Failure to attend radiation oncology appointments during COVID-19: Analysis of data from an Australian public hospital

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Abstract

Introduction: COVID-19 has impacted lives worldwide. Public health guidance has advocated for minimisation of infection risk by encouraging social isolation and physical distancing. In response, many health services have changed delivery practices to increased use of telehealth. We undertook an audit of hospital attendance data collected from a radiation oncology service in a large public hospital in Victoria, Australia between January and September in 2019, and the same period in 2020. The aim was to discern the impact of COVID-19 on attendance at appointments and whether attendance rates differed by appointment type.

Methods: Attendance data and appointment type for the two targeted periods (a total of 62,528 appointments for 3383 patients) were extracted from the database maintained by the radiation oncology service. Logistic generalised estimating equation (GEE) models were run with the final model including the COVID-19 period (pre, during) and all patient and appointment characteristics.
Results: Results indicated a small decrease in attendance in 2020 (OR = 1.13, 95% CI 1.01–1.25, $P = 0.026$) with this predominantly reported for the non-treatment appointments, which consisted of follow-up appointments, nurse appointments, and treatment review appointments.
Conclusion: Attendance for radiation oncology treatment was largely unaffected by COVID-19 although other services experienced slight reductions. Changes to work practices, specifically the increased use of telehealth, may have moderated the impact. Given the focus on one service in one location, it is not possible to generalise these results and future research should closely monitor both patient and staff satisfaction with services delivered via modified processes.

Key words: failure to attend; OVID-19; radiation oncology; telehealth.

Introduction

COVID-19 impacted countries worldwide including Australia, although the impact varied widely across jurisdictions. In Australia, Victoria was particularly affected, with the state government instituting a State of Emergency on the 16 March 2020 that resulted in powers to constrain individual movement. Subsequent to this, six lockdowns were implemented, with the extent and nature of these varying over time. Melbourne, the capital city, experienced a total of 263 days of lockdown up until the 21 October 2021.

COVID-19 presents a significant health threat, especially to cancer patients. A major strategy for any health care institution was implementation of robust infection and environmental controls in the fight against COVID-19.[1] In health care, hand sanitising, mask use, and physical distancing were implemented as well as increasing use of modified appointment protocols incorporating active patient flow management, telephone and

telehealth consultation (i.e., services delivered by computer video chat) for cancer services where physical examination was not required, including consultation in radiation oncology departments.[2] Workflow adjustments have been rapid, including in Australia, where changes that would typically have been implemented over years have been condensed into weeks.[3] Adjustments to the manner in which patients' appointments are timetabled and completed (i.e., patient flow) are exemplified in the report of practices in Germany,[4] in which careful management of patient movements, together with minimised time in clinic resulted in sustained clinical excellence and no reported COVID-19 diagnoses in 2020.

Clinical research data also confirm that some components of a quality radiation oncology service can be delivered via telephone or telehealth. Results establishing this have been obtained in radiation medicine services in Canada[5] and Singapore,[6] although data from other locations, including the US, report reduced case numbers (decreased by 32% on average) and revenue reduction of at least 20% among 71% of services offering radiation oncology during COVID-19.[7]

Research examining the impact of these changes on patient outcomes has been reported as positive, with one Italian study reporting that change in physical patient flow and increased use of telephone and telehealth appointments for some types of appointments, was associated with similar patient outcomes in 2020 compared with those before the virus.[8] Moreover, assessment in Victoria, Australia of radiation oncology staff responsiveness to the changes to work practices and patient flow during COVID-19 has confirmed high levels of staff satisfaction with the changes.[9]

Notwithstanding the widespread efforts by cancer services to mitigate the risk of potential patient exposure to COVID-19 while attending radiation oncology and other cancer services,[9] the impact of the pandemic on patient attitudes to their treatment and comfort when attending appointments potentially remains a barrier to effective treatment and requires further examination.[10] Additionally, patient concern about various aspects of treatment and support via telehealth during COVID-19, is an important matter for research. For example, Orazem et al.[11] surveyed patients (n = 468) attending a comprehensive cancer centre in Slovenia over a 2-week period in May and June of 2020. Eight percent of this sample reported that they had thought about skipping a face to face appointment during COVID-19 although data on the percentage actually missing an appointment were not presented. Patients indicated a desire for video consultations (15%), although these were not offered, with 92.6% of patients who had a phone consultation with their oncologist indicating they were pleased with the appointment.

