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Patient wait times for daily outpatient radiotherapy appointments (a single-centre study)

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Original Article

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Abstract

Purpose: Patient wait time for every single fraction of every patient treated at our centre for the past year has been presented in this study. The waiting time data were analysed across different treatment sites and modalities.

Materials and Methods: Between March 2021 and March 2022, all patients and their corresponding recorded measurements of waiting time were analysed. Times recorded included check-in time (CK), scheduled time to start treatment (SC) and beam-on time for the first beam of therapy (ST). SPSS version 18 was used for statistical calculations, correlations and assessing significance.

Results: A total of 181 patients were treated during this duration. The total number of radiotherapy (RT) sessions recorded was 3011. Out of these 3011 sessions, number of times treated by rapid arc (RA), intensity-modulated radiotherapy (IMRT), three-dimensional conformal radiotherapy (3DCRT), stereotactic body radiotherapy (SBRT), stereotactic radiosurgery and stereotactic radiotherapy (SRS/SRT) were 68.18%, 30.19%, 0.167%, 0.565% and 0.19%, respectively. The mean (± standard deviation) times for scheduled time to start treatment (SC) to check-in time (CK), SC to ST (beam-on time for the first beam of treatment), CK to ST and (CK or SC) to ST were -14 ± 48 min, 6 ± 50 min, 19 ± 24 min and -4 ± 31 min, respectively.

Conclusion: Patient wait times during RT were presented in this study. This study covered the daily waiting times before RT during modern-day RT treatment sessions. This vast series of consecutive patient data will be a valuable resource for the future planning and management of any modern RT department.

Introduction

Radiotherapy (RT) is an essential component of cancer management. RT was used either alone or in combination with surgery and chemotherapy. RT was used for both curative as well as palliative goals.[1–3] It was thought that about 80% of cancer patients who were cured by a combination of treatments, while almost 20% were cured by RT alone.[4] Overall, nearly 60%–70% of all cancer patients require RT during their treatment course.

Radiation therapy has continuously advanced from two-dimensional approaches to three-dimensional conformal radiotherapy (3DCRT), intensity-modulated radiotherapy (IMRT), image-guided radiotherapy (IGRT) and volumetric-modulated arc-based therapies (VMATs). Patients who are advised to undertake RT are typically required to make daily visits to the RT department. The frequency of therapy might range from a single session (stereotactic radiosurgery (SRS) and palliative care) to fractionated treatments lasting 6–7 weeks.[5] Patients must wait in the department prior to being put inside the treatment equipment for single or fractionated sessions. This waiting time in the department, as well as the time spent in the machine, can have a considerable impact on the patient's and immediate family's daily activities.[6]

Further, while modern-day RT is presumed to be time-efficient, there is a lack of objective data. No large data set of patients analysing the waiting and treatment times encountered in a modern set-up has been reported. Our hospital has an advanced radiation oncology set-up, using IMRT and rapid arc (RA) treatments coupled with image guidance for most patients. This study tried to assess patient wait times for daily outpatient RT appointments. Patient waiting time was presented for every single fraction of every patient treated at our centre for the past year. This study aimed to find out how long patients had to wait for outpatient RT appointments daily and whether it had any dependencies on the site and modality of treatment.

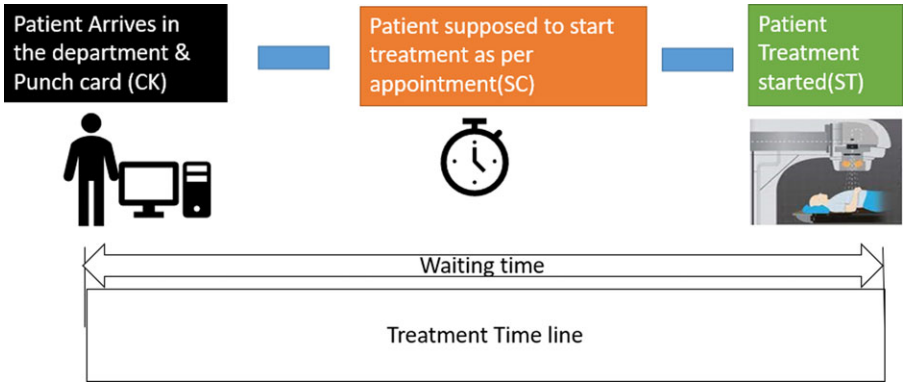

Figure 1. Typical workflow for patient arrival, intimation to the helpdesk and start of patient treatment in our department.

