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Original Manuscript

Radiotherapy Service Amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia.

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ABSTRACT

Background: Several changes in hospital policies took place to mitigate the spread of Coronavirus disease 2019 (COVID-19). However, the patient's perception to these abrupt changes in medical services is not known. This study analyzed the quality of radiotherapy service during the COVID-19 pandemic and the patient's perception of them.

Methods: This descriptive study will qualitatively assess cancer patient perception of the quality of radiotherapy service during COVID-19 pandemic. Willing participants were given a questionnaire that explore two major aspects: the patient's general knowledge of COVID-19 and their perception of radiotherapy service during the pandemic.

Results: The 145 participants of this study were generally well-informed about the significance of COVID-19 pandemic. Most respondents claimed to adequately practice preventive measures and put high regards in personal protective equipment (PPE) worn by them and healthcare workers for their safety. Their level of trust to all healthcare workers remained high and identified hospital announcements (television, brochures) educated them the most in regards to the relationship of COVID-19 and cancer.

Conclusion: The changes in hospital policies and radiation oncology service in our institution were well-received by the study population. Despite the majority of respondents were afraid and anxious of being infected of COVID-19 while undergoing treatment, only a minority of them contemplated to delay or completely stop going for treatment. By adhering to major guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the pandemic.

Keywords: Radiation oncology, radiotherapy, COVID-19, service quality

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) was declared as a global pandemic on March 11th, 2020, by the World Health Organization. The prevalence of cancer in COVID-19 patients is higher compared

to the general population because of the immunosuppressive state as results of the malignant disease and anticancer treatment [1–3]. Furthermore, they were observed to have a greater risk of severe events (needing intensive care unit care and/or invasive ventilation assistance) compared to patients without cancer [4].

Radiotherapy is one of the mainstay cancer treatment modalities that has played a greater role since the COVID-19 pandemic began. For example, neoadjuvant short-course radiotherapy is preferred over long-course chemoradiotherapy for patients with locally advanced colorectal cancer [5]. The COVID-19 outbreak presented several novel challenges to the radiation oncology unit. First, the frailties of patients who are admitted to the radiation oncology unit created risks of exposure and cross-transmission between frail and fit patients. Second, restriction on the number of patients who are admitted to the hospital or for radiation therapy can affect the efficacy of the therapy itself [6]. Third, prolonged period of radiotherapy will increase the duration of contact between people thus increasing the chance of Coronavirus transmission. Fourth, constant cleaning and disinfection of the equipment policies used in radiation oncology because of its constant sequence of use by different patients, thus increasing the potential for COVID-19 cross-contamination [7,8].

In accordance to the COVID-19 National task force, institutional, and specialists guidelines, our institution implemented numerous changes to help mitigate the spread of infection and allocation of limited resources [7]. Several changes include scheduled meeting, patient screening before entering treatment facilities, a maximum of one patient companion, solo consultation, mandatory use of face mask, physical distancing, modification of treatment program, etc. In addition to technical adjustments such as above, the population's knowledge and behavioural compliance to preventive measures will affect the outcome of the pandemic. A report suggests that knowledge and attitude towards infectious diseases during the SARS outbreak in 2003 were associated with a degree of fear in the population, affecting the spread of disease [9]. Uncooperative behaviours such as underestimation, stigmatization, panic emotions, false beliefs to prevent outbreaks weakened the fight against the pandemic [10]. The reaction and perception of cancer patients undergoing radiotherapy to such changes is currently

unknown. As a measure of quality control, the main objective of this study is to explore the patients' level of satisfaction and to identify major factors that affects their level of comfort and fear. Obtaining such information can aid policy and decision makers in creating the best strategies for ensuring optimal cancer care.

MATERIALS & METHODS

The study was conducted in qualitative descriptive with a cross-sectional design and aimed to see perception from patients towards the changes in radiotherapy service during the COVID-19 pandemic. Patients who are eligible and gave their consent were given the questionnaire to be answered during their visit to the radiology oncology unit. The local COVID-19 task force, group of oncology specialists, and hospital administrators created the questionnaire that was approved by the ethical committee. The questionnaire is comprised of 38 multiple-choice questions divided into three main parts. The first eight questions designed to obtain patient demographic information (Table 1). The second part consisted of 15 questions (question number 9–23) evaluate the participants' general knowledge on COVID-19 (Table 2) and the third section (question number 24–38) evaluate the participants' perception on radiotherapy service (Table 3). Overall, the questionnaire can evaluate the successfulness of the COVID-19 local protocols.

The questionnaire was originally created in Indonesian that was translated to English by two independent translators. A third reviewer approved the best version for publication.

Participants of this study were all cancer patients in any disease stage with prior, current, or history of radiotherapy. Data collection was performed from July 3rd, 2020 until July 17th, 2020, in a tertiary referral hospital, Central Java. This research used a convenience-sampling method to provide maximum patient variations. Patients who refused to participate or deemed to be clinically unfit were excluded from the study. Those who met the criteria were handed out a questionnaire by one researcher. Every participant was given an unlimited amount of time to finish the questionnaire that was collected within the same day. Family members were allowed to assist participants who were unable to read. Participants would not be isolated while filling out the questionnaire. However, they were encouraged to finish out

the questionnaire by themselves and avoid being influenced by a family member or other patients. Data were expressed as total number (n) and percentage (%) unless stated otherwise. Data were analyzed using Microsoft Excel for Mac 2011 Version 14.4.1 (Microsoft Corporation, Washington, United States). This study was approved by the hospital Ethics Committee (No.543/EC/KEPK-RSDK.2020).

RESULTS

A total of 145 cancer patients were enrolled in the study. There were 113 females (77.9%) and 32 (22.1%) males. The participant's mean, median, and minimum-maximum age were 50.3, 50, 20, and 82 years old respectively. All participants were Indonesians and half of them (n=73, 50.3%) had high school degree or higher. The top three diagnoses were breast cancer (35.9%), head and neck cancer (24.8%), and gynaecologic cancer (22.8%). Complete patient demographics is presented in Table 1. All participants had received at least one session of radiotherapy before the pandemic. Fifty-eight patients (40.0%) were afraid of being infected by the coronavirus while undergoing radiotherapy, 20 (13.8%) had thought of delaying radiotherapy, and 18 (12.4%) patients had considered stopping hospital visit until the pandemic is over. Twenty-two participants (15.2%) experienced difficulty in accessing the hospital because of regional lock-down during mid-March to April 2020. Treatment postponement was experienced by 6 (4.1%) patients and longer treatment queue by 4 (2.8%) patients.

Most patients (67.6%) trusted the hospital safety measures. Participants were asked on how much they trusted the hospital workers (doctors, nurses, administrators, etc.) to maintain their safety; 21 (14.5%) were neutral about it, 13 (9.0%) trusted, and 111 (76.6%) were very trusting. Interestingly, the majority of respondents (65 out of 145, 44.7%) claimed to be not educated by healthcare workers. Most of them acquired knowledge regarding COVID-19 from hospital announcements. More than half of the participants (55.2%) thought that the quality of the radiotherapy services remained the same during the outbreak, 44.8% thought it got better. Most of the participants (65.5%) believed that wearing PPE was the most useful way to reduce anxiety or fear when undergoing radiotherapy during the outbreak. The perception on the quality and changes in radiotherapy service is lister Table 3.

DISCUSSION

The COVID-19 pandemic has increased the complexity of cancer care. The four main aspects of radiotherapy service that undergone adjustments during the pandemic include modification of facility, operational, staffing, and treatment modifications that is summarized in the Supplementary Table 1 and Table 2 [7,11]. Based on our experience, modifications in the facility and operational aspects can be undertaken sufficiently.

Online reservations prior to consultation was made mandatory for all patients that can be accessed from website (https://perjanjian.rskariadi.id/) or through mobile application (*Kariadi Pendaftaran Online*) that can be downloaded from Google Play Store and Apple App Store. Patients were instructed to come with a maximum of one companion, 15 minutes before the designated time, and to leave directly after consultation or treatment. Before entering the building, all patients were screened using the COVID-19 Early Warning Score (EWS) screening tool [12]. Patients were categorized into four main groups depending on history of COVID-19 contact, clinical symptoms, and laboratory results to be managed accordingly [13]. Admitted patients are obligated to wear facemask and maintain at least 1 meter distance with other people at all time. Only one patient companion are allowed to enter the treatment facility and the patient needs to go into the consultation room alone. Prior to the emergence of COVID-19, such measures would undoubtedly create nuisance for the patients. Interestingly, the results from this study proved the contrary. A total of 137 out 145 (94.5%) participants of this study were satisfied with the changes in hospital policies and that using PPE is the major determinant for reducing their level of fear and anxiety. Limiting anxiety in cancer patient is important considering how it affects treatment adherence, satisfaction, and outcome [14].

Staffing and treatment protocol modifications proved to be much more challenging to implement. The limited number practicing radiation oncologists in our hospital prevents scheduling of independent functional staffs and limiting working hours to 20 hours per week. In terms of treatment modification, our institution utilized hypofractionation radiotherapy whenever possible. A number of studies supports the use of hypofractionated radiotherapy during COVID-19 [15,16]. With a slight increase in treatment

time during each radiotherapy session, hypofractionation protocol reduces the total amount of time to complete the treatment program, thus allowing requiring less hospital visits and more patients to be treated within period of time [17]. In effort to reduce patient load and better allocation of limited resources, some randomized trials support deferring radiotherapy by using systemic therapy first. For examples the use of induction chemotherapy for nasopharyngeal carcinoma and androgen deprivation therapy in prostate cancer [18]. Beside utilizing hypofractionation, delay in follow-up visits, encouragement for palliative care are also advocated by the Indonesian Radiation Oncology Society (IROS) which in in accordance with the guidelines published by the American Society for Radiation Oncology (ASTRO) [7,19,20]. Telemedicine has not been developed yet in our hospital, since effective use teleconsultation require optimal gadgets and internet connection which may prove to be a luxury for most of our patients with low-socioeconomic background.

The COVID-19 pandemic continuously receives substantial media coverage through numerous platforms, mainly through the internet and television [21]. The mainstream media has proven to be a very effective method in mass education, considering most patients claimed to acquire their knowledge of COVID-19 from it. Almost all participants of this study practiced COVID-19 preventive measures. Public awareness and cooperation by practicing towards the preventive measures is paramount in the war against a global crisis [10,22]. The surge of information may create excessive and irrational fear. However, some might argue that fear is necessary in this extraordinary circumstances, since fear was associated with increased patients obedience to rules and practice optimal prevention measures [22]. Policy makers should utilize the most effective mass information platform for patient education and base their decision on evidence-based medicine.

To our knowledge, this is the first study that evaluated the perception of cancer patients to the changes in radiotherapy services in Indonesia. the authors identified several limitations to this study. The limited number of respondents that was recruited using convenience sampling method does not represent the general population. The use of questionnaire and the presence of the researcher during data collection may resulted in response bias.

CONCLUSION

In conclusion, the COVID-19 crises has created major challenges of radiation oncology service. Healthcare providers must adjust accordingly to manage the scarcity of resources and limit the spread of infection. By adhering to major clinical guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the COVID-19 pandemic that is well received by cancer patients in Central Java.

Conflict of interest
None declared.

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Author contributions:
Yan Wisnu Prajoko: study conception, data collection, analysis, manuscript writing, and approval for submission.
Tommy Supit: study conception, data collection, analysis, manuscript writing and approval for submission.

What is known

- The prevalence of cancer in COVID-19 patients is higher compared to the general population due to their immunosuppressed status.
- The COVID-19 pandemic necessitates numerous changes in hospital policies to limit the spread of the infectious disease. The patients' perceptions on these changes remains to be elucidated.
- The patients' perceptions towards the pandemic and the changes in radiotherapy services will affect their level of compliance to treatment, thus affecting the cure rate.

New findings:

- Anxiety and fear of contracting COVID-19 while undergoing radiotherapy in the hospital is common among cancer patients, however it does not deter them from coming for treatment.
- The mainstream media is a very effective method for mass education. Study participants acquired most of the information regarding COVID-19 from it.

- Constant and adequate personal protective equipment worn by medical staff and patients is the major determinant for reducing the patients' level of anxiety while in hospital.

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Table 1: Patient Demographics

Patient demographics	n	%
Total	145	100.0
Female	113	77.9
Age (years old)1	50.3; 50; 20-82	
No. household member1	3.9; 4; 1-10	
Married	128	88.3
Ethnicity		
Javanese	139	95.9
Chinese	3	2.1
Balinese	1	0.7
Dayak	1	0.7
Malay	1	0.7
Level of education		
No formal education	9	6.2
Elementary	39	26.9
Middle	24	16.6
High	36	24.8
College and above	37	25.5
Level of monthy income2		
Below average	90	62.1
Average	51	35.2
Above average	4	2.8
Cancer diagnosis		
Breast	52	35.9
Gynecologic	33	22.8
Hematology	1	0.7
Colorectal	5	3.4
Head and Neck	36	24.8
Urology	3	2.1
Neurologic	5	3.4
Skin	2	1.4
Lymphoma	6	4.1
Sarcoma	2	1.4
No. of radiotherapy		
<5	38	26.2
5 to 20	54	37.2
>20	53	36.6

1 Data presented as mean, median, and minimum-maximum respectively

2 Below average: less than 3 million Indonesian Rupiah (IDR), average: between 3 to 15 million IDR, above average: more than 15 million IDR.