In summary, research to date suggests that radiation oncology services have successfully adapted their protocols overall, although data on patient response to attendance for different components of services remains unclear. The aim of this study was to investigate if appointment attendance rates in a large radiation oncology service in Victoria, Australia changed during the COVID-19 compared with the period prior to the pandemic, and whether patient or appointment characteristics influenced failure to attend.

Methods

Design and setting

Appointment data from a public radiation oncology service in a large general hospital in Melbourne, Victoria, Australia were accessed to examine attendance prior to, and during the COVID-19 pandemic. Approval for the extraction of audit data was provided by Austin Health Human Ethics Committee (Audit/20/Austin/68). Patient and appointment details for the months January to September in 2019 and 2020 were extracted from Mosaiq™ (Elekta, Stockholm, Sweden), a commercial record and verification database that is used to store all patient data and treatment records in a single location. It is important to note that in response to the pandemic, this service instituted changes to work practices, including the introduction of telehealth services in March 2020, details of which are available elsewhere.[8] Appointments in 2019 were classified as Pre-COVID-19, and in 2020 as During COVID-19.

Participants

All patients who had a radiation oncology appointment during the study period in 2019 and 2020 (n = 3383) were included in the study.

Appointments

An appointment was defined as a billable procedure with a health practitioner, where the patient was required to attend, resulting in some patients having multiple appointments in 1 day, such as consultation and treatment. For each appointment, failure to attend was identified if the patient did not arrive, or the appointment was moved or cancelled by the patient or clinic. Appointments were described by day of the week, calendar month, and in person or remotely by telephone or telehealth. Appointments were also categorised by type: allied health, follow-up, new consultation, nurse, radiation planning, radiation treatment, or treatment review.

Patient demographics

Age was categorised as <40, 40–59, 60–79, and ≥80 years. A patient's social economic status (SES) was calculated from home postcode using the Index of

Relative Socio-economic Disadvantage (population mean = 1000, standard deviation = 100). This score was derived from the Australian Bureau of Statistics census-based local neighbourhood Socio-Economic Index for Areas (SEIFA). SEIFA values were analysed using categories determined by the quintiles in the distribution of the general population; higher values represent greater advantage. Postcode was also used to identify if a patient lived in an urban or rural area, and in Victoria or another state.

Statistical analysis

The main aim was to compare the risk of failure to attend appointments in the period During-COVID-19 (year 2020) versus the period Pre-COVID-19 (year 2019). In what follows we refer to this comparison as the 'COVID-19 effect'. Failure to attend was defined as a situation where the patient and their health service professionals did not have contact in the scheduled time, either face to face or via telehealth. Logistic generalised estimating equation (GEE) models with robust standard errors to account for multiple appointments for each patient were used to estimate (i) the 'COVID-19 effect' on the risk of failure to attend; and (ii) whether the 'COVID-19 effect' was modified by patient or appointment characteristics. Initially, we fit univariate models to estimate the 'COVID-19 effect', and assess whether patient and appointment characteristics were associated with risk of failure to attend an appointment. We then fit a multivariate model including the COVID-19 period (pre, during) and all patient and appointment characteristics, retaining only those covariates statistically associated with failure to attend. Finally, we added to this model an interaction between COVID-19 period and each covariate. The final multivariate model was used to estimate the risk of failure to attend an appointment pre- and during-COVID-19 for each appointment type, at the mean values of all other covariate values. For measures with multiple categories, a joint test of significance is also reported. All statistical analyses were performed using Stata 17 (Stata Corp, LLC, College Station, TX, USA).

Results

Failure to attend and year

We extracted 62,528 appointments for 3383 patients from the database. Of these, 497 (0.8%) appointments from 39 (1.2%) patients were deemed ineligible for inclusion because the patient was not required to attend. Of the 62,031 eligible appointments for 3344 patients, we further excluded 784 appointments that occurred in the first week of January and 33 Saturday appointments because these were not routine times when the clinic was open, resulting in an analysis dataset with 61,214 (98.7%) appointments for 3328 (99.5%) patients.