Materials and Methods

Between March 2021 and March 2022, 181 patients were taken for RT treatment at our centre. The treatment of these patients resulted in 3011 recorded measurements of waiting time. Our department has ARIA (Varian, Palo Alto, CA, United States) RT networking solution (V 15.1). Since the department had an existing paperless environment, all the specified time points were recorded digitally in the system. Our department has one Varian True-beam (Varian, CA, United States) linear accelerator. Post-simulation, date and time of appointment were given to the patients for the start of the therapy as per the available timing in the linear accelerator. In March 2021, the Barcode scanner system was introduced to electronically record the patient waiting time for each fraction of their treatment.

Before the first session, all patients were provided with a card along with an individualised barcode. Two to three pm on every treatment day was reserved only for new patients in our department, which could be termed as a standard time slot for all new patients. After the first day of treatment on a standard time slot for all new start patients, patients were provided with a scheduled time for treatment (SC). In Figure 1, the typical workflow of our department for waiting time was described with all the abbreviations used. For all the sessions, the patient punched the barcode on a stationary barcode scanner placed in the helpdesk, and this time was automatically registered in ARIA as the patient check-in time (CK). Figure 1 shows typical scheduling in our departmental linear accelerator. After the patient was taken to the radiation therapy area, the treating technologist entered the patient file so that the ARIA sequencer status changed from check-in to 'start treatment.' The following terminologies were used in this study which was related to patient wait time:

1. Schedule time (SC) was when the patient was supposed to start the treatment on any particular day.
2. Check-in time (CK) was when the patient punched the card in the barcode scanner available at the helpdesk area.
3. Start time (ST) was the time when the first beam is switched ON for the patient's treatment on that day.

For the first day of treatment, the patient was called to report at a fixed time (which is different from the time allotted for the rest of the treatment). Based on the time allotted, the patient was scheduled in the daily treatment calendar, viz. 'Appointment scheduling' in ARIA. The patient's card was scanned after his/her arrival at the department for the first day of treatment. For the rest course of the treatment, patients were asked to scan the card whenever they reported to the helpdesk of RT department for treatment.

For this study, data for each day of treatment for every patient were procured from the ARIA system. Further, a report was generated from it to calculate the patient waiting time. For statistical calculations, correlations and assessing significance, Statistical Package for the Social Sciences (SPSS version 18, New York, United States) was used.

Before being transferred to the treatment area, a nurse checked each patient's vitals (blood pressure, temperature and pulse) every day. This activity increased (ST-CK). It took about (2 + 1) minutes to check a patient's vitals (Average + Standard deviation). However, this information was not included in the analysis because it only covered a small subset of patients (not all 3011 sessions).

Results

A total of 3011 sessions of treatment delivery were recorded. These included 2053 sessions (68·183%) of RA sessions, 930 sessions (30·887%) of IMRT, 17 sessions (0·565 %) of SBRT, 6 sessions (0·199%) of SRS/stereotactic radiotherapy (SRT) and 5 (0·166%) sessions of 3DCRT.

Figure 2 shows the frequency plot of the (CK-SC), (ST-SC), (ST-CK), and whichever is lower between (ST-SC) and (ST-CK). The last one considered the fact that a patient made an early check-in regarding the scheduled treatment time (SC). An overall analysis of the waiting time is shown in Table 1.

The Pearson correlation coefficient between (CK-SC) and (ST-SC) is 0·8839. In case of the delayed arrival of the patient, it was anticipated that the treatment could be delayed. The Pearson correlation coefficient for a relation between (ST-SC) and (ST-CK) is 0·2891, that is, they were positively correlated but weakly. The (ST-CK) and (CK-SC) were weakly negatively correlated with a value of −0·193. It implied that (ST-CK) and (CK-SC) were oppositely correlated.

Site-wise analysis revealed that the (ST-CK) is almost similar irrespective of the site. The average ± SD for the brain, head, neck, thorax (excluding breast), breast, abdomen, spine mets, multiple mets and pelvis was provided in Table 1.

