated regimens with enough evidence, and three institutions did both modifications mentioned above. Most institutions also stratified their patients with emergency, definitive, and palliative cases scheduled earlier than postoperative and benign cases.

Thirteen institutions (81.3%) reported the use of telemedicine.

## Patient Results

Only 12 institutions provided patient data. Most institutions reported increased percentages of patients with treatment interruptions during ECQ compared to the month before—8 of 12. The rate of patients without treatment interruptions was noticeably lower during the ECQ (33.6%) than that of the previous month, which was only 69.4% (Table 1). The most significant differences in rates were seen in Institutions D and K. The exceptions with few interruptions were Institutions B, F, H, and K (Figure 2).

A total of 142 patients were able to participate in the phone survey. The mean age of patients with treatment interruptions was 51.64 years old. The majority of the patients were in the 56-65 years age range, female (73.2%) and living in the NCR (60.6%) (Table 2 and Figure 1). The estimated mean distance from a patient's home to the RT facility was 31 kilometers.

Approximately 30% of the patients had gynecologic diseases, whereas almost 27% had breast cancer. More than half of the patients had advanced cancers. RT was given post-operatively and definitively in 45.1% and 38%, respectively.

The most common reason (58.5%) cited by patients for treatment interruptions was transportation, followed by fear of getting COVID-19 (19.7%). More than 10% of the patients said that the center had problems with their

**Table 1.** Comparison of percentage of patients able to adhere to the scheduled Radiation Therapy treatment before and during the ECQ

| Institution | Before the ECQ | During the ECQ |
|---|---|---|
| *A* | 100.0% | 82.5% |
| *B* | 74.5% | 77.2% |
| *C* | 88.2% | 62.9% |
| *D* | 100.0% | 0.0% |
| *E* | 90.6% | 70.0% |
| *F* | 30.0% | 62.9% |
| *G* | 100.0% | 81.4% |
| *H* | 65.0% | 100.0% |
| *I* | 78.9% | 60.0% |
| *J* | 85.1% | 72.9% |
| *K* | 97.3% | 0.0% |
| *L* | 92.3% | 92.9% |
| *Total* | 69.4% | 33.6% |

