

Appendix II

Prioritizing delivery of cancer treatment during a COVID19 lockdown - the experience of a clinical oncology service in India.

Patient Number on machine during the lockdown period	2
Priority group-wise patient population planned for RT during the lockdown	2
Radiotherapy Treatment Delivery Problems	5
Multivariable Logistic Regression Modelling	6
Results of Multivariable Modelling of Factors predicting Radiotherapy Protocol deviations	7
Results of Multivariable Modelling of Factors predicting Systemic Chemotherapy Protocol deviations	9

Patient Number on machine during the lockdown period