Discussion

To provide optimal health care, patient satisfaction and related parameters are essential. As per French J et al., waiting times for daily RT are one of the parameters that can significantly impact patient satisfaction.[7] More than expected, WT (waiting time) can make patients irritable and lead to a loss of quality time for the patient as well as the attendants. This study did not consider

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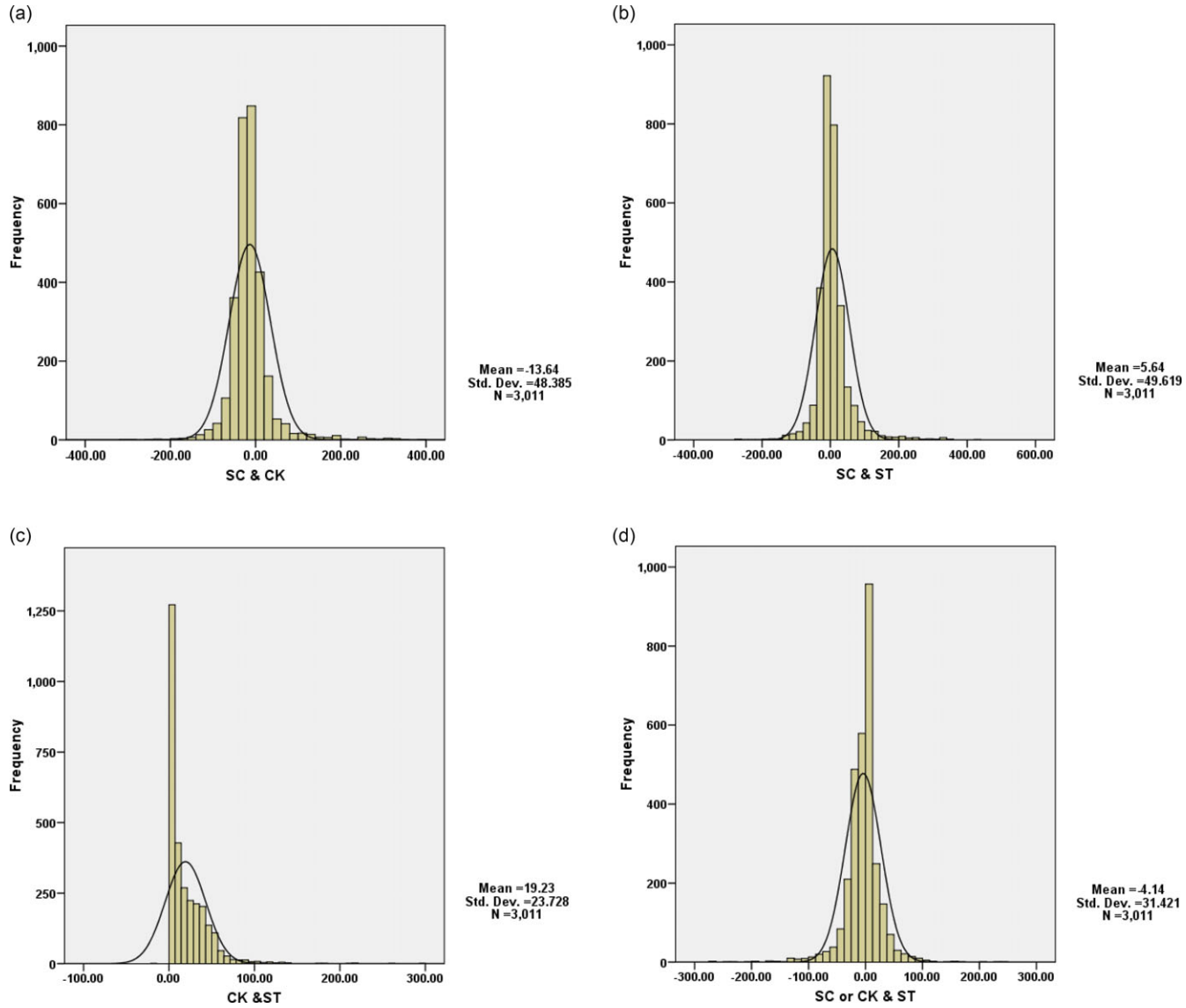

Figure 2. Analysis of (a) frequency plot of the (CK-SC),(b) frequency plot of the (ST-SC), (c) frequency plot of the (ST-CK) and (d) frequency plot of whichever was lower between (ST-SC) and (ST-CK).

patient feedback data; however, patient satisfaction is a very important parameter for evaluating the quality of RT treatment at any hospital.