Table 2: General knowledge of COVID-19

Questions	Answer	n	%
Q9. Are you worried about being infected by the Corona virus?	Very worried	33	22.8
	Worried	79	54.5
	Not Worry	33	22.8
Q10. Are you or have you been infected with Corona virus?	Yes	0	0.0
	No	89	61.4
	Do not know	56	38.6
Q11. If you answer Yes or No above, have you undergone a Corona examination?	Yes	15	10.3
	No	130	89.7
Q12. Is your daily activities disrupted since the pandemic began?	Very	27	18.6
	Yes	58	40.0
	A little	59	40.7
	Not at all	1	0.7
Q13. Have you been staying at home and avoid social events since the outbreak?	Yes	140	96.6
	No	5	3.4
Q14. Have you been keeping a safe distance of two meters from other people?	Yes	140	96.6
	No	5	3.4
Q15. Did you wash your hands more often since the outbreak?	Yes	144	99.3
	No	1	0.7
Q16. Have you been wearing a mask when your leave the house or meet other people?	Yes	144	99.3
	No	1	0.7
Q17. In your opinion, should people cancel and avoid social events during the outbreak?	Yes	138	95.2
	No	7	4.8
Q18. In your opinion, should people avoid shaking hands during the outbreak?	Yes	139	95.9
	No	6	4.1
Q19. In your opinion, should all non-essential stores (other than supermarkets, pharmacies, post offices, gas stations, etc.) be closed during the pandemic?	Yes	57	39.3
	No	88	60.7
Q20. In your opinion, should there be a curfew (except for grocery shopping, work, medical treatment)?	Yes	100	69.0
	No	45	31.0
Q21. Can the Corona virus infection make your cancer worse?	Yes	70	48.3
	No	75	51.7
Q22. Where did you get information about COVID-19?	Radio	1	0.7
	Television	108	74.5
	Internet	35	24.1

	Other	1	0.7
Q23. What are your estimates of the number of Indonesians infection with Corona virus at this time?	<100	4	2.8
	100-1.000	17	11.7
	5000	31	21.4
	5000-10.000	29	20.0
	> 10.000	64	44.1

Table 3: Perception on the quality and changes in radiotherapy service

Questions	Answer	n	%
Q24. Are you afraid of being infected with Corona virus while undergoing radiotherapy at the hospital?	Very afraid	58	40.0
	Somewhat afraid	76	52.4
	Not afraid	11	7.6
Q25. Have you thought of stopping or delaying radiotherapy during the outbreak?	Yes	20	13.8
	No	125	86.2
Q26. Have you thought of stopping going to the clinic routinely during the outbreak?	Yes	18	12.4
	No	127	87.6
Q27. Have you ever faced difficulty in getting radiotherapy during the outbreak? If yes, what was the cause?	No difficulty	109	75.2
	Access to hospital	22	15.2
	Treatment postponement	6	4.1
	Longer treatment queue	4	2.8
	Limited hospital workers	1	0.7
	Other	3	2.1
Q28. Did you experience any changes in the radiotherapy service during the outbreak?	Yes	54	37.2
	No	91	62.8
Q29. In your opinion, is the hospital's safety measures and policy in dealing with the Corona virus outbreak adequate?	Not adequate at all	0	0.0
	Not adequate	8	5.5
	Adequate	98	67.6
	More than adequate	39	26.9
Q30. In your opinion, are the personal protective equipment (PPE) used by hospital workers and their action are adequate to prevent Corona virus transmission within the hospital?	Not adequate at all	0	0.0
	Not adequate	4	2.8
	Adequate	98	67.6
	More than adequate	43	29.7
Q31. How much do you trust the hospital workers (doctors, nurses, administrators, etc.) in maintaining your safety?	Not at all	0	0.0
	A little	0	0.0
	Neutral	21	14.5
	Trust	13	9.0
	Very trusting	111	76.6
Q32. Is there a change in the health care service quality during the outbreak?	Got very bad	0	0.0
	A little worse	3	2.1
	The same	75	51.7
	Better	56	38.6
	Become much better	11	7.6
Q33. Were you educated about the Corona virus outbreak by the radiotherapy unit workers (doctors, nurses, ward officers)?	Not at all	65	44.8
	A little	24	16.6
	Yes	43	29.7
	A lot	13	9.0
Q34. Where did you get most information about the Corona virus and its relationship to your	Doctor	15	10.3
	Nurse	11	7.6
	Administrators	5	3.4

disease?	Hospital announcements (television, brochures)	90	62.1
	Other	24	16.6
Q35. What about the quality of radiotherapy services you received during the outbreak?	Got very bad	0	0.0
	A little worse	0	0.0
	The same	80	55.2
	Better	60	41.4
	Become much better	5	3.4
Q36. What do you think can best improve the quality of radiotherapy services?	More PPE worn by hospital workers	56	38.6
	More PPE provided	27	18.6
	More education from hospital workers	36	24.8
	Speed up radiotherapy program	23	15.9
	Stopping or delaying radiotherapy	0	0.0
	Other	3	2.1
Q37. Are you afraid or worried about going to the oncology clinic during the outbreak?	Yes, very	23	15.9
	A little	56	38.6
	Not afraid/ worried	66	45.5
Q38. In your opinion, what is the most useful way to reduce the level of anxiety or fear when undergoing radiotherapy during the outbreak?	Wearing PPE	95	65.5
	PPE worn by hospital workers	16	11.0
	Education and communication with hospital workers	27	18.6
	Speed up radiotherapy program	6	4.1
	Stopping or delaying radiotherapy	0	0.0
	Other	1	0.7

Supplementary Table 1: Recommendation of major aspects requiring adjustment within radiotherapy center during COVID-19 pandemic

Major Aspects to be Modified	**Recommendation**

Facility	• Reorganizing couch and chairs in the waiting room (minimum distance of 1 meter) • Opening multiple access to treatment machines to reduce possible crowding • Installation of transparent barrier between healthcare workers and patients whenever possible
Operational	• Obligating screening of body temperature for everyone entering the radiotherapy building • Stricter radiation scheduling to reduce the waiting time within the radiotherapy building to as minimal as possible • Restricting number of people in patient's waiting room • Routine facilities disinfection (every 15 minutes for door handle, table, couch and general disinfection for all rooms every week) • Obligating use of proper personal protective equipment (PPE) according to risk of transmission from patients • No treatment for suspected and confirmed patients. However, in very selected cases where radiotherapy is absolutely necessary for suspected or confirmed patient, then it has to be schedule for treatment as the last patient. Preparation has to be done including use of proper PPEs for all staffs and covering the hallway, treatment room, and couch with disposable plastic wrap, then thorough disinfectant has to be carried out.
Staffing	• Two independent functional staffs composed of all professionals required to run radiotherapy services (no crossing schedule between teams) • Limiting working hours to 20 hours per week for each staff • Staff over the age of 60 or having multiple co-morbidities were advised to work from home
Patient treatment modification	• Prioritizing clinical indications for radiotherapy (following published consensus)[23]. • Use of hypofractionation radiotherapy whenever indicated • Delaying non-urgent patient follow-up • Developing a teleconsultation

Supplementary Table 2: Recommendation: Risk assessment within radiotherapy centers and its corresponding recommended personal protective equipment (PPE)

Level of Protection	Area	Personnel	Activity	PPE Recommendation
Level 1	• Back office (Administration and Finance room) • Admission area • Medical record room	• Administration staff • Receptionist • Cashier • Medical record staff	• General office activity • Administrative activity • Patient education • Patient registration • Administration services	• Surgical mask • Hospital gown • Recommended distance of 1 m between staff and patients, an acrylic divider can be utilized. Otherwise, use level 2 PPE.
	• Medical physics and dosimetry room • Medical and non-medical technician room • Logistic Area	• Medical physicist • Medical and non-medical technician • Logistic staff	• Treatment planning activity • Standby for corrective maintenance • Logistic activity	• Surgical mask • Hospital gown • QA/QC and maintenance in radiation machine use level 2 PPE
Level 2	• Radiotherapy facility entrance access	• Security	• Patient Assistance • Quick history taking on contact and symptoms • Temperature screening	• Surgical mask • Disposable apron on top of hospital gown
	• Other common areas in radiotherapy facilities	• Cleaning service	• Facility cleaning	• Surgical mask • Hospital gown • Non sterile gloves
Level 3	• Outpatient clinics • Triage area • Radiation bunker • Simulator room	• Doctor • Nurse • Triage staff • Radiation Technology Technician • Nurse	• Consultation • Physical Examination • Treatment • Triage • Patient set up	• Surgical mask or N95 mask when interacting with suspect or confirmed patient • Hospital gown • Surgical cap

	• CT simulator room • Day care room		• Patient positioning • Couch cleaning after treatment of every patient	• Google or face shield • Non sterile gloves
Level 4	• Brachytherapy area	• Doctor • Nurse • Radiation Technology Technician	• Brachytherapy application • Brachytherapy treatment	• N95 mask • Sterile apron on top of hospital gown • Surgical cap • Google or face shield • Gloves, use sterile gloves whenever necessary • Foot cover

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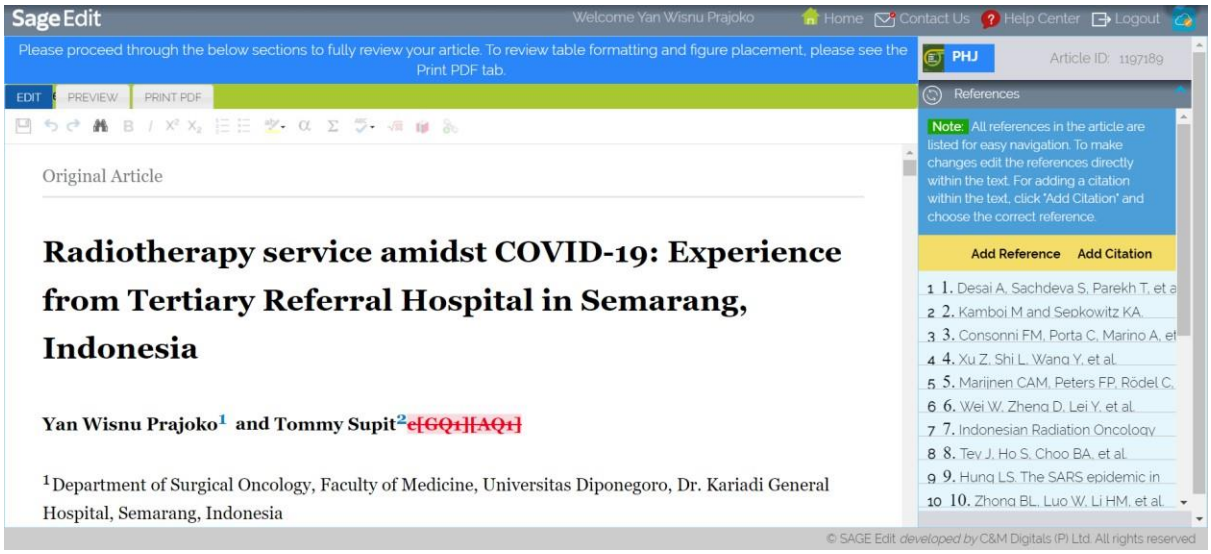

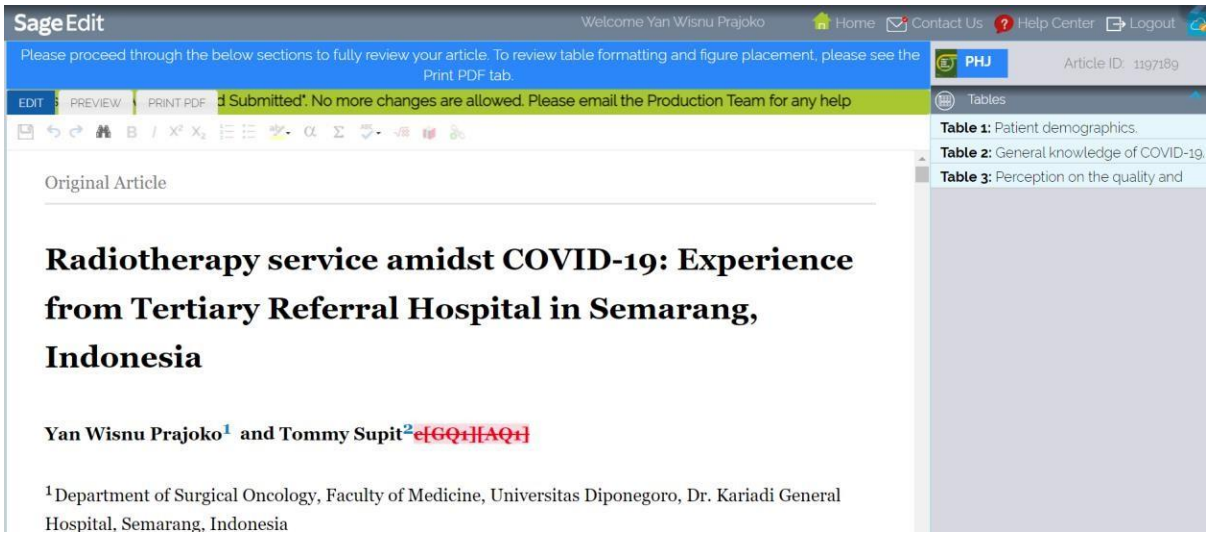


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Radiotherapy service amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia
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Original Article

Radiotherapy service amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia

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Abstract

Background:

Several changes in hospital policies took place to mitigate the spread of Coronavirus disease 2019 (COVID-19). However, the patient's perception to these abrupt changes in medical services is not known. This study analyzed the quality of radiotherapy service during the COVID-19 pandemic and the patient's perception of them.

Methods:

This descriptive study will qualitatively assess cancer patient perception of the quality of radiotherapy service during COVID-19 pandemic. Willing participants were given a questionnaire that explore two major aspects: the patient's general knowledge of COVID-19 and their perception of radiotherapy service during the pandemic.