Table 1. Patient demographic and appointment characteristics by period

Characteristic	Period[†]			
	Pre-COVID-19, 2019 (*n* = 2181 patients)		During-COVID-19, 2020 (*n* = 2234 patients)	
	n	%	*n*	%
Demographic				
Age (years)				
<40	75	3.4	65	2.9
40–59	473	21.7	500	22.4
60–79	1,229	56.4	1,279	57.3
≥80	404	18.5	390	17.5
Mean (SD) age (years)	68.1	13.3	67.8	13.1
Mean (SD) SES	1023.6	65.5	1024.2	65.6
SES quintiles				
1 most disadvantaged	180	8.3	189	8.5
2	314	14.4	306	13.7
3	261	12.0	266	11.9
4	501	23.0	527	23.6
5 least disadvantaged	925	42.4	946	42.3
Rural	235	10.8	247	11.1
Live out of Victoria	19	0.9	29	1.3
Appointments	Mean	SD	Mean	SD
Mean (SD) number of days[†]	8.9	11.4	8.1	11.0
Mean (SD) number of appointments[§]	14.7	21.3	13.0	19.8

SES: Socio-economic status measured using the Index of Relative Socio-economic Disadvantage.

[†]Period: 7 January 2019–30 September 2019, 6 January 2020–30 September 2020.

[‡]Number of days in the year where patient had one or more appointment.

[§]Number of appointments in the year.

Pre-COVID-19, in 2019, 2181 patients had appointments. During-COVID-19, in 2020, 2234 patients had appointments, with 32.7% (*n* = 1087) of patients in the study having appointments in both years. Patient characteristics and appointment characteristics by year are shown in Tables 1 and 2 respectively.

The overall risk of failure to attend was low in both years: 8.71% (95%CI 8.40%–9.03%) in 2019 and 8.87% (95%CI 8.54%–9.20%) in 2020. After accounting for clustering, there was some evidence that patients were more likely to fail to attend appointments in 2020 compared with 2019 (OR = 1.13, 95% CI 1.01–1.25, *P* = 0.026; Table 3).

Factors associated with failure to attend

Several patient and appointment characteristics were associated with failure to attend (Table 3). Only one characteristic, type of appointment, was found to moderate the 'COVID-19 effect' and retained in the final model. In this model, risk of failure to attend was lower if appointment was by telehealth (OR = 0.54, 95% CI

Table 2. Radiation oncology appointment characteristics by period

Appointment characteristic	Period[†]			
	Pre-COVID-19, 2019 (n = 32,089 appointments by 2181 patients)		During-COVID-19, 2020 (n = 29,125 appointments by 2234 patients)	
	n	%	n	%
Day of the week				
Monday	6326	19.7	5742	19.7
Tuesday	6581	20.5	5931	20.4
Wednesday	7398	23.1	6675	22.9
Thursday	7236	22.5	6603	22.7
Friday	4548	14.2	4174	14.3
Total	32,089	100	29,125	100
Calendar month				
January	3338	10.4	3175	10.9
February	3270	10.2	3473	11.9
March	3215	10.0	3830	13.2
April	3566	11.1	3197	11.0
May	4119	12.8	3065	10.5
June	3212	10.0	3413	11.7
July	3829	11.9	3325	11.4
August	3775	11.8	2637	9.1
September	3765	11.7	3010	10.3
Total				
Telehealth	174	0.5	4340	14.9
Face to Face	31,915	99.4	24,785	85.1
Total	32,089	100	29,125	100
Type				
Allied health	1107	3.4	1010	3.5
Follow-up	3886	12.1	4331	14.9
New consultation	1027	3.2	996	3.4
Nurse	9057	28.2	8,051	27.6
Radiation planning	1259	3.9	1137	3.9
Radiation treatment	13,775	42.9	11,872	40.8
Treatment review	1978	6.2	1728	5.9
Total	32,089	100	29,125	100

[†]Periods: 7 January 2019—30 September 2019, 6 January 2020–30 September 2020.

0.48–0.60), and higher if the patient was 80 years old or older (OR = 1.27, 95% CI 1.13–1.42) or lived in an area with high socio-economic disadvantage (OR = 1.24, 95% CI 1.11–1.38) (See Table 3, Final Model).

Only one characteristic type of appointment was found to moderate the 'COVID-19 effect'. Figure 1 shows the estimated risk of failure to attend by period and appointment type. Risk of failure to attend was significantly higher in 2020 compared with 2019 for follow-up appointments (difference in risk: 3.1%, 95% CI 0.7%–5.4%); nurse appointments (2.0%, 95% CI 0.8%–3.2%); and treatment review appointments (3.6%, 95% CI 1.1%–6.0%).