In 25% of all instances, the patient was late. Departmental staff were being questioned regarding the possible reasons for the delay of patient treatment from the scheduled treatment time to investigate the probable cause. Based on the survey questionnaire, the following result came out. In decreasing order of frequency, the following were the reasons identified: (1) the patient arrived late, (2) the patient arrived at the right time but did not bring the radiosensitiser drug (temozolomide), (3) bladder/rectum volume not matching after set-up imaging, (4) claustrophobic patient, (5) interpreter not available at the time of set-up/treatment, and (6) patient/relative punched the card first at the help desk and left for chemotherapy without informing RT technologist/helpdesk. Similarly, the on-treatment time can be an essential factor for the treating facility and the patient, which was not included in this study.

The strengths of our data were as follows: (1) a large number of observations, (2) all consecutive patients for 1 year and (3) all individual patient timings for all days during the RT course. These data were produced for each patient using an ARIA (V15.1, Varian, Palo Alto, CA, United States) workstation connected to a barcode scanner. These data may not be able to be extrapolated to multi-linac RT centres as the centre that has been used is only a single linac centre. Multi-linac centres have many other reasons that patients could be delayed, including the significantly higher patient load. This can be considered as limitation of our study.

The present study's goal was to determine what was causing the delays by examining and measuring the waiting times associated with daily tasks. It included 181 outpatients that were scheduled for standard treatment.[8] Subsequently, the authors calculated

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Table 1. Table showing the different wait times, categorised by treatment site

Site	Difference between check-in and scheduled time (CK-SC) in min	Difference between start time and scheduled time (ST-SC) in min	Difference between start time and check-in time (ST-CK) in min	(ST-SC) or (ST-CK) whichever lesser in min
Brain	−13·91 ± 48·41	5·21 ± 49·49	19·08 ± 23·50	−4·47 ± 31·29
Head neck	−13·67 ± 48·43	5·43 ± 49·64	19·05 ± 23·78	−4·29 ± 31·54
Thorax	−13·13 ± 49·07	5·52 ± 50·48	18·61 ± 23·32	−4·53 ± 31·58
Breast	−13·75 ± 48·24	5·34 ± 49·43	19·04 ± 23·70	−4·31 ± 31·47
Abdomen	−13·58 ± 50·44	6·8 ± 51·78	20·33 ± 24·67	−3·47 ± 31·91
Spine	−13·54 ± 50·34	5·7 ± 51·86	19·19 ± 23·73	−4·47 ± 31·50
Multiple site	−12·87 ± 50·00	5·91 ± 51·42	18·74 ± 23·52	−4·42 ± 32·13
Pelvis	−13·64 ± 48·49	5·64 ± 49·72	19·235 ± 23·76	−4·17 ± 31·48
Max	−12·87	6·8	20·33	−3·47
Min	−13·91	5·21	18·61	−4·53

The average value of (CK-SC), (ST-SC), (ST-CK), and whichever was lower between (ST-CK) and (ST-SC) were 13.64 ± 48.38 min, 5.64 ± 49.62 min, 19.23 ± 23.73 min and −4.14 ± 31.42 min, respectively. The minimum value for the difference between ST and CK was 1.2 ± 2.17 min for 3DCRT. But 3DCRT consists of only 0.16 % of total fractions of treatment. The most treated modality is rapid arc/VMAT. Hence, the minimum difference between ST and CK for RA was 19.25 ± 23.78 min. The value for the difference between ST and CK for IMRT, RA/VMAT, SBRT and SRT was 13.49 ± 0.59 min, 21.96 ± 26.24 min, 7.65 ± 14.25 min and 21.8 ± 23.74 min, respectively (Table 2).

Table 2. Table showing the different wait times, categorised by a treatment technique

Treatment modality	Difference between check-in and scheduled time (CK-SC) in min	Difference between start time and scheduled time (ST-SC) in min	Difference between start time and check-in time (ST-CK) in min	(ST-SC) or (ST-CK) whichever lesser in min
3DCRT	71·20 ± 64·844	72·4 ± 63·89	1·2 ± 2·17	1·2 ± 2·17
IMRT	−14·71 ± 29·66	−1·18 ± 31·12	13·49 ± 15·59	−5·92 ± 22·62
RA	−13·43 ± 54·72	8·58 ± 55·82	21·96 ± 26·24	−3·33 ± 34·76
SBRT	−3·23 ± 37·27	4·47 ± 30·24	7·65 ± 14·25	−7·17 ± 11·93
SRT	−28·4 ± 27·99	−6·8 ± 6·06	21·8 ± 23·74	−6·8 ± 6·06

WTs (defined as the difference between the scheduled appointment time and the treatment start time, that is, (ST-CK). For various sites and modalities, the waiting time was examined. It was crucial to know whether waiting times vary depending on the site and treatment modalities while treating a variety of patients at a single linac. A widespread belief was that patients on the water protocol must wait longer than other patients.[9] Therefore, dependencies of waiting time on various sites and modalities, if any, were evaluated. Unlike Munshi et al., these data were not divided into two halves, the first day of treatment and the remainder of the treatment period.[10] The treatment session of each patient was included in a single set of daily waiting time data.