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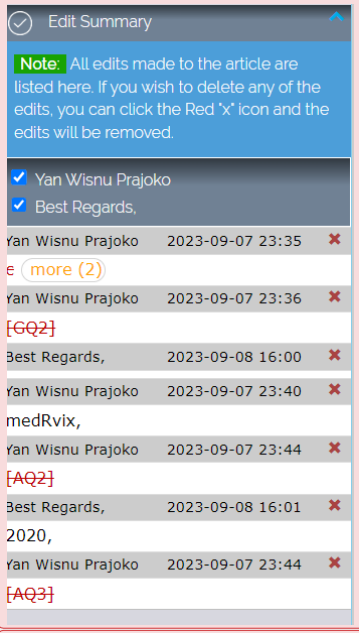

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Results:

The 145 participants of this study were generally well-informed about the significance of COVID-19 pandemic. Most respondents claimed to adequately practice preventive measures and put high regards in personal protective equipment (PPE) worn by them and healthcare workers for their safety. Their level of trust to all healthcare workers remained high and identified hospital announcements (television, brochures) educated them the most in regards to the relationship of COVID-19 and cancer.

Conclusion:

The changes in hospital policies and radiation oncology service in our institution were well-received by the study population. Despite the majority of respondents were afraid and anxious of being infected of COVID-19 while undergoing treatment, only a minority of them contemplated to delay or completely stop going for treatment. By adhering to major guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the pandemic.

Keywords

Radiation oncology, radiotherapy, COVID-19, service quality

Date received: 25 January 2023; accepted: 9 August 2023

Introduction

The Coronavirus Disease 2019 (COVID-19) was declared as a global pandemic on March 11th, 2020, by the World Health Organization. The prevalence of cancer in COVID-19 patients is higher compared to the general population because of the immunosuppressive state as results of the malignant disease and anticancer treatment.[1–3] Furthermore, they were observed to have a greater risk of severe events (needing intensive care unit care and/or invasive ventilation assistance) compared to patients without cancer.[4]

Radiotherapy is one of the mainstay cancer treatment modalities that has played a greater role since the COVID-19 pandemic began. For example, neoadjuvant short-course radiotherapy is preferred over long-course chemoradiotherapy for patients with locally advanced colorectal cancer.[5] The COVID-19 outbreak presented several novel challenges to the radiation oncology unit. First, the frailties of patients who are

admitted to the radiation oncology unit created risks of exposure and cross-transmission between frail and fit patients. Second, restriction on the number of patients who are admitted to the hospital or for radiation therapy can affect the efficacy of the therapy itself.[6] Third, prolonged period of radiotherapy will increase the duration of contact between people thus increasing the chance of Coronavirus transmission. Fourth, constant cleaning and disinfection of the equipment policies used in radiation oncology because of its constant sequence of use by different patients, thus increasing the potential for COVID-19 cross-contamination.[7,8]

In accordance to the COVID-19 National task force, institutional, and specialists guidelines, our institution implemented numerous changes to help mitigate the spread of infection and allocation of limited resources.[7] Several changes include scheduled meeting, patient screening before entering treatment facilities, a maximum of one patient companion, solo consultation, mandatory use of face mask, physical distancing, modification of treatment program, etc. In addition to technical adjustments such as above, the population's knowledge and behavioral compliance to preventive measures will affect the outcome of the pandemic. A report suggests that knowledge and attitude toward infectious diseases during the SARS outbreak in 2003 were associated with a degree of fear in the population, affecting the spread of disease.[9] Uncooperative behaviors such as underestimation, stigmatization, panic emotions, false beliefs to prevent outbreaks weakened the fight against the pandemic.[10] The reaction and perception of cancer patients undergoing radiotherapy to such changes is currently unknown. As a measure of quality control, the main objective of this study is to explore the patients' level of satisfaction and to identify major factors that affects their level of comfort and fear. Obtaining such information can aid policy and decision makers in creating the best strategies for ensuring optimal cancer care.

Materials and methods

The study was conducted in qualitative descriptive with a cross-sectional design and aimed to see perception from patients toward the changes in radiotherapy service during the COVID-19 pandemic. Patients who are eligible and gave their consent were given the questionnaire to be answered during their visit to the radiology oncology unit. The local COVID-19 task force, group of oncology specialists, and hospital administrators created the questionnaire that was approved by the ethical committee. The questionnaire is comprised of 38 multiple-choice

questions divided into three main parts. The first eight questions designed to obtain patient demographic information (Table 1). The second part consisted of 15 questions (question number 9–23) evaluate the participants' general knowledge on COVID-19 (Table 2) and the third section (question number 24–38) evaluate the participants' perception on radiotherapy service (Table 3). Overall, the questionnaire can evaluate the successfulness of the COVID-19 local protocols.

Table 1.
Patient demographics.

Patient demographics	*n*	%
Total	145	100.0
Female	113	77.9
Age (years old)[a]	50.3; 50; 20–82	
No. household member[a]	3.9; 4; 1–10	
Married	128	88.3
Ethnicity		
Javanese	139	95.9
Chinese	3	2.1
Balinese	1	0.7
Dayak	1	0.7
Malay	1	0.7
Level of education		
No formal education	9	6.2
Elementary	39	26.9
Middle	24	16.6
High	36	24.8
College and above	37	25.5
Level of monthly income[b]		
Below average	90	62.1
Average	51	35.2
Above average	4	2.8
Cancer diagnosis		
Breast	52	35.9
Gynecologic	33	22.8
Hematology	1	0.7
Colorectal	5	3.4
Head and neck	36	24.8
Urology	3	2.1
Neurologic	5	3.4
Skin	2	1.4
Lymphoma	6	4.1
Sarcoma	2	1.4
No. of radiotherapy		

Patient demographics	*n*	%
<5	38	26.2
5–20	54	37.2
>20	53	36.6

[a]Data presented as mean, median, and minimum-maximum respectively.

[b]Below average: less than 3 million Indonesian Rupiah (IDR), average: between 3 and 15 million IDR, above average: more than 15 million IDR.

Table 2.
General knowledge of COVID-19.

Questions	Answer	*n*	%
Q9. Are you worried about being infected by the Corona virus?	Very worried	33	22.8
	Worried	79	54.5
	Not worry	33	22.8
Q10. Are you or have you been infected with Corona virus?	Yes	0	0.0
	No	89	61.4
	Do not know	56	38.6
Q11. If you answer Yes or No above, have you undergone a Corona examination?	Yes	15	10.3
	No	130	89.7
Q12. Is your daily activities disrupted since the pandemic began?	Very	27	18.6
	Yes	58	40.0
	A little	59	40.7
	Not at all	1	0.7
Q13. Have you been staying at home and avoid social events since the outbreak?	Yes	140	96.6
	No	5	3.4
Q14. Have you been keeping a safe distance of 2 m from other people?	Yes	140	96.6
	No	5	3.4
Q15. Did you wash your hands more often since the outbreak?	Yes	144	99.3
	No	1	0.7
Q16. Have you been wearing a mask when your leave the house or meet other people?	Yes	144	99.3
	No	1	0.7
Q17. In your opinion, should people cancel and avoid social events during the outbreak?	Yes	138	95.2
	No	7	4.8
Q18. In your opinion, should people avoid shaking hands during the outbreak?	Yes	139	95.9
	No	6	4.1
Q19. In your opinion, should all non-essential stores (other than supermarkets, pharmacies, post offices, gas stations, etc.) be closed during the pandemic?	Yes	57	39.3
	No	88	60.7
Q20. In your opinion, should there be a curfew (except for grocery shopping, work, medical treatment)?	Yes	100	69.0
	No	45	31.0
Q21. Can the Corona virus infection make your cancer worse?	Yes	70	48.3

Questions	Answer	*n*	%
	No	75	51.7
Q22. Where did you get information about COVID-19?	Radio	1	0.7
	Television	108	74.5
	Internet	35	24.1
	Other	1	0.7
Q23. What are your estimates of the number of Indonesians infection with Corona virus at this time?	<100	4	2.8
	100–1000	17	11.7
	5000	31	21.4
	5000–10,000	29	20.0
	>10,000	64	44.1

Table 3.
Perception on the quality and changes in radiotherapy service.

Questions	Answer	*n*	%
Q24. Are you afraid of being infected with Corona virus while undergoing radiotherapy at the hospital?	Very afraid	58	40.0
	Somewhat afraid	76	52.4
	Not afraid	11	7.6
Q25. Have you thought of stopping or delaying radiotherapy during the outbreak?	Yes	20	13.8
	No	125	86.2
Q26. Have you thought of stopping going to the clinic routinely during the outbreak?	Yes	18	12.4
	No	127	87.6
Q27. Have you ever faced difficulty in getting radiotherapy during the outbreak? If yes, what was the cause?	No difficulty	109	75.2
	Access to hospital	22	15.2
	Treatment postponement	6	4.1
	Longer treatment queue	4	2.8
	Limited hospital workers	1	0.7
	Other	3	2.1
Q28. Did you experience any changes in the radiotherapy service during the outbreak?	Yes	54	37.2
	No	91	62.8
Q29. In your opinion, is the hospital's safety measures and policy in dealing with the Corona virus outbreak adequate?	Not adequate at all	0	0.0
	Not adequate	8	5.5
	Adequate	98	67.6
	More than adequate	39	26.9
Q30. In your opinion, are the personal protective equipment (PPE) used by hospital workers and their action are adequate to prevent Corona virus transmission within the hospital?	Not adequate at all	0	0.0
	Not adequate	4	2.8
	Adequate	98	67.6
	More than adequate	43	29.7
Q31. How much do you trust the hospital workers (doctors, nurses, administrators, etc.) in maintaining your safety?	Not at all	0	0.0
	A little	0	0.0
	Neutral	21	14.5
	Trust	13	9.0
	Very trusting	111	76.6
	Got very bad	0	0.0

Questions	Answer	*n*	%
Q32. Is there a change in the health care service quality during the outbreak?	A little worse	3	2.1
	The same	75	51.7
	Better	56	38.6
	Become much better	11	7.6
Q33. Were you educated about the Corona virus outbreak by the radiotherapy unit workers (doctors, nurses, ward officers)?	Not at all	65	44.8
	A little	24	16.6
	Yes	43	29.7
	A lot	13	9.0
Q34. Where did you get most information about the Corona virus and its relationship to your disease?	Doctor	15	10.3
	Nurse	11	7.6
	Administrators	5	3.4
	Hospital announcements (television, brochures)	90	62.1
	Other	24	16.6
Q35. What about the quality of radiotherapy services you received during the outbreak?	Got very bad	0	0.0
	A little worse	0	0.0
	The same	80	55.2
	Better	60	41.4
	Become much better	5	3.4
Q36. What do you think can best improve the quality of radiotherapy services?	More PPE worn by hospital workers	56	38.6
	More PPE provided	27	18.6
	More education from hospital workers	36	24.8
	Speed up radiotherapy program	23	15.9
	Stopping or delaying radiotherapy	0	0.0
	Other	3	2.1
Q37. Are you afraid or worried about going to the oncology clinic during the outbreak?	Yes, very	23	15.9
	A little	56	38.6
	Not afraid/worried	66	45.5
Q38. In your opinion, what is the most useful way to reduce the level of anxiety or fear when undergoing radiotherapy during the outbreak?	Wearing PPE	95	65.5
	PPE worn by hospital workers	16	11.0
	Education and communication with hospital workers	27	18.6
	Speed up radiotherapy program	6	4.1
	Stopping or delaying radiotherapy	0	0.0
	Other	1	0.7

The questionnaire was originally created in Indonesian that was translated to English by two independent translators. A third reviewer approved the best version for publication.

Participants of this study were all cancer patients in any disease stage with prior, current, or history of radiotherapy. Data collection was performed from July 3rd, 2020 until July 17th, 2020, in a tertiary referral hospital, Central Java. This research used a convenience-sampling method to provide maximum patient variations. Patients who refused to participate or deemed to be clinically unfit were excluded from the study. Those who met the criteria were handed out a questionnaire by one researcher. Every participant was given an unlimited amount of time to finish the questionnaire that was collected within the same day. Family members were allowed to assist participants who were unable to read. Participants would not be isolated while filling out the questionnaire. However, they were encouraged to finish out the questionnaire by themselves and avoid being influenced by a family member or other patients. Data were expressed as total number (n) and percentage (%) unless stated otherwise. Data were analyzed using Microsoft Excel for Mac 2011 Version 14.4.1 (Microsoft Corporation, Washington, United States). This study was approved by the hospital Ethics Committee (No. 543/EC/KEPK-RSDK.2020).

Results

A total of 145 cancer patients were enrolled in the study. There were 113 females (77.9%) and 32 (22.1%) males. The participant's mean, median, and minimum-maximum age were 50.3, 50, 20, and 82 years old respectively. All participants were Indonesians and half of them (n = 73, 50.3%) had high school degree or higher. The top three diagnoses were breast cancer (35.9%), head and neck cancer (24.8%), and gynecologic cancer (22.8%). Complete patient demographics is presented in Table 1. All participants had received at least one session of radiotherapy before the pandemic. Fifty-eight patients (40.0%) were afraid of being infected by the coronavirus while undergoing radiotherapy, 20 (13.8%) had thought of delaying radiotherapy, and 18 (12.4%) patients had considered stopping hospital visit until the pandemic is over. Twenty-two participants (15.2%) experienced difficulty in accessing the hospital because of regional lock-down during mid-March to April 2020. Treatment postponement was experienced by 6 (4.1%) patients and longer treatment queue by 4 (2.8%) patients.

Most patients (67.6%) trusted the hospital safety measures. Participants were asked on how much they trusted the hospital workers (doctors, nurses, administrators, etc.) to maintain their safety; 21 (14.5%) were neutral about it, 13 (9.0%) trusted, and 111 (76.6%) were very trusting. Interestingly, the majority of respondents (65 out of 145, 44.7%) claimed to be not educated by healthcare workers. Most of them acquired knowledge regarding COVID-19 from hospital announcements. More than half of the participants (55.2%) thought that the quality of the radiotherapy services remained the same during the outbreak, 44.8% thought it got better. Most of the participants (65.5%) believed that wearing PPE was the most useful way to reduce anxiety or fear when undergoing radiotherapy during the outbreak. The perception on the quality and changes in radiotherapy service is listed in Table 3.