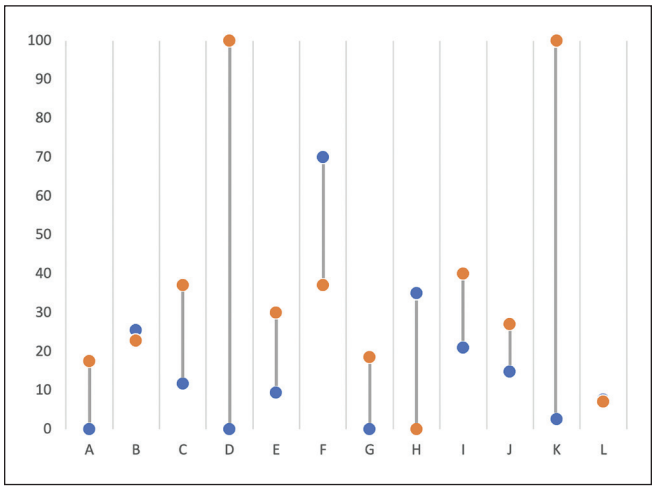


**Figure 2.** Scatter plot (with drop lines) of percentages of patients with treatment interruptions.

*(Legend: ● Before quarantine (February) ● Early lockdown (March)*

**Table 2.** Demographic and clinical profile of patients with treatment interruptions

| Variables | Patients with treatment interruptions (n=142) | Percentage (%) |
|---|---|---|
| ***By age group*** | | |
| < 25 years old | 5 | 3.5 |
| 26 – 35 years old | 16 | 11.3 |
| 36 – 45 years old | 23 | 16.2 |
| 46 – 55 years old | 35 | 24.6 |
| 56 – 65 years old | 40 | 28.2 |
| 66 – 70 years old | 23 | 16.2 |
| ***By sex*** | | |
| Male | 38 | 26.8 |
| Female | 104 | 73.2 |
| ***By area of residence*** | | |
| NCR (National Capital Region) | 86 | 60.6 |
| Region I (Ilocos Region) | 2 | 1.4 |
| Region II (Cagayan Valley) | 2 | 1.4 |
| Region III (Central Luzon) | 18 | 12.7 |
| Region IV-A (CALABARZON) | 32 | 22.5 |
| Region IV-B (MIMAROPA) | 1 | 0.7 |
| Region VI (Western Visayas) | 1 | 0.7 |
| ***Oncologic system*** | | |
| Gynecology | 42 | 29.6 |
| Breast | 38 | 26.8 |
| Head and Neck | 20 | 14.1 |
| Gastrointestinal | 15 | 10.6 |
| Genitourinary | 8 | 5.6 |
| Central Nervous System | 5 | 3.5 |
| Lymphatic/Reticuloendothelial | 4 | 2.8 |
| Palliative | 4 | 2.8 |
| Soft Tissue/Sarcoma | 3 | 2.1 |
| Lung | 2 | 1.4 |
| Pediatric | 1 | 0.7 |
| ***Stages*** | | |
| Stage 1 | 10 | 7.0 |
| Stage 2 | 39 | 27.5 |
| Stage 3 | 63 | 44.4 |
| Stage 4 | 20 | 14.1 |
| N/A | 10 | 7.0 |
| ***Treatment Intent*** | | |
| Radical postoperative | 64 | 45.1 |
| Definitive | 54 | 38.0 |
| Palliative | 17 | 12.0 |
| Pre-operative | 7 | 4.9 |

**Table 3.** Patient-reported causative factors of treatment interruptions among patients

| Factors | Frequency (n=142) | Percentage (% out of 142) |
|---|---|---|
| ***Transportation*** | 83 | 58.5 |
| ***Fear of getting infected*** | 28 | 19.7 |
| ***Machine problem*** | 18 | 12.7 |
| ***Financial constraints*** | 14 | 9.9 |
| ***Advised for interruption due to clinical situation*** | 12 | 8.5 |
| ***Temporary suspension of services at the institution*** | 12 | 8.5 |
| ***Advised to quarantine due to having COVID-19 symptoms*** | 8 | 5.6 |
| ***Treatment toxicity*** | 6 | 4.2 |
| ***Unavailability of a companion during treatment*** | 2 | 1.4 |

**Table 4.** Worry level of patients for missing Radiation Therapy (RT) and getting the COVID-19 virus

| Variables/categories, statistical measure | Statistical values for worry level |
|---|---|
| ***For missing RT (overall mean score)*** | 2.15 |
| Not worried at all [n, (%)] | 36 (25.4) |
| Slightly worried [n, (%)] | 49 (34.5) |
| Very worried [n, (%)] | 57 (40.1) |
| ***For getting the COVID-19 virus (overall mean score)*** | 2.39 |
| Not worried at all [n, (%)] | 23 (16.2) |
| Slightly worried [n, (%)] | 41 (28.9) |
| Very worried [n, (%)] | 78 (54.9) |

machines and was constrained financially. Some were also advised to interrupt treatment due to clinical situations or quarantine because they had COVID-19 symptoms. Other factors were the temporary suspension of services at the institution, treatment toxicity, and unavailability of a companion during the treatment (Table 3).

Using a 3-point scale with 1 graded as not worried, 2 as slightly worried, and 3 as very worried, the mean worry level score for getting the COVID-19 virus (2.39) was higher than the score for missing RT (2.15).[18] More patients said they were very worried about getting COVID-19 than patients who said they were very worried about missing RT (Table 4).

## DISCUSSION

Early in the pandemic, the national radiation oncology society wrote, "radiation treatment must not be interrupted as much as possible" and implemented certain schemes that would help institutions adapt to the ongoing pandemic.[17] All institutions were compliant in implementing infection control measures, and it was hoped that this would be enough to allow normal operations to continue. However, it was seen that many institutions had to suspend operations temporarily. This is likely due to the need to reassign resources to COVID-19. The two government hospitals designated for COVID (Institutions D & K) were also the most affected, whereas four private institutions were the least affected.[19,20]

It may thus be valuable to adapt Italy's experience by ensuring hospitals designated for non-COVID oncology patients.[21] It should not be too difficult for a patient to transfer to a non-COVID center. There may also be room for organized referrals; that is, institutions can partner with certain other institutions so that each will serve as backup to the other. This way, patients' needs are met, regardless of whether their hospital is a COVID center or not.