Discussion

In the current study, there was a small, significant increase in the proportion of some types of radiation oncology service appointments that patients failed to attend during COVID-19. This is similar to another international study of patients receiving radiotherapy treatment where there was a 20% reduction in radiation oncology services in the first wave of COVID-19[12] although much smaller.

It is important to note that key appointment characteristics were found to consistently predict failure to attend radiation oncology services, regardless of the presence of COVID-19 in the community. Patterns of associations across both years indicated reduced risk of non-attendance for telehealth versus face to face consultations, and increased risk of non-attendance if the patient was 80 years or older or lived in an area with higher socio-economic disadvantage. This finding is likely to reflect the difficulties of travel to the hospital for specific groups within the population and highlights the need to develop further alternative approaches to service delivery, regardless of the COVID-19 situation. Type of appointment was also predictive of failure to attend in both years. Unsurprisingly, treatment appointments were less likely to be missed in either year. Future research might examine how the nature of service delivery varies between face-to-face and telehealth appointments, and whether specific training is required to optimise service delivery remotely.

The impact of COVID-19 was not uniform across type of appointment. Follow-up appointments, nurse appointments, and treatment review appointments were the most affected. It is possible that patients who failed to attend estimated that the risk of missing these appointments was outweighed by the risk of attending hospital appointments during the COVID-19 pandemic, an interpretation consistent with that of researchers reporting non-attendance for nuclear-medicine examination during COVID-19.[13] It is likely that patients viewed non-treatment appointments as less critical than treatment appointments. Certainly, public health messaging encouraged people to stay within their local area and minimise attendance at health facilities where COVID-19 patients might be in attendance. Moreover, the radiation oncology service that forms the focus of the current study is located in Melbourne, Victoria, and during the pandemic, the state government in this jurisdiction restricted travel to within 5 kms of the home for significant periods of time, although exemptions were granted for health appointments. Research has confirmed that public health messaging impacted perceived risk of COVID-19 in the general population although responses to the physical distancing guidance was found to vary by political stance (e.g., ref. 14). Further research should examine the extent to which public health messaging impacted attitude to risk among those diagnosed with cancer.

In light of the high burden of COVID-19, further changes were implemented throughout 2021 by the service. These included carer attendance restrictions,

Table 3. Estimated risk of failure to attend radiation oncology appointment (61,214 appointments for 3328 patients)

| Measures	Univariable models[†]			Multivariable model[‡]					
				Without interaction			Final model with interaction		
	OR	95% CI	*P*-value	OR	95% CI	*P*-value	OR	95% CI	*P*-value
During-COVID19 period[§]	1.13	1.01–1.25	0.026	1.17	1.06–1.30	0.002	1.06	0.85–1.32	0.627
Aged ≥80 years	1.46	1.28–1.67	<0.001	1.27	1.13–1.42	<0.001	1.27	1.13–1.43	<0.001
Disadvantaged[¶]	1.21	1.07–1.37	0.002	1.24	1.11–1.38	<0.001	1.24	1.11–1.38	<0.001
Telehealth appointment	1.26	1.16–1.38	<0.001	0.54	0.48–0.60	<0.001	0.54	0.48–0.61	<0.001
Type of appointment									
Allied health	2.66	2.29–3.08	<0.001**	2.95	2.53–3.42	<0.001**	2.99	2.41–3.71	<0.001**
Follow-up	5.81	5.19–6.49		6.92	6.14–7.79		6.57	5.57–7.76	
New consultation	1.98	1.65–2.37		2.31	1.92–2.77		2.47	1.93–3.16	
Nurse	1.72	1.59–1.87		1.75	1.61–1.90		1.58	1.41–1.77	
Radiation planning	2.40	2.04–2.82		2.41	2.05–2.83		2.37	1.87–2.99	
Radiation treatment (reference)	1.00			1.00			1.00		
Treatment review	2.64	2.34–2.97		2.94	2.60–3.33		2.61	2.19–3.11	
Interaction									
During-COVID19 × Allied health							0.95	0.71–1.28	0.017**
During-COVID19 × Follow-up							1.11	0.87–1.41	
During-COVID19 × New consultation							0.84	0.58–1.22	
During-COVID19 × Nurse meeting							1.23	1.04–1.46	
During-COVID19 × Radiation planning							1.04	0.75–1.44	
During-COVID19 × Treatment review							1.29	1.00–1.65	

†Each measure fitted separately unadjusted for any covariates.