Discussion

The COVID-19 pandemic has increased the complexity of cancer care. The four main aspects of radiotherapy service that undergone adjustments during the pandemic include modification of facility, operational, staffing, and treatment modifications that is summarized in the Supplemental Tables 1 and 2.[7,11] Based on our experience, modifications in the facility and operational aspects can be undertaken sufficiently.

Online reservations prior to consultation was made mandatory for all patients that can be accessed from website (https://perjanjian.rskariadi.id/) or through mobile application (*Kariadi Pendaftaran Online*) that can be downloaded from Google Play Store and Apple App Store. Patients were instructed to come with a maximum of one companion, 15 min before the designated time, and to leave directly after consultation or treatment. Before entering the building, all patients were screened using the COVID-19 Early Warning Score (EWS) screening tool.[12] Patients were categorized into four main groups depending on history of COVID-19 contact, clinical symptoms, and laboratory results to be managed accordingly.[13] Admitted patients are obligated to wear facemask and maintain at least 1 m distance with other people at all time. Only one patient companion are allowed to enter the treatment facility and the patient needs to go into the consultation room alone. Prior to the emergence of COVID-19, such measures would undoubtedly create nuisance for the patients. Interestingly, the results from this study proved the contrary. A total of 137 out 145 (94.5%) participants of this study were satisfied with the changes in hospital policies and that using PPE is the major determinant for reducing their

level of fear and anxiety. Limiting anxiety in cancer patient is important considering how it affects treatment adherence, satisfaction, and outcome.[14]

Staffing and treatment protocol modifications proved to be much more challenging to implement. The limited number practicing radiation oncologists in our hospital prevents scheduling of independent functional staffs and limiting working hours to 20 h per week. In terms of treatment modification, our institution utilized hypofractionation radiotherapy whenever possible. A number of studies supports the use of hypofractionated radiotherapy during COVID-19.[15,16] With a slight increase in treatment time during each radiotherapy session, hypofractionation protocol reduces the total amount of time to complete the treatment program, thus allowing requiring less hospital visits and more patients to be treated within period of time.[17] In effort to reduce patient load and better allocation of limited resources, some randomized trials support deferring radiotherapy by using systemic therapy first. For example the use of induction chemotherapy for nasopharyngeal carcinoma and androgen deprivation therapy in prostate cancer.[18] Beside utilizing hypofractionation, delay in follow-up visits, encouragement for palliative care are also advocated by the Indonesian Radiation Oncology Society (IROS) which in in accordance with the guidelines published by the American Society for Radiation Oncology (ASTRO).[7,19,20] Telemedicine has not been developed yet in our hospital, since effective use teleconsultation require optimal gadgets and internet connection which may prove to be a luxury for most of our patients with low-socioeconomic background.

The COVID-19 pandemic continuously receives substantial media coverage through numerous platforms, mainly through the internet and television.[21] The mainstream media has proven to be a very effective method in mass education, considering most patients claimed to acquire their knowledge of COVID-19 from it. Almost all participants of this study practiced COVID-19 preventive measures. Public awareness and cooperation by practicing toward the preventive measures is paramount in the war against a global crisis.[10,22] The surge of information may create excessive and irrational fear. However, some might argue that fear is necessary in this extraordinary circumstances, since fear was associated with increased patients obedience to rules and practice optimal prevention measures.[22,23] Policy makers should utilize the most effective mass information platform for patient education and base their decision on evidence-based medicine.

To our knowledge, this is the first study that evaluated the perception of cancer patients to the changes in radiotherapy services in Indonesia. the authors identified several limitations to this study. The limited number of respondents that was recruited using convenience sampling method does not represent the general population. The use of questionnaire and the presence of the researcher during data collection may resulted in response bias.

Conclusion

In conclusion, the COVID-19 crises has created major challenges of radiation oncology service. Healthcare providers must adjust accordingly to manage the scarcity of resources and limit the spread of infection. By adhering to major clinical guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the COVID-19 pandemic that is well received by cancer patients in Central Java.

What is known

- The prevalence of cancer in COVID-19 patients is higher compared to the general population due to their immunosuppressed status.
- The COVID-19 pandemic necessitates numerous changes in hospital policies to limit the spread of the infectious disease. The patients' perceptions on these changes remains to be elucidated.
- The patients' perceptions toward the pandemic and the changes in radiotherapy services will affect their level of compliance to treatment, thus affecting the cure rate.

New findings

- Anxiety and fear of contracting COVID-19 while undergoing radiotherapy in the hospital is common among cancer patients, however it does not deter them from coming for treatment.
- The mainstream media is a very effective method for mass education. Study participants acquired most of the information regarding COVID-19 from it.
- Constant and adequate personal protective equipment worn by medical staff and patients is the major determinant for reducing the patients' level of anxiety while in hospital.

Author contributions

Yan Wisnu Prajoko: study conception, data collection, analysis, manuscript writing, and approval for submission. Tommy Supit: study conception, data collection, analysis, manuscript writing and approval for submission.

Declaration of conflicting interests [GQ2]

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The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Supplemental material

Supplemental material for this article is available online.

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Original Article

Journal of Public Health Research

Radiotherapy service amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia

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Yan Wisnu Prajoko[1] and Tommy Supit[2] [GQ: 1]

Abstract

Background: Several changes in hospital policies took place to mitigate the spread of Coronavirus disease 2019 (COVID-19). However, the patient's perception to these abrupt changes in medical services is not known. This study analyzed the quality of radiotherapy service during the COVID-19 pandemic and the patient's perception of them.

Methods: This descriptive study will qualitatively assess cancer patient perception of the quality of radiotherapy service during COVID-19 pandemic. Willing participants were given a questionnaire that explore two major aspects: the patient's general knowledge of COVID-19 and their perception of radiotherapy service during the pandemic.

Results: The 145 participants of this study were generally well-informed about the significance of COVID-19 pandemic. Most respondents claimed to adequately practice preventive measures and put high regards in personal protective equipment (PPE) worn by them and healthcare workers for their safety. Their level of trust to all healthcare workers remained high and identified hospital announcements (television, brochures) educated them the most in regards to the relationship of COVID-19 and cancer.

Conclusion: The changes in hospital policies and radiation oncology service in our institution were well-received by the study population. Despite the majority of respondents were afraid and anxious of being infected of COVID-19 while undergoing treatment, only a minority of them contemplated to delay or completely stop going for treatment. By adhering to major guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the pandemic.

Keywords

Radiation oncology, radiotherapy, COVID-19, service quality

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Introduction

The Coronavirus Disease 2019 (COVID-19) was declared as a global pandemic on March 11th, 2020, by the World Health Organization. The prevalence of cancer in COVID-19 patients is higher compared to the general population because of the immunosuppressive state as results of the malignant disease and anticancer treatment.[1–3] Furthermore, they were observed to have a greater risk of severe events (needing intensive care unit care and/or invasive ventilation assistance) compared to patients without cancer.[4]

Radiotherapy is one of the mainstay cancer treatment modalities that has played a greater role since the COVID-19 pandemic began. For example, neoadjuvant short-course radiotherapy is preferred over long-course chemoradiotherapy for patients with locally advanced colorectal cancer.[5] The COVID-19 outbreak presented several novel challenges to the radiation oncology unit. First, the frailties of patients who are admitted to the radiation oncology unit created risks of exposure and

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[AQ: 1]

cross-transmission between frail and fit patients. Second, restriction on the number of patients who are admitted to the hospital or for radiation therapy can affect the effi- cacy of the therapy itself.[6] Third, prolonged period of radiotherapy will increase the duration of contact between people thus increasing the chance of Coronavirus transmission. Fourth, constant cleaning and disinfection of the equipment policies used in radiation oncology because of its constant sequence of use by different patients, thus increasing the potential for COVID-19 cross-contamination.[7,8]

In accordance to the COVID-19 National task force, institutional, and specialists guidelines, our institution implemented numerous changes to help mitigate the spread of infection and allocation of limited resources.[7] Several changes include scheduled meeting, patient screening before entering treatment facilities, a maximum of one patient companion, solo consultation, mandatory use of face mask, physical distancing, modification of treatment program, etc. In addition to technical adjustments such as above, the population's knowledge and behavioral compliance to preventive measures will affect the outcome of the pandemic. A report suggests that knowledge and attitude toward infectious diseases during the SARS outbreak in 2003 were associated with a degree of fear in the population, affecting the spread of disease.[9] Uncooperative behaviors such as underestimation, stigmatization, panic emotions, false beliefs to prevent outbreaks weakened the fight against the pandemic.[10] The reaction and perception of cancer patients undergoing radiotherapy to such changes is currently unknown. As a measure of quality control, the main objective of this study is to explore the patients' level of satisfaction and to identify major factors that affects their level of comfort and fear. Obtaining such information can aid policy and decision makers in creating the best strategies for ensuring optimal cancer care.

Materials and methods

The study was conducted in qualitative descriptive with a cross-sectional design and aimed to see perception from patients toward the changes in radiotherapy service during the COVID-19 pandemic. Patients who are eligible and gave their consent were given the questionnaire to be answered during their visit to the radiology oncology unit. The local COVID-19 task force, group of oncology specialists, and hospital administrators created the questionnaire that was approved by the ethical committee. The questionnaire is comprised of 38 multiple-choice questions divided into three main parts. The first eight questions designed to obtain patient demographic information (Table 1). The second part consisted of 15 questions (question number 9–23) evaluate the participants' general knowledge on COVID-19 (Table 2) and the third section (question number 24–38) evaluate the participants' perception on radiotherapy service (Table 3). Overall, the questionnaire can evaluate the successfulness of the COVID-19 local protocols.

The questionnaire was originally created in Indonesian that was translated to English by two independent translators. A third reviewer approved the best version for publication.

Participants of this study were all cancer patients in any disease stage with prior, current, or history of radiotherapy. Data collection was performed from July 3rd, 2020 until July 17th, 2020, in a tertiary referral hospital, Central Java. This research used a convenience-sampling method to provide maximum patient variations. Patients who refused to participate or deemed to be clinically unfit were excluded from the study. Those who met the criteria were handed out a questionnaire by one researcher. Every participant was given an unlimited amount of time to finish the questionnaire that was collected within the same day. Family members were allowed to assist participants who were unable to read. Participants would not be isolated while filling out the questionnaire. However, they were encouraged to finish out the questionnaire by themselves and avoid being influenced by a family member or other patients. Data were expressed as total number (n) and percentage (%) unless stated otherwise. Data were analyzed using Microsoft Excel for Mac 2011 Version 14.4.1 (Microsoft Corporation, Washington, United States). This study was approved by the hospital Ethics Committee (No. 543/EC/KEPK-RSDK.2020).

Results

A total of 145 cancer patients were enrolled in the study. There were 113 females (77.9%) and 32 (22.1%) males. The participant's mean, median, and minimum-maximum age were 50.3, 50, 20, and 82 years old respectively. All participants were Indonesians and half of them (n = 73, 50.3%) had high school degree or higher. The top three diagnoses were breast cancer (35.9%), head and neck cancer (24.8%), and gynecologic cancer (22.8%). Complete patient demographics is presented in Table 1. All participants had received at least one session of radiotherapy before the pandemic. Fifty-eight patients (40.0%) were afraid of being infected by the coronavirus while undergoing radiotherapy, 20 (13.8%) had thought of delaying radiotherapy, and 18 (12.4%) patients had considered stopping hospital visit until the pandemic is over. Twenty-two participants (15.2%) experienced difficulty in accessing the hospital because of regional lock-down during mid-March to April 2020. Treatment postponement was experienced by 6 (4.1%) patients and longer treatment queue by 4 (2.8%) patients.

Most patients (67.6%) trusted the hospital safety measures. Participants were asked on how much they trusted

Table 1. Patient demographics.

Patient demographics	*n*	%
Total	145	100.0
Female	113	77.9
Age (years old)[a]	50.3; 50; 20–82	
No. household member[a]	3.9; 4; 1–10	
Married	128	88.3
Ethnicity		
Javanese	139	95.9
Chinese	3	2.1
Balinese	1	0.7
Dayak	1	0.7
Malay	1	0.7
Level of education		
No formal education	9	6.2
Elementary	39	26.9
Middle	24	16.6
High	36	24.8
College and above	37	25.5
Level of monthly income[b]		
Below average	90	62.1
Average	51	35.2
Above average	4	2.8
Cancer diagnosis		
Breast	52	35.9
Gynecologic	33	22.8
Hematology	1	0.7
Colorectal	5	3.4
Head and neck	36	24.8
Urology	3	2.1
Neurologic	5	3.4
Skin	2	1.4
Lymphoma	6	4.1
Sarcoma	2	1.4
No. of radiotherapy		
<5	38	26.2
5–20	54	37.2
>20	53	36.6

[a]Data presented as mean, median, and minimum-maximum respectively.
[b]Below average: less than 3 million Indonesian Rupiah (IDR), average: between 3 and 15 million IDR, above average: more than 15 million IDR.

the hospital workers (doctors, nurses, administrators, etc.) to maintain their safety; 21 (14.5%) were neutral about it, 13 (9.0%) trusted, and 111 (76.6%) were very trusting. Interestingly, the majority of respondents (65 out of 145, 44.7%) claimed to be not educated by healthcare workers. Most of them acquired knowledge regarding COVID-19 from hospital announcements. More than half of the participants (55.2%) thought that the quality of the radiotherapy services remained the same during the outbreak, 44.8% thought it got better. Most of the participants (65.5%) believed that wearing PPE was the most useful way to reduce anxiety or fear when undergoing radiotherapy during the outbreak. The perception on the quality and changes in radiotherapy service is listed in Table 3.

Discussion

The COVID-19 pandemic has increased the complexity of cancer care. The four main aspects of radiotherapy service that undergone adjustments during the pandemic include modification of facility, operational, staffing, and treatment modifications that is summarized in the Supplemental Tables 1 and 2.[7,11] Based on our experience, modifications in the facility and operational aspects can be undertaken sufficiently.