Though suspensions on an institutional level contributed to the increase in the number of patients with treatment interruptions, the patients themselves claimed that this was not the primary reason for treatment interruption. Even when services resumed, enough resources were allocated to cancer care, and proper infection control measures were put in place, many patients were still unable to receive RT. The most common patient-reported factor was transportation. During the strictest parts of the lockdown, there was no public transportation. This may also explain why the four institutions without increased patients with interruptions were private institutions, likely catering to patients who could afford more expensive means of transport.

Hence, the authors recommend an organized transportation system for patients and staff as an essential component in ensuring continued treatment. From the experience of some institutions, relocating staff to temporary living spaces near the hospital is another solution.

Hospitals have learned to provide emergency accommodations in extreme situations, but the response was reactive rather than proactive. Expectedly, this caused stress for the involved personnel, as reported in the institutional survey. There was anxiety about getting infected and infecting family members and loved ones.

Even though institutions could implement global recommendations for infection control, patients were more worried about contracting COVID than having their cancers progress. Hence, the authors recommend patient education to alleviate anxiety, especially for patients whose cancer treatment could not be delayed.

An analysis of patient characteristics also showed more female patients with interruptions. This merely reflected the census of cases. The majority of patients getting treated were women with breast and gynecologic cancers. Also, because these lockdowns occurred mainly in the NCR, it stands to reason that most of the patients affected lived in the NCR or the immediately adjacent Regions III and IV-A. However, the small percentage of patients from farther regions shows the need to prioritize setting up radiation therapy facilities in provinces away from NCR.

A limitation of the study was that the period was only for the first month of ECQ. However, four weeks is a significant time for cancer patients for whom a more responsive health system is needed. Future studies to determine if and how radiotherapy facilities could adapt to the pandemic if given enough time may also be warranted.

## CONCLUSIONS

Radiotherapy treatment interruptions were significant during the beginning of the pandemic period. Compliance with international and local recommendations was not enough to ensure that all patients received their required treatments. Particularly in a restricted-resource setting, we most efficiently and judiciously used available resources.

Based on institutional and patient results, the causative factors of interruptions included suspension of services, lack of transportation, and anxiety of patients and staff. Organized referral systems, provision of transportation or nearby accommodation for patients and staff, and effective communication to reassure patients that radiotherapy can be continued safely are recommended on top of compliance to available guidelines.

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### Statement of Authorship

- Study conception and design: Ylanan, Cañal, Pineda, Valmonte
- Acquisition of data: Ylanan, Cañal, Pineda, Valmonte
- Analysis and interpretation of data: Ylanan, Cañal, Pineda, Valmonte
- Drafting of manuscript: Ylanan, Cañal, Pineda, Valmonte
- Critical revision: Ylanan, Cañal
- Approval of the final version submitted: Ylanan, Cañal, Pineda, Valmonte

### Author Disclosure

All authors declared no conflicts of interest.

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## APPENDICES

### Appendix 1. Institutional Survey Form

1. Were patients allowed to continue RT? If there was a temporary suspension of services, for how long? What was done during the suspension?
2. Was the institution able to accept new patients, both admitted and outpatient?
   a. For consultation at the clinic?
   b. For CT simulation or planning?
   c. For daily treatment?
3. Did brachytherapy services continue?
4. Are there any challenges in delivering RT at your institution due to any of the following
   a. Staffing: What fraction of the RT staff were reassigned to COVID-designated areas? What fraction of the staff were identified as confirmed COVID-19 cases? Were there any mental health concerns? Did this affect the quantity or quality of RT?
   b. Environment: Is the facility near areas that would increase the risk of infection?
   c. Machines or Equipment: Did any machine require servicing hindered by the ECQ?
   d. Others
5. What measures were taken in response to the crisis and for patients unable to continue treatment?

a. Infection control (i.e., disinfection measures)
b. Prioritization of patients (i.e., to determine which patients can continue or start RT)
c. Rational modification of treatment plans (i.e., hypo-fractionation, planned delay)
d. Use of telemedicine
e. Others

### Appendix 2. Patient Survey Form

1. Why has the patient been unable to continue RT?
2. How worried is the patient about (1 - not worried at all, 2 - slightly worried, 3 - very worried)
   a. Missing RT?
   b. Getting the coronavirus?
3. What does the patient think will allow them to continue RT?