‡All measures fitted jointly.

§During-COVID-19 appointments: 6 January 2020–30 September 2020; Pre-COVID-19 appointments (reference category): 7 January 2019 to 30 September 2019.

¶Disadvantaged was defined as score in the lowest 2 quintiles of the Index of Relative Socio-economic Disadvantage.

**P-value from joint test of significance.
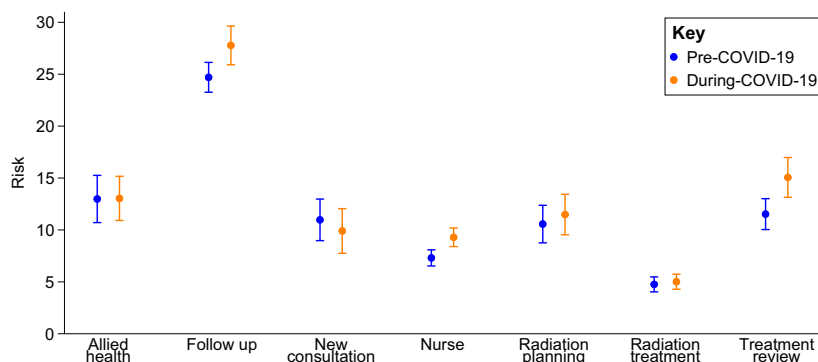
Fig. 1. Estimated risk of failure of failure to attend by type of appointment and period with 95% confidence intervals.

implementation of increasing personal protective equipment for patients and staff (from surgical masks to N95 masks and face shields for staff and N95 masks for patients). Twice weekly, rapid antigen testing was instituted in late 2021 for all patients and visiting carers.

There are several limitations to the data reported here that should be noted. Data are only reported for a 9-month period in both years, reflecting the time of the rollout of changed practices. While this represents only a 7-month period of a 24-month pandemic, it reflects the time of greatest change to the delivery of health care services and a time of extended government restrictions on citizens movements and activities. It also reflects a time period when no COVID-19 vaccines were available in Australia. Another limitation is that the database did not include reason for non-attendance. Moreover, the patients' perceptions of the acceptability of radiation oncology services received during COVID-19 were not examined, and such information is critical to future decision-making around health service workflow

management in times of pandemic. Additionally, data were collected from one service operating in one location in Victoria, Australia, Even though this is a large service, generalizability is problematic.

It is also important to note that data on patient satisfaction with changes to appointment practices in radiation oncology were not collected. It is critical that the patients' perspectives are captured because these could also influence treatment adherence and outcomes. Recent data suggest that telehealth appointments during COVID-19 were reported to be as appropriate as traditional in-person medical appointments.[15] Moreover, professional guidelines clearly describe best practice in telehealth delivery, thereby facilitating transfer of services, where appropriate.[16] Integrating telehealth into routine practice can potentially reduce the impact of inefficiencies in the delivery of cancer care for patients.[17]

In the context of radiation oncology appointments, the data are even more encouraging. A US study[18] that compared the patient experience of a radiation oncology appointment between those seen in the office ($n = 726$) versus those seen via telemedicine ($n = 351$) indicated largely comparable experiences, with confidence in their doctor, understanding of their treatment plan, and confidence in the treatment, better or no different for telemedicine patients. It is important to note that these data were not collected during COVID-19.

In conclusion, the data presented here are encouraging because they suggest a very low level of failure to attend appointments at a radiation oncology service during COVID-19. The implications for practice are important to consider; telehealth is acceptable to patients for those appointments for which it is appropriate and deemed important, and both staff and patients can adapt to service changes that are rolled-out quickly. The extent to which these results are replicated in other health settings, where the prevalence of the COVID-19 transmission was greater, is unknown, requiring further research. It is likely that increasing familiarity and comfort with new services received via telehealth and telephone will lead to even fewer failures to attend for all forms of health consultation in the future, regardless of pandemic status.

Acknowledgements

Data availability statement

The data that support the findings of this study are available from Austin Health. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the authors at the ONJ Centre with the permission of Austin Health.

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