Online reservations prior to consultation was made mandatory for all patients that can be accessed from website (https://perjanjian.rskariadi.id/) or through mobile application (*Kariadi Pendaftaran Online*) that can be downloaded from Google Play Store and Apple App Store. Patients were instructed to come with a maximum of one companion, 15 min before the designated time, and to leave directly after consultation or treatment. Before enter- ing the building, all patients were screened using the COVID-19 Early Warning Score (EWS) screening tool.[12] Patients were categorized into four main groups depending on history of COVID-19 contact, clinical symptoms, and laboratory results to be managed accordingly.[13] Admitted patients are obligated to wear facemask and maintain at least 1 m distance with other people at all time. Only one patient companion are allowed to enter the treatment facility and the patient needs to go into the consultation room alone. Prior to the emergence of COVID-19, such measures would undoubtedly create nuisance for the patients. Interestingly, the results from this study proved the contrary. A total of 137 out 145 (94.5%) participants of this study were satisfied with the changes in hospital policies and that using PPE is the major determinant for reducing their level of fear and anxiety. Limiting anxiety in cancer patient is important considering how it affects treatment adherence, satisfaction, and outcome.[14]

Staffing and treatment protocol modifications proved to be much more challenging to implement. The limited number practicing radiation oncologists in our hospital prevents scheduling of independent functional staffs and limiting working hours to 20 h per week. In terms of treatment modification, our institution utilized hypofractionation radiotherapy whenever possible. A number of studies supports the use of hypofractionated radiotherapy during COVID-19.[15,16] With a slight increase in treatment time during each radiotherapy session, hypofractionation protocol reduces the total amount of time to complete the treatment program, thus allowing requiring less hospital visits and more patients to be treated within period of time.[17] In effort to reduce patient load and better allocation of limited resources, some randomized trials support deferring

Table 2. General knowledge of COVID-19.

Questions	Answer	*n*	%
Q9. Are you worried about being infected by the Corona virus?	Very worried	33	22.8
	Worried	79	54.5
	Not worry	33	22.8
Q10. Are you or have you been infected with Corona virus?	Yes	0	0.0
	No	89	61.4
	Do not know	56	38.6
Q11. If you answer Yes or No above, have you undergone a Corona examination?	Yes	15	10.3
	No	130	89.7
Q12. Is your daily activities disrupted since the pandemic began?	Very	27	18.6
	Yes	58	40.0
	A little	59	40.7
	Not at all	1	0.7
Q13. Have you been staying at home and avoid social events since the outbreak?	Yes	140	96.6
	No	5	3.4
Q14. Have you been keeping a safe distance of 2m from other people?	Yes	140	96.6
	No	5	3.4
Q15. Did you wash your hands more often since the outbreak?	Yes	144	99.3
	No	1	0.7
Q16. Have you been wearing a mask when your leave the house or meet other people?	Yes	144	99.3
	No	1	0.7
Q17. In your opinion, should people cancel and avoid social events during the outbreak?	Yes	138	95.2
	No	7	4.8
Q18. In your opinion, should people avoid shaking hands during the outbreak?	Yes	139	95.9
	No	6	4.1
Q19. In your opinion, should all non-essential stores (other than supermarkets, pharmacies, post offices, gas stations, etc.) be closed during the pandemic?	Yes	57	39.3
	No	88	60.7
Q20. In your opinion, should there be a curfew (except for grocery shopping, work, medical treatment)?	Yes	100	69.0
	No	45	31.0
Q21. Can the Corona virus infection make your cancer worse?	Yes	70	48.3
	No	75	51.7
Q22. Where did you get information about COVID-19?	Radio	1	0.7
	Television	108	74.5
	Internet	35	24.1
	Other	1	0.7
Q23. What are your estimates of the number of Indonesians infection with Corona virus at this time?	<100	4	2.8
	100–1000	17	11.7
	5000	31	21.4
	5000–10,000	29	20.0
	>10,000	64	44.1

radiotherapy by using systemic therapy first. For example the use of induction chemotherapy for nasopharyngeal carcinoma and androgen deprivation therapy in prostate cancer.[18] Beside utilizing hypofractionation, delay in follow-up visits, encouragement for palliative care are also advocated by the Indonesian Radiation Oncology Society (IROS) which in in accordance with the guidelines published by the American Society for Radiation Oncology (ASTRO).[7,19,20] Telemedicine has not been developed yet in our hospital, since effective use teleconsultation require optimal gadgets and internet connection which may prove to be a luxury for most of our patients with low-socioeconomic background.

The COVID-19 pandemic continuously receives substantial media coverage through numerous platforms, mainly through the internet and television.[21] The mainstream media has proven to be a very effective method in mass education, considering most patients claimed to acquire their knowledge of COVID-19 from it. Almost all participants of this study practiced COVID-19 preventive measures. Public awareness and cooperation by practicing toward the preventive measures is paramount in the war against a global crisis.[10,22] The surge of information may create excessive and irrational fear. However, some might argue that fear is necessary in this extraordinary circumstances, since fear was associated with increased patients

Table 3. Perception on the quality and changes in radiotherapy service.

Questions	Answer	*n*	%
Q24. Are you afraid of being infected with Corona virus while undergoing radiotherapy at the hospital?	Very afraid	58	40.0
	Somewhat afraid	76	52.4
	Not afraid	11	7.6
Q25. Have you thought of stopping or delaying radiotherapy during the outbreak?	Yes	20	13.8
	No	125	86.2
Q26. Have you thought of stopping going to the clinic routinely during the outbreak?	Yes	18	12.4
	No	127	87.6
Q27. Have you ever faced difficulty in getting radiotherapy during the outbreak? If yes, what was the cause?	No difficulty	109	75.2
	Access to hospital	22	15.2
	Treatment postponement	6	4.1
	Longer treatment queue	4	2.8
	Limited hospital workers	1	0.7
	Other	3	2.1
Q28. Did you experience any changes in the radiotherapy service during the outbreak?	Yes	54	37.2
	No	91	62.8
Q29. In your opinion, is the hospital's safety measures and policy in dealing with the Corona virus outbreak adequate?	Not adequate at all	0	0.0
	Not adequate	8	5.5
	Adequate	98	67.6
	More than adequate	39	26.9
Q30. In your opinion, are the personal protective equipment (PPE) used by hospital workers and their action are adequate to prevent Corona virus transmission within the hospital?	Not adequate at all	0	0.0
	Not adequate	4	2.8
	Adequate	98	67.6
	More than adequate	43	29.7
Q31. How much do you trust the hospital workers (doctors, nurses, administrators, etc.) in maintaining your safety?	Not at all	0	0.0
	A little	0	0.0
	Neutral	21	14.5
	Trust	13	9.0
	Very trusting	111	76.6
Q32. Is there a change in the health care service quality during the outbreak?	Got very bad	0	0.0
	A little worse	3	2.1
	The same	75	51.7
	Better	56	38.6
	Become much better	11	7.6
Q33. Were you educated about the Corona virus outbreak by the radiotherapy unit workers (doctors, nurses, ward officers)?	Not at all	65	44.8
	A little	24	16.6
	Yes	43	29.7
	A lot	13	9.0
Q34. Where did you get most information about the Corona virus and its relationship to your disease?	Doctor	15	10.3
	Nurse	11	7.6
	Administrators	5	3.4
	Hospital announcements (television, brochures)	90	62.1
	Other	24	16.6
Q35. What about the quality of radiotherapy services you received during the outbreak?	Got very bad	0	0.0
	A little worse	0	0.0
	The same	80	55.2
	Better	60	41.4
	Become much better	5	3.4
Q36. What do you think can best improve the quality of radiotherapy services?	More PPE worn by hospital workers	56	38.6
	More PPE provided	27	18.6
	More education from hospital workers	36	24.8
	Speed up radiotherapy program	23	15.9
	Stopping or delaying radiotherapy	0	0.0
	Other	3	2.1

(Continued)

Table 3. (Continued)

Questions	Answer	*n*	%
Q37. Are you afraid or worried about going to the oncology clinic during the outbreak?	Yes, very	23	15.9
	A little	56	38.6
	Not afraid/worried	66	45.5
Q38. In your opinion, what is the most useful way to reduce the level of anxiety or fear when undergoing radiotherapy during the outbreak?	Wearing PPE	95	65.5
	PPE worn by hospital workers	16	11.0
	Education and communication with hospital workers	27	18.6
	Speed up radiotherapy program	6	4.1
	Stopping or delaying radiotherapy	0	0.0
	Other	1	0.7

undergoing radiotherapy in the hospital is common

obedience to rules and practice optimal prevention measures.[22,23] Policy makers should utilize the most effective mass information platform for patient education and base their decision on evidence-based medicine.

To our knowledge, this is the first study that evaluated the perception of cancer patients to the changes in radiotherapy services in Indonesia. the authors identified several limitations to this study. The limited number of respondents that was recruited using convenience sampling method does not represent the general population. The use of questionnaire and the presence of the researcher during data collection may resulted in response bias.

Conclusion

In conclusion, the COVID-19 crises has created major challenges of radiation oncology service. Healthcare providers must adjust accordingly to manage the scarcity of resources and limit the spread of infection. By adhering to major clinical guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the COVID-19 pandemic that is well received by cancer patients in Central Java.

What is known

- The prevalence of cancer in COVID-19 patients is higher compared to the general population due to their immunosuppressed status.
- The COVID-19 pandemic necessitates numerous changes in hospital policies to limit the spread of the infectious disease. The patients' perceptions on these changes remains to be elucidated.
- The patients' perceptions toward the pandemic and the changes in radiotherapy services will affect their level of compliance to treatment, thus affecting the cure rate.

New findings

- Anxiety and fear of contracting COVID-19 while

among cancer patients, however it does not deter them from coming for treatment.
- The mainstream media is a very effective method for mass education. Study participants acquired most of the information regarding COVID-19 from it.
- Constant and adequate personal protective equip- ment worn by medical staff and patients is the major determinant for reducing the patients' level of anxi- ety while in hospital.

Author contributions

Yan Wisnu Prajoko: study conception, data collection, analysis, manuscript writing, and approval for submission. Tommy Supit: study conception, data collection, analysis, manuscript writing and approval for submission.

Declaration of conflicting interests[GQ: 2]

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Supplemental material

Supplemental material for this article is available online.

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Journal of Public Health Research

Radiotherapy Service Amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia.

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Keywords:	Radiation oncology, radiotherapy, COVID-19, service quality, Quality

Abstract:	Background: Several changes in hospital policies took place to mitigate the spread of Coronavirus disease 2019 (COVID-19). However, the patient's perception to these abrupt changes in medical services is not known. This study analyzed the quality of radiotherapy service during the COVID-19 pandemic and the patient's perception of them. Methods: This descriptive study will qualitatively assess cancer patient perception of the quality of radiotherapy service during COVID-19 pandemic. Willing participants were given a questionnaire that explore two major aspects: the patient's general knowledge of COVID-19 and their perception of radiotherapy service during the pandemic. Results: The 145 participants of this study were generally well-informed about the significance of COVID-19 pandemic. Most respondents claimed to adequately practice preventive measures and put high regards in personal protective equipment (PPE) worn by them and healthcare workers for their safety. Their level of trust to all healthcare workers remained high and identified hospital announcements (television, brochures) educated them the most in regards to the relationship of COVID-19 and cancer. Conclusion: The changes in hospital policies and radiation oncology service in our institution were well-received by the study population. Despite the majority of respondents were afraid and anxious of being infected of COVID-19 while undergoing treatment, only a minority of them contemplated to delay or completely stop going for treatment. By adhering to major guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the pandemic.

Radiotherapy Service Amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia.

ABSTRACT

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Keywords: Radiation oncology, radiotherapy, COVID-19, service quality

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) was declared as a global pandemic on March 11th, 2020, by the World Health Organization. The prevalence of cancer in COVID-19 patients is higher compared to the general population because of the immunosuppressive state as results of the malignant disease and anticancer treatment [1–3]. Furthermore, they were observed to

have a greater risk of severe events (needing intensive care unit care and/or invasive ventilation assistance) compared to patients without cancer [4].

Radiotherapy is one of the mainstay cancer treatment modalities that has played a greater role since the COVID-19 pandemic began. For example, neoadjuvant short-course radiotherapy is preferred over long-course chemoradiotherapy for patients with locally advanced colorectal cancer [5]. The COVID-19 outbreak presented several novel challenges to the radiation oncology unit. First, the frailties of patients who are admitted to the radiation oncology unit created risks of exposure and cross-transmission between frail and fit patients. Second, restriction on the number of patients who are admitted to the hospital or for radiation therapy can affect the efficacy of the therapy itself [6]. Third, prolonged period of radiotherapy will increase the duration of contact between people thus increasing the chance of Coronavirus transmission. Fourth, constant cleaning and disinfection of the equipment policies used in radiation oncology because of its constant sequence of use by different patients, thus increasing the potential for COVID-19 cross-contamination [7,8].

In accordance to the COVID-19 National task force, institutional, and specialists guidelines, our institution implemented numerous changes to help mitigate the spread of infection and allocation of limited resources [7]. Several changes include scheduled meeting, patient screening before entering treatment facilities, a maximum of one patient companion, solo consultation, mandatory use of face mask, physical distancing, modification of treatment program, etc. In addition to technical adjustments such as above, the population's knowledge and behavioural compliance to preventive measures will affect the outcome of the pandemic. A report suggests that knowledge and attitude towards infectious diseases during the SARS outbreak in 2003 were associated with a degree of fear in the population, affecting the spread

of disease [9]. Uncooperative behaviours such as underestimation, stigmatization, panic emotions, false beliefs to prevent outbreaks weakened the fight against the pandemic [10]. The reaction and perception of cancer patients undergoing radiotherapy to such changes is currently unknown. As a measure of quality control, the main objective of this study is to explore the patients' level of satisfaction and to identify major factors that affects their level of comfort and fear. Obtaining such information can aid policy and decision makers in creating the best strategies for ensuring optimal cancer care.