In this study, the mean WT ± SD was 19 ± 24 min for 3011 outpatient appointments (OPAs), where WT = (ST-CK) in min. A total of 2262/3011 (75·12%) OPAs were early or on time; however, 749/3011 (24·9%) were delayed by (37·8 ± 58·06 min). The number of instances where the waiting time from check-in to the start of treatment was less than 20 min was 1299(43·13%).

The waiting period for SRS/SRT patients did not deviate significantly from the rest of the modalities of treatment, for example, IMRT, RA and 3DCRT.[11,12] According to Huang et al., patients appear content if they do not have to wait more than 37 min if they arrive on time and 63 min if they arrive late.[13] Patient wait time determination was the interest for this study in a department where the average daily workload per machine is between 15 and 20 patients in a paperless environment. According to Lorentzon et al., patient waiting time is a critical measure for evaluating the overall quality of service provided by a Radiation Oncology department.[14] The first day of the patient's treatment was different to the rest of the days for the following reasons. Patients' first and subsequent days' treatment session waiting times were combined despite the probable chance of long waiting times on the first day compared to the rest of the sessions. However, during the first day of therapy, a certain period (between 2 and 3 pm) was given for SC, distinct from the remainder of the day's SC.

International patients from countries other than India make up about 10% of our radiation oncology patient population. The vast majority of these patients do not speak English and require interpretation services. The reliance on interpreters is a significant factor in the prolonged waiting and treatment times experienced by these patients.

Frequent patient requests came during winter to shift treatment sessions towards noon to avoid fog and cold. Also, heavy rain caused terrible road conditions, impelling patients to come late for their scheduled RT treatment sessions. Seasonal weather patterns influenced wait times at our RT department in this way. Seasonal weather patterns, concurrent chemotherapy schedules, communication difficulties with foreign patients and bladder-

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filling techniques for patients undergoing pelvic RT are all potential factors that could have influenced patient wait times. It should be noted that all of our patients had their vital signs (blood pressure, temperature and pulse) checked daily before being transferred to the treatment area by a designated nurse. This exercise has the potential to increase (ST-CK). The average time to check a patient's vital signs is (2 ± 1) minutes (Average ± Standard deviation). However, because these data were gathered for a minimal number of patients (not all 3011 sessions), it was excluded from the analysis.

It is worth noting that our wait times had no real relationship with the arrival time. One probable explanation is that the concerned technologist made every attempt to accommodate the patients as soon as possible, even if they arrived early or late.

There were also some errors in our data. Given that the centre being used has just one linac, it may not be possible to apply these results to multi-linac radiation centres. In addition to the much larger patient load, there are a number of other factors that could cause patients to be delayed in multi-linac centres. This can be viewed as a study restriction. This study considered neither the duration of treatment nor the time spent on imaging. One reason for the delay in treatment was the time it took to check the patient's vital signs, but a quantitative description and comparison with the total wait time was needed to assess the impact of this wait time on the total waiting time. Mistakes in punching by the patient and the RT technologist can result in data inaccuracies. Every day, all patients visited the nursing station to check their vitals. The nursing station independently checked whether the patient's card had been checked in or not. For this reason, card punching errors would be uncommon.

Conclusion

Most of the patient appointments began treatment within 30 min of their check-in time. In the health care setting, waiting times may be inevitable and provide specific problems in reducing them. On the other hand, waiting times can be effectively handled if the causes of delays have been discovered to improve patient satisfaction. According to our analysis, the main source of treatment delays was an indirect consequence of catching up on previous delays; hence, detecting and minimising initial delays could have a large impact on reducing patient waiting times overall. Continuous monitoring of waiting time is encouraged as part of the patient satisfaction and patient-centred care strategy so that methods can be established to reduce waiting times in similar outpatient clinic settings. To summarise, we have given our findings regarding patient-related RT times. Our research focuses on the everyday wait times for RT. This vast series of consecutive patient data will be a valuable resource for future planners and policymakers.

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Conflicts of interest. There are no conflicts of interest.

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