MATERIALS & METHODS

The study was conducted in qualitative descriptive with a cross-sectional design and aimed to see perception from patients towards the changes in radiotherapy service during the COVID-19 pandemic. Patients who are eligible and gave their consent were given the questionnaire to be answered during their visit to the radiology oncology unit. The local COVID-19 task force, group of oncology specialists, and hospital administrators created the questionnaire that was approved by the ethical committee. The questionnaire is comprised of 38 multiple-choice questions divided into three main parts. The first eight questions designed to obtain patient demographic information (Table 1). The second part consisted of 15 questions (question number 9–23) evaluate the participants' general knowledge on COVID-19 (Table 2) and the third section (question number 24–38) evaluate the participants' perception on radiotherapy service (Table 3). Overall, the questionnaire can evaluate the successfulness of the COVID-19 local protocols.

The questionnaire was originally created in Indonesian that was translated to English by two independent translators. A third reviewer approved the best version for publication.

Participants of this study were all cancer patients in any disease stage with prior, current, or history of radiotherapy. Data collection was performed from July 3rd, 2020 until July 17th, 2020, in a tertiary referral hospital, Central Java. This research used a convenience-sampling method to provide maximum patient variations. Patients who refused to participate or deemed to be clinically unfit were excluded from the study. Those who met the criteria were handed out a questionnaire by one researcher. Every participant was given an unlimited amount of time to finish the questionnaire that was collected within the same day. Family members were allowed to assist participants who were unable to read. Participants would not be isolated while filling out the questionnaire. However, they were encouraged to finish out the questionnaire by themselves and avoid being influenced by a family member or other patients. Data were expressed as total number (n) and percentage (%) unless stated otherwise. Data were analyzed using Microsoft Excel for Mac 2011 Version 14.4.1 (Microsoft Corporation, Washington, United States). This study was approved by the hospital Ethics Committee (No.543/EC/KEPK-RSDK.2020).

RESULTS

A total of 145 cancer patients were enrolled in the study. There were 113 females (77.9%) and 32 (22.1%) males. The participant's mean, median, and minimum-maximum age were 50.3, 50, 20, and 82 years old respectively. All participants were Indonesians and half of them (n=73, 50.3%) had high school degree or higher. The top three diagnoses were breast cancer (35.9%), head and neck cancer (24.8%), and gynaecologic cancer (22.8%). Complete patient demographics is presented in Table 1. All participants had received at least one session of radiotherapy before the pandemic. Fifty-eight patients (40.0%) were afraid of being infected by the coronavirus while undergoing radiotherapy, 20 (13.8%) had thought of delaying radiotherapy, and 18 (12.4%) patients had considered stopping hospital visit until the pandemic

is over. Twenty-two participants (15.2%) experienced difficulty in accessing the hospital because of regional lock-down during mid-March to April 2020. Treatment postponement was experienced by 6 (4.1%) patients and longer treatment queue by 4 (2.8%) patients.

Most patients (67.6%) trusted the hospital safety measures. Participants were asked on how much they trusted the hospital workers (doctors, nurses, administrators, etc.) to maintain their safety; 21 (14.5%) were neutral about it, 13 (9.0%) trusted, and 111 (76.6%) were very trusting. Interestingly, the majority of respondents (65 out of 145, 44.7%) claimed to be not educated by healthcare workers. Most of them acquired knowledge regarding COVID-19 from hospital announcements. More than half of the participants (55.2%) thought that the quality of the radiotherapy services remained the same during the outbreak, 44.8% thought it got better. Most of the participants (65.5%) believed that wearing PPE was the most useful way to reduce anxiety or fear when undergoing radiotherapy during the outbreak. The perception on the quality and changes in radiotherapy service is lister Table 3.

DISCUSSION

The COVID-19 pandemic has increased the complexity of cancer care. The four main aspects of radiotherapy service that undergone adjustments during the pandemic include modification of facility, operational, staffing, and treatment modifications that is summarized in the Supplementary Table 1 and Table 2 [7,11]. Based on our experience, modifications in the facility and operational aspects can be undertaken sufficiently.

Online reservations prior to consultation was made mandatory for all patients that can be accessed from website (https://perjanjian.rskariadi.id/) or through mobile application (*Kariadi Pendaftaran Online*) that can be downloaded from Google Play Store and Apple App Store.

Patients were instructed to come with a maximum of one companion, 15 minutes before the designated time, and to leave directly after consultation or treatment. Before entering the building, all patients were screened using the COVID-19 Early Warning Score (EWS) screening tool [12]. Patients were categorized into four main groups depending on history of COVID-19 contact, clinical symptoms, and laboratory results to be managed accordingly [13]. Admitted patients are obligated to wear facemask and maintain at least 1 meter distance with other people at all time. Only one patient companion are allowed to enter the treatment facility and the patient needs to go into the consultation room alone. Prior to the emergence of COVID-19, such measures would undoubtedly create nuisance for the patients. Interestingly, the results from this study proved the contrary. A total of 137 out 145 (94.5%) participants of this study were satisfied with the changes in hospital policies and that using PPE is the major determinant for reducing their level of fear and anxiety. Limiting anxiety in cancer patient is important considering how it affects treatment adherence, satisfaction, and outcome [14].

Staffing and treatment protocol modifications proved to be much more challenging to implement. The limited number practicing radiation oncologists in our hospital prevents scheduling of independent functional staffs and limiting working hours to 20 hours per week. In terms of treatment modification, our institution utilized hypofractionation radiotherapy whenever possible. A number of studies supports the use of hypofractionated radiotherapy during COVID-19 [15,16]. With a slight increase in treatment time during each radiotherapy session, hypofractionation protocol reduces the total amount of time to complete the treatment program, thus allowing requiring less hospital visits and more patients to be treated within period of time [17]. In effort to reduce patient load and better allocation of limited resources, some randomized trials support deferring radiotherapy by using systemic therapy first. For examples the use of induction chemotherapy for nasopharyngeal carcinoma and androgen

deprivation therapy in prostate cancer [18]. Beside utilizing hypofractionation, delay in follow-up visits, encouragement for palliative care are also advocated by the Indonesian Radiation Oncology Society (IROS) which in in accordance with the guidelines published by the American Society for Radiation Oncology (ASTRO) [7,19,20]. Telemedicine has not been developed yet in our hospital, since effective use teleconsultation require optimal gadgets and internet connection which may prove to be a luxury for most of our patients with low-socioeconomic background.

The COVID-19 pandemic continuously receives substantial media coverage through numerous platforms, mainly through the internet and television [21]. The mainstream media has proven to be a very effective method in mass education, considering most patients claimed to acquire their knowledge of COVID-19 from it. Almost all participants of this study practiced COVID-19 preventive measures. Public awareness and cooperation by practicing towards the preventive measures is paramount in the war against a global crisis [10,22]. The surge of information may create excessive and irrational fear. However, some might argue that fear is necessary in this extraordinary circumstances, since fear was associated with increased patients obedience to rules and practice optimal prevention measures [22]. Policy makers should utilize the most effective mass information platform for patient education and base their decision on evidence-based medicine.

To our knowledge, this is the first study that evaluated the perception of cancer patients to the changes in radiotherapy services in Indonesia. the authors identified several limitations to this study. The limited number of respondents that was recruited using convenience sampling method does not represent the general population. The use of questionnaire and the presence of the researcher during data collection may resulted in response bias.

CONCLUSION

In conclusion, the COVID-19 crises has created major challenges of radiation oncology service. Healthcare providers must adjust accordingly to manage the scarcity of resources and limit the spread of infection. By adhering to major clinical guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the COVID-19 pandemic that is well received by cancer patients in Central Java.

Conflict of interest
None declared.

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Yan Wisnu Prajoko: study conception, data collection, analysis, manuscript writing, and approval for submission.
Tommy Supit: study conception, data collection, analysis, manuscript writing and approval for submission.

What is known

- The prevalence of cancer in COVID-19 patients is higher compared to the general population due to their immunosuppressed status.
- The COVID-19 pandemic necessitates numerous changes in hospital policies to limit the spread of the infectious disease. The patients' perceptions on these changes remains to be elucidated.
- The patients' perceptions towards the pandemic and the changes in radiotherapy services will affect their level of compliance to treatment, thus affecting the cure rate.

New findings:

- Anxiety and fear of contracting COVID-19 while undergoing radiotherapy in the hospital is common among cancer patients, however it does not deter them from coming for treatment.

- The mainstream media is a very effective method for mass education. Study participants acquired most of the information regarding COVID-19 from it.
- Constant and adequate personal protective equipment worn by medical staff and patients is the major determinant for reducing the patients' level of anxiety while in hospital.

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Table 1: Patient Demographics

Patient demographics	n	%
Total	145	100.0
Female	113	77.9
Age (years old)1	50.3; 50; 20-82	
No. household member1	3.9; 4; 1-10	
Married	128	88.3
Ethnicity		
Javanese	139	95.9
Chinese	3	2.1
Balinese	1	0.7
Dayak	1	0.7
Malay	1	0.7
Level of education		
No formal education	9	6.2
Elementary	39	26.9
Middle	24	16.6
High	36	24.8
College and above	37	25.5
Level of monthy income2		
Below average	90	62.1
Average	51	35.2
Above average	4	2.8
Cancer diagnosis		
Breast	52	35.9
Gynecologic	33	22.8
Hematology	1	0.7
Colorectal	5	3.4
Head and Neck	36	24.8
Urology	3	2.1
Neurologic	5	3.4
Skin	2	1.4
Lymphoma	6	4.1
Sarcoma	2	1.4
No. of radiotherapy		
<5	38	26.2
5 to 20	54	37.2
>20	53	36.6

1 Data presented as mean, median, and minimum-maximum respectively
2 Below average: less than 3 million Indonesian Rupiah (IDR), average: between 3 to 15 million IDR, above average: more than 15 million IDR.

Table 2: General knowledge of COVID-19

Questions	Answer	n	%
Q9. Are you worried about being infected by the Corona virus?	Very worried	33	22.8
	Worried	79	54.5
	Not Worry	33	22.8
Q10. Are you or have you been infected with Corona virus?	Yes	0	0.0
	No	89	61.4
	Do not know	56	38.6
Q11. If you answer Yes or No above, have you undergone a Corona examination?	Yes	15	10.3
	No	130	89.7
Q12. Is your daily activities disrupted since the pandemic began?	Very	27	18.6
	Yes	58	40.0
	A little	59	40.7
	Not at all	1	0.7
Q13. Have you been staying at home and avoid social events since the outbreak?	Yes	140	96.6
	No	5	3.4
Q14. Have you been keeping a safe distance of two meters from other people?	Yes	140	96.6
	No	5	3.4
Q15. Did you wash your hands more often since the outbreak?	Yes	144	99.3
	No	1	0.7
Q16. Have you been wearing a mask when your leave the house or meet other people?	Yes	144	99.3
	No	1	0.7
Q17. In your opinion, should people cancel and avoid social events during the outbreak?	Yes	138	95.2
	No	7	4.8
Q18. In your opinion, should people avoid shaking hands during the outbreak?	Yes	139	95.9
	No	6	4.1
Q19. In your opinion, should all non-essential stores (other than supermarkets, pharmacies, post offices, gas stations, etc.) be closed during the pandemic?	Yes	57	39.3
	No	88	60.7
Q20. In your opinion, should there be a curfew (except for grocery shopping, work, medical treatment)?	Yes	100	69.0
	No	45	31.0
Q21. Can the Corona virus infection make your cancer worse?	Yes	70	48.3
	No	75	51.7
Q22. Where did you get information about COVID-19?	Radio	1	0.7
	Television	108	74.5

	Internet	35	24.1
	Other	1	0.7
Q23. What are your estimates of the number of Indonesians infection with Corona virus at this time?	<100	4	2.8
	100-1.000	17	11.7
	5000	31	21.4
	5000-10.000	29	20.0
	> 10.000	64	44.1

Table 3: Perception on the quality and changes in radiotherapy service

Questions	Answer	n	%
Q24. Are you afraid of being infected with Corona virus while undergoing radiotherapy at the hospital?	Very afraid	58	40.0
	Somewhat afraid	76	52.4
	Not afraid	11	7.6
Q25. Have you thought of stopping or delaying radiotherapy during the outbreak?	Yes	20	13.8
	No	125	86.2
Q26. Have you thought of stopping going to the clinic routinely during the outbreak?	Yes	18	12.4
	No	127	87.6
Q27. Have you ever faced difficulty in getting radiotherapy during the outbreak? If yes, what was the cause?	No difficulty	109	75.2
	Access to hospital	22	15.2
	Treatment postponement	6	4.1
	Longer treatment queue	4	2.8
	Limited hospital workers	1	0.7
	Other	3	2.1
Q28. Did you experience any changes in the radiotherapy service during the outbreak?	Yes	54	37.2
	No	91	62.8
Q29. In your opinion, is the hospital's safety measures and policy in dealing with the Corona virus outbreak adequate?	Not adequate at all	0	0.0
	Not adequate	8	5.5
	Adequate	98	67.6
	More than adequate	39	26.9
Q30. In your opinion, are the personal protective equipment (PPE) used by hospital workers and their action are adequate to prevent Corona virus transmission within the hospital?	Not adequate at all	0	0.0
	Not adequate	4	2.8
	Adequate	98	67.6
	More than adequate	43	29.7
Q31. How much do you trust the hospital workers (doctors, nurses, administrators, etc.) in maintaining your safety?	Not at all	0	0.0
	A little	0	0.0

Neutral	21	14.5	Trust	13	9.0
			Very trusting	111	76.6
	Q32. Is there a change in the health care service quality during the outbreak?		Got very bad	0	0.0
			A little worse	3	2.1
			The same	75	51.7
			Better	56	38.6

	Become much better	11	7.6
Q33. Were you educated about the Corona virus outbreak by the radiotherapy unit workers (doctors, nurses, ward officers)?	Not at all	65	44.8
	A little	24	16.6
	Yes	43	29.7
	A lot	13	9.0
Q34. Where did you get most information about the Corona virus and its relationship to your disease?	Doctor	15	10.3
	Nurse	11	7.6
	Administrators	5	3.4
	Hospital announcements (television, brochures)	90	62.1
	Other	24	16.6
Q35. What about the quality of radiotherapy services you received during the outbreak?	Got very bad	0	0.0
	A little worse	0	0.0
	The same	80	55.2
	Better	60	41.4
	Become much better	5	3.4
Q36. What do you think can best improve the quality of radiotherapy services?	More PPE worn by hospital workers	56	38.6
	More PPE provided	27	18.6
	More education from hospital workers	36	24.8
	Speed up radiotherapy program	23	15.9
	Stopping or delaying radiotherapy	0	0.0
	Other	3	2.1
Q37. Are you afraid or worried about going to the oncology clinic during the outbreak?	Yes, very	23	15.9
	A little	56	38.6
	Not afraid/ worried	66	45.5
Q38. In your opinion, what is the most useful way to reduce the level	Wearing PPE	95	65.5

of anxiety or

fear when undergoing		PPE worn by hospital workers	16	11.0
	radiotherapy during the outbreak?	Education and communication	27	18.6

	with hospital workers		
	Speed up radiotherapy program	6	4.1
	Stopping or delaying radiotherapy	0	0.0
	Other	1	0.7

Supplementary Table 1: Recommendation of major aspects requiring adjustment within radiotherapy center during COVID-19 pandemic

Major Aspects to be Modified	**Recommendation**
Facility	• Reorganizing couch and chairs in the waiting room (minimum distance of 1 meter) • Opening multiple access to treatment machines to reduce possible crowding • Installation of transparent barrier between healthcare workers and patients whenever possible
Operational	• Obligating screening of body temperature for everyone entering the radiotherapy building • Stricter radiation scheduling to reduce the waiting time within the radiotherapy building to as minimal as possible • Restricting number of people in patient's waiting room • Routine facilities disinfection (every 15 minutes for door handle, table, couch and general disinfection for all rooms every week) • Obligating use of proper personal protective equipment (PPE) according to risk of transmission from patients • No treatment for suspected and confirmed patients. However, in very selected cases where radiotherapy is absolutely necessary for suspected or confirmed patient, then it has to be schedule for treatment as the last patient. Preparation has to be done including use of proper PPEs for all staffs and covering the hallway, treatment room, and couch with disposable

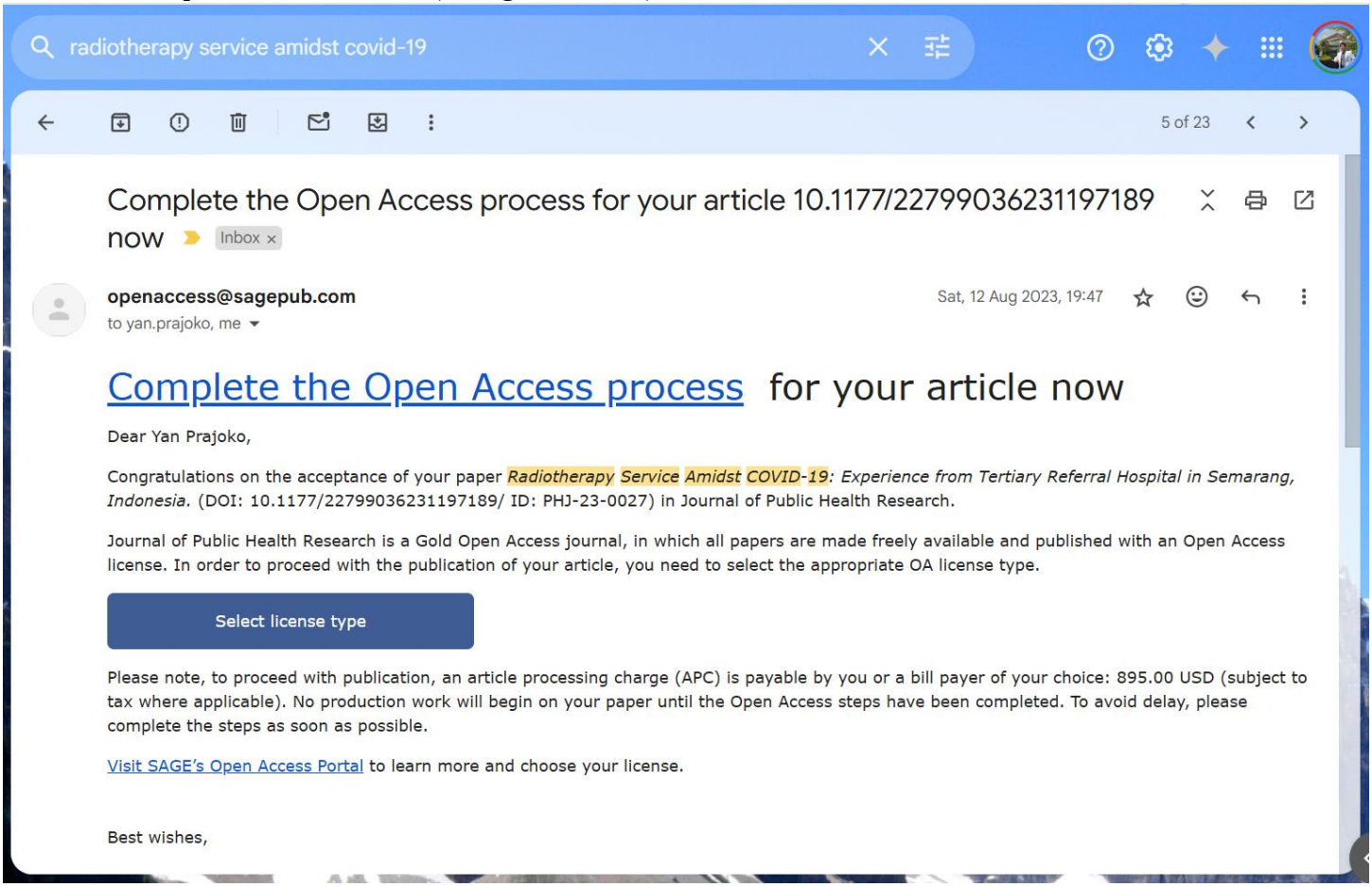
	plastic wrap, then thorough disinfectant has to be carried out.
Staffing	• Two independent functional staffs composed of all professionals required to run radiotherapy services (no crossing schedule between teams) • Limiting working hours to 20 hours per week for each staff • Staff over the age of 60 or having multiple co-morbidities were advised to work from home
Patient treatment modification	• Prioritizing clinical indications for radiotherapy (following published consensus)[23]. • Use of hypofractionation radiotherapy whenever indicated • Delaying non-urgent patient follow-up • Developing a teleconsultation

Supplementary Table 2: Recommendation: Risk assessment within radiotherapy centers and its corresponding recommended personal protective equipment (PPE)

Level of Protection	Area	Personnel	Activity	PPE Recommendation
Level 1	• Back office (Administration and Finance room) • Admission area • Medical record room	• Administration staff • Receptionist • Cashier • Medical record staff	• General office activity • Administrative activity • Patient education • Patient registration • Administration services	• Surgical mask • Hospital gown • Recommended distance of 1 m between staff and patients, an acrylic divider can be utilized. Otherwise, use level 2 PPE.
	• Medical physics and dosimetry room • Medical and non-medical technician room • Logistic Area	• Medical physicist • Medical and non-medical technician • Logistic staff	• Treatment planning activity • Standby for corrective maintenance • Logistic activity	• Surgical mask • Hospital gown • QA/QC and maintenance in radiation machine use level 2 PPE
Level 2	• Radiotherapy facility entrance access	• Security	• Patient Assistance • Quick history taking on contact and symptoms • Temperature screening	• Surgical mask • Disposable apron on top of hospital gown
	• Other common areas in radiotherapy facilities	• Cleaning service	• Facility cleaning	• Surgical mask • Hospital gown • Non sterile gloves
Level 3	• Outpatient clinics • Triage area	• Doctor • Nurse • Triage staff	• Consultation • Physical Examination • Treatment • Triage • Patient set up	• Surgical mask or N95 mask when interacting with suspect or

	• Radiation bunker • Simulator room • CT simulator room • Day care room	• Radiation Technology Technician • Nurse	• Patient positioning • Couch cleaning after treatment of every patient	confirmed patient • Hospital gown • Surgical cap • Google or face shield • Non sterile gloves
Level 4	• Brachytherapy area	• Doctor • Nurse • Radiation Technology Technician	• Brachytherapy application • Brachytherapy treatment	• N95 mask • Sterile apron on top of hospital gown • Surgical cap • Google or face shield • Gloves, use sterile gloves whenever necessary • Foot cover

4. Accepted for Publication (12 Agustus 2023)



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5. Paper has been Published (15 Agustus 2023)

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Original Article

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Radiotherapy service amidst COVID-19: Experience from Tertiary Referral Hospital in Semarang, Indonesia

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Abstract

Background: Several changes in hospital policies took place to mitigate the spread of Coronavirus disease 2019 (COVID-19). However, the patient's perception to these abrupt changes in medical services is not known. This study analyzed the quality of radiotherapy service during the COVID-19 pandemic and the patient's perception of them.

Methods: This descriptive study will qualitatively assess cancer patient perception of the quality of radiotherapy service during COVID-19 pandemic. Willing participants were given a questionnaire that explore two major aspects: the patient's general knowledge of COVID-19 and their perception of radiotherapy service during the pandemic.

Results: The 145 participants of this study were generally well-informed about the significance of COVID-19 pandemic. Most respondents claimed to adequately practice preventive measures and put high regards in personal protective equipment (PPE) worn by them and healthcare workers for their safety. Their level of trust to all healthcare workers remained high and identified hospital announcements (television, brochures) educated them the most in regards to the relationship of COVID-19 and cancer.

Conclusion: The changes in hospital policies and radiation oncology service in our institution were well-received by the study population. Despite the majority of respondents were afraid and anxious of being infected of COVID-19 while undergoing treatment, only a minority of them contemplated to delay or completely stop going for treatment. By adhering to major guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the pandemic.

Keywords

Radiation oncology, radiotherapy, COVID-19, service quality

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Introduction

The Coronavirus Disease 2019 (COVID-19) was declared as a global pandemic on March 11th, 2020, by the World Health Organization. The prevalence of cancer in COVID-19 patients is higher compared to the general population because of the immunosuppressive state as results of the malignant disease and anticancer treatment.[1–3] Furthermore, they were observed to have a greater risk of severe events (needing intensive care unit care and/or invasive ventilation assistance) compared to patients without cancer.[4]

Radiotherapy is one of the mainstay cancer treatment modalities that has played a greater role since the COVID-19 pandemic began. For example, neoadjuvant short-course radiotherapy is preferred over long-course chemoradiotherapy for patients with locally advanced colorectal cancer.[5] The COVID-19 outbreak presented several novel challenges to the radiation oncology unit. First, the frailties of patients who are admitted to the radiation oncology unit created risks of exposure and

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cross-transmission between frail and fit patients. Second, restriction on the number of patients who are admitted to the hospital or for radiation therapy can affect the efficacy of the therapy itself.[6] Third, prolonged period of radiotherapy will increase the duration of contact between people thus increasing the chance of Coronavirus transmission. Fourth, constant cleaning and disinfection of the equipment policies used in radiation oncology because of its constant sequence of use by different patients, thus increasing the potential for COVID-19 cross-contamination.[7,8]

In accordance to the COVID-19 National task force, institutional, and specialists guidelines, our institution implemented numerous changes to help mitigate the spread of infection and allocation of limited resources.[7] Several changes include scheduled meeting, patient screening before entering treatment facilities, a maximum of one patient companion, solo consultation, mandatory use of face mask, physical distancing, modification of treatment program, etc. In addition to technical adjustments such as above, the population's knowledge and behavioral compliance to preventive measures will affect the outcome of the pandemic. A report suggests that knowledge and attitude toward infectious diseases during the SARS outbreak in 2003 were associated with a degree of fear in the population, affecting the spread of disease.[9] Uncooperative behaviors such as underestimation, stigmatization, panic emotions, false beliefs to prevent outbreaks weakened the fight against the pandemic.[10] The reaction and perception of cancer patients undergoing radiotherapy to such changes is currently unknown. As a measure of quality control, the main objective of this study is to explore the patients' level of satisfaction and to identify major factors that affects their level of comfort and fear. Obtaining such information can aid policy and decision makers in creating the best strategies for ensuring optimal cancer care.

Materials and methods

The study was conducted in qualitative descriptive with a cross-sectional design and aimed to see perception from patients toward the changes in radiotherapy service during the COVID-19 pandemic. Patients who are eligible and gave their consent were given the questionnaire to be answered during their visit to the radiology oncology unit. The local COVID-19 task force, group of oncology specialists, and hospital administrators created the questionnaire that was approved by the ethical committee. The questionnaire is comprised of 38 multiple-choice questions divided into three main parts. The first eight questions designed to obtain patient demographic information (Table 1). The second part consisted of 15 questions (question number 9–23) evaluate the participants' general knowledge on COVID-19 (Table 2) and the third section (question number 24–38) evaluate the participants' perception on radiotherapy service (Table 3). Overall, the questionnaire can evaluate the successfulness of the COVID-19 local protocols.

The questionnaire was originally created in Indonesian that was translated to English by two independent translators. A third reviewer approved the best version for publication.

Participants of this study were all cancer patients in any disease stage with prior, current, or history of radiotherapy. Data collection was performed from July 3rd, 2020 until July 17th, 2020, in a tertiary referral hospital, Central Java. This research used a convenience-sampling method to provide maximum patient variations. Patients who refused to participate or deemed to be clinically unfit were excluded from the study. Those who met the criteria were handed out a questionnaire by one researcher. Every participant was given an unlimited amount of time to finish the questionnaire that was collected within the same day. Family members were allowed to assist participants who were unable to read. Participants would not be isolated while filling out the questionnaire. However, they were encouraged to finish out the questionnaire by themselves and avoid being influenced by a family member or other patients. Data were expressed as total number (n) and percentage (%) unless stated otherwise. Data were analyzed using Microsoft Excel for Mac 2011 Version 14.4.1 (Microsoft Corporation, Washington, United States). This study was approved by the hospital Ethics Committee (No. 543/EC/KEPK-RSDK.2020).

Results

A total of 145 cancer patients were enrolled in the study. There were 113 females (77.9%) and 32 (22.1%) males. The participant's mean, median, and minimum-maximum age were 50.3, 50, 20, and 82 years old respectively. All participants were Indonesians and half of them ($n=73$, 50.3%) had high school degree or higher. The top three diagnoses were breast cancer (35.9%), head and neck cancer (24.8%), and gynecologic cancer (22.8%). Complete patient demographics is presented in Table 1. All participants had received at least one session of radiotherapy before the pandemic. Fifty-eight patients (40.0%) were afraid of being infected by the coronavirus while undergoing radiotherapy, 20 (13.8%) had thought of delaying radiotherapy, and 18 (12.4%) patients had considered stopping hospital visit until the pandemic is over. Twenty-two participants (15.2%) experienced difficulty in accessing the hospital because of regional lock-down during mid-March to April 2020. Treatment postponement was experienced by 6 (4.1%) patients and longer treatment queue by 4 (2.8%) patients.

Most patients (67.6%) trusted the hospital safety measures. Participants were asked on how much they trusted

Table 1. Patient demographics.

Patient demographics	*n*	%
Total	145	100.0
Female	113	77.9
Age (years old)[a]	50.3; 50; 20–82	
No. household member[a]	3.9; 4; 1–10	
Married	128	88.3
Ethnicity		
Javanese	139	95.9
Chinese	3	2.1
Balinese	1	0.7
Dayak	1	0.7
Malay	1	0.7
Level of education		
No formal education	9	6.2
Elementary	39	26.9
Middle	24	16.6
High	36	24.8
College and above	37	25.5
Level of monthly income[b]		
Below average	90	62.1
Average	51	35.2
Above average	4	2.8
Cancer diagnosis		
Breast	52	35.9
Gynecologic	33	22.8
Hematology	1	0.7
Colorectal	5	3.4
Head and neck	36	24.8
Urology	3	2.1
Neurologic	5	3.4
Skin	2	1.4
Lymphoma	6	4.1
Sarcoma	2	1.4
No. of radiotherapy		
<5	38	26.2
5–20	54	37.2
>20	53	36.6

[a]Data presented as mean, median, and minimum-maximum respectively.
[b]Below average: less than 3 million Indonesian Rupiah (IDR), average: between 3 and 15 million IDR, above average: more than 15 million IDR.

the hospital workers (doctors, nurses, administrators, etc.) to maintain their safety; 21 (14.5%) were neutral about it, 13 (9.0%) trusted, and 111 (76.6%) were very trusting. Interestingly, the majority of respondents (65 out of 145, 44.7%) claimed to be not educated by healthcare workers. Most of them acquired knowledge regarding COVID-19 from hospital announcements. More than half of the participants (55.2%) thought that the quality of the radiotherapy services remained the same during the outbreak, 44.8% thought it got better. Most of the participants (65.5%) believed that wearing PPE was the most useful way to reduce anxiety or fear when undergoing radiotherapy during the outbreak. The perception on the quality and changes in radiotherapy service is listed in Table 3.

Discussion

The COVID-19 pandemic has increased the complexity of cancer care. The four main aspects of radiotherapy service that undergone adjustments during the pandemic include modification of facility, operational, staffing, and treatment modifications that is summarized in the Supplemental Tables 1 and 2.[7,11] Based on our experience, modifications in the facility and operational aspects can be undertaken sufficiently.

Online reservations prior to consultation was made mandatory for all patients that can be accessed from website (https://perjanjian.rskariadi.id/) or through mobile application (*Kariadi Pendaftaran Online*) that can be downloaded from Google Play Store and Apple App Store. Patients were instructed to come with a maximum of one companion, 15 min before the designated time, and to leave directly after consultation or treatment. Before entering the building, all patients were screened using the COVID-19 Early Warning Score (EWS) screening tool.[12] Patients were categorized into four main groups depending on history of COVID-19 contact, clinical symptoms, and laboratory results to be managed accordingly.[13] Admitted patients are obligated to wear facemask and maintain at least 1 m distance with other people at all time. Only one patient companion are allowed to enter the treatment facility and the patient needs to go into the consultation room alone. Prior to the emergence of COVID-19, such measures would undoubtedly create nuisance for the patients. Interestingly, the results from this study proved the contrary. A total of 137 out 145 (94.5%) participants of this study were satisfied with the changes in hospital policies and that using PPE is the major determinant for reducing their level of fear and anxiety. Limiting anxiety in cancer patient is important considering how it affects treatment adherence, satisfaction, and outcome.[14]

Staffing and treatment protocol modifications proved to be much more challenging to implement. The limited number practicing radiation oncologists in our hospital prevents scheduling of independent functional staffs and limiting working hours to 20 h per week. In terms of treatment modification, our institution utilized hypofractionation radiotherapy whenever possible. A number of studies supports the use of hypofractionated radiotherapy during COVID-19.[15,16] With a slight increase in treatment time during each radiotherapy session, hypofractionation protocol reduces the total amount of time to complete the treatment program, thus allowing requiring less hospital visits and more patients to be treated within period of time.[17] In effort to reduce patient load and better allocation of limited resources, some randomized trials support deferring

Table 2. General knowledge of COVID-19.

Questions	Answer	*n*	%
Q9. Are you worried about being infected by the Corona virus?	Very worried	33	22.8
	Worried	79	54.5
	Not worry	33	22.8
Q10. Are you or have you been infected with Corona virus?	Yes	0	0.0
	No	89	61.4
	Do not know	56	38.6
Q11. If you answer Yes or No above, have you undergone a Corona examination?	Yes	15	10.3
	No	130	89.7
Q12. Is your daily activities disrupted since the pandemic began?	Very	27	18.6
	Yes	58	40.0
	A little	59	40.7
	Not at all	1	0.7
Q13. Have you been staying at home and avoid social events since the outbreak?	Yes	140	96.6
	No	5	3.4
Q14. Have you been keeping a safe distance of 2 m from other people?	Yes	140	96.6
	No	5	3.4
Q15. Did you wash your hands more often since the outbreak?	Yes	144	99.3
	No	1	0.7
Q16. Have you been wearing a mask when your leave the house or meet other people?	Yes	144	99.3
	No	1	0.7
Q17. In your opinion, should people cancel and avoid social events during the outbreak?	Yes	138	95.2
	No	7	4.8
Q18. In your opinion, should people avoid shaking hands during the outbreak?	Yes	139	95.9
	No	6	4.1
Q19. In your opinion, should all non-essential stores (other than supermarkets, pharmacies, post offices, gas stations, etc.) be closed during the pandemic?	Yes	57	39.3
	No	88	60.7
Q20. In your opinion, should there be a curfew (except for grocery shopping, work, medical treatment)?	Yes	100	69.0
	No	45	31.0
Q21. Can the Corona virus infection make your cancer worse?	Yes	70	48.3
	No	75	51.7
Q22. Where did you get information about COVID-19?	Radio	1	0.7
	Television	108	74.5
	Internet	35	24.1
	Other	1	0.7
Q23. What are your estimates of the number of Indonesians infection with Corona virus at this time?	<100	4	2.8
	100–1000	17	11.7
	5000	31	21.4
	5000–10,000	29	20.0
	>10,000	64	44.1

radiotherapy by using systemic therapy first. For example the use of induction chemotherapy for nasopharyngeal carcinoma and androgen deprivation therapy in prostate cancer.[18] Beside utilizing hypofractionation, delay in follow-up visits, encouragement for palliative care are also advocated by the Indonesian Radiation Oncology Society (IROS) which in in accordance with the guidelines published by the American Society for Radiation Oncology (ASTRO).[7,19,20] Telemedicine has not been developed yet in our hospital, since effective use teleconsultation require optimal gadgets and internet connection which may prove to be a luxury for most of our patients with low-socioeconomic background.

The COVID-19 pandemic continuously receives substantial media coverage through numerous platforms, mainly through the internet and television.[21] The mainstream media has proven to be a very effective method in mass education, considering most patients claimed to acquire their knowledge of COVID-19 from it. Almost all participants of this study practiced COVID-19 preventive measures. Public awareness and cooperation by practicing toward the preventive measures is paramount in the war against a global crisis.[10,22] The surge of information may create excessive and irrational fear. However, some might argue that fear is necessary in this extraordinary circumstances, since fear was associated with increased patients

Table 3. Perception on the quality and changes in radiotherapy service.

Questions	Answer	*n*	%
Q24. Are you afraid of being infected with Corona virus while undergoing radiotherapy at the hospital?	Very afraid	58	40.0
	Somewhat afraid	76	52.4
	Not afraid	11	7.6
Q25. Have you thought of stopping or delaying radiotherapy during the outbreak?	Yes	20	13.8
	No	125	86.2
Q26. Have you thought of stopping going to the clinic routinely during the outbreak?	Yes	18	12.4
	No	127	87.6
Q27. Have you ever faced difficulty in getting radiotherapy during the outbreak? If yes, what was the cause?	No difficulty	109	75.2
	Access to hospital	22	15.2
	Treatment postponement	6	4.1
	Longer treatment queue	4	2.8
	Limited hospital workers	1	0.7
	Other	3	2.1
Q28. Did you experience any changes in the radiotherapy service during the outbreak?	Yes	54	37.2
	No	91	62.8
Q29. In your opinion, is the hospital's safety measures and policy in dealing with the Corona virus outbreak adequate?	Not adequate at all	0	0.0
	Not adequate	8	5.5
	Adequate	98	67.6
	More than adequate	39	26.9
Q30. In your opinion, are the personal protective equipment (PPE) used by hospital workers and their action are adequate to prevent Corona virus transmission within the hospital?	Not adequate at all	0	0.0
	Not adequate	4	2.8
	Adequate	98	67.6
	More than adequate	43	29.7
Q31. How much do you trust the hospital workers (doctors, nurses, administrators, etc.) in maintaining your safety?	Not at all	0	0.0
	A little	0	0.0
	Neutral	21	14.5
	Trust	13	9.0
	Very trusting	111	76.6
Q32. Is there a change in the health care service quality during the outbreak?	Got very bad	0	0.0
	A little worse	3	2.1
	The same	75	51.7
	Better	56	38.6
	Become much better	11	7.6
Q33. Were you educated about the Corona virus outbreak by the radiotherapy unit workers (doctors, nurses, ward officers)?	Not at all	65	44.8
	A little	24	16.6
	Yes	43	29.7
	A lot	13	9.0
Q34. Where did you get most information about the Corona virus and its relationship to your disease?	Doctor	15	10.3
	Nurse	11	7.6
	Administrators	5	3.4
	Hospital announcements (television, brochures)	90	62.1
	Other	24	16.6
Q35. What about the quality of radiotherapy services you received during the outbreak?	Got very bad	0	0.0
	A little worse	0	0.0
	The same	80	55.2
	Better	60	41.4
	Become much better	5	3.4
Q36. What do you think can best improve the quality of radiotherapy services?	More PPE worn by hospital workers	56	38.6
	More PPE provided	27	18.6
	More education from hospital workers	36	24.8
	Speed up radiotherapy program	23	15.9
	Stopping or delaying radiotherapy	0	0.0
	Other	3	2.1

(Continued)

Table 3. (Continued)

Questions	Answer	*n*	%
Q37. Are you afraid or worried about going to the oncology clinic during the outbreak?	Yes, very	23	15.9
	A little	56	38.6
	Not afraid/worried	66	45.5
Q38. In your opinion, what is the most useful way to reduce the level of anxiety or fear when undergoing radiotherapy during the outbreak?	Wearing PPE	95	65.5
	PPE worn by hospital workers	16	11.0
	Education and communication with hospital workers	27	18.6
	Speed up radiotherapy program	6	4.1
	Stopping or delaying radiotherapy	0	0.0
	Other	1	0.7

obedience to rules and practice optimal prevention measures.[22,23] Policy makers should utilize the most effective mass information platform for patient education and base their decision on evidence-based medicine.

To our knowledge, this is the first study that evaluated the perception of cancer patients to the changes in radiotherapy services in Indonesia. the authors identified several limitations to this study. The limited number of respondents that was recruited using convenience sampling method does not represent the general population. The use of questionnaire and the presence of the researcher during data collection may resulted in response bias.

Conclusion

In conclusion, the COVID-19 crises has created major challenges of radiation oncology service. Healthcare providers must adjust accordingly to manage the scarcity of resources and limit the spread of infection. By adhering to major clinical guidelines and adjustments of local resources, the delivery of radiotherapy service can remain consistent during the COVID-19 pandemic that is well received by cancer patients in Central Java.

What is known

- The prevalence of cancer in COVID-19 patients is higher compared to the general population due to their immunosuppressed status.
- The COVID-19 pandemic necessitates numerous changes in hospital policies to limit the spread of the infectious disease. The patients' perceptions on these changes remains to be elucidated.
- The patients' perceptions toward the pandemic and the changes in radiotherapy services will affect their level of compliance to treatment, thus affecting the cure rate.

New findings

- Anxiety and fear of contracting COVID-19 while undergoing radiotherapy in the hospital is common among cancer patients, however it does not deter them from coming for treatment.
- The mainstream media is a very effective method for mass education. Study participants acquired most of the information regarding COVID-19 from it.
- Constant and adequate personal protective equipment worn by medical staff and patients is the major determinant for reducing the patients' level of anxiety while in hospital.

Author contributions

Yan Wisnu Prajoko: study conception, data collection, analysis, manuscript writing, and approval for submission. Tommy Supit: study conception, data collection, analysis, manuscript writing and approval for submission.

Declaration of conflicting interests

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Supplemental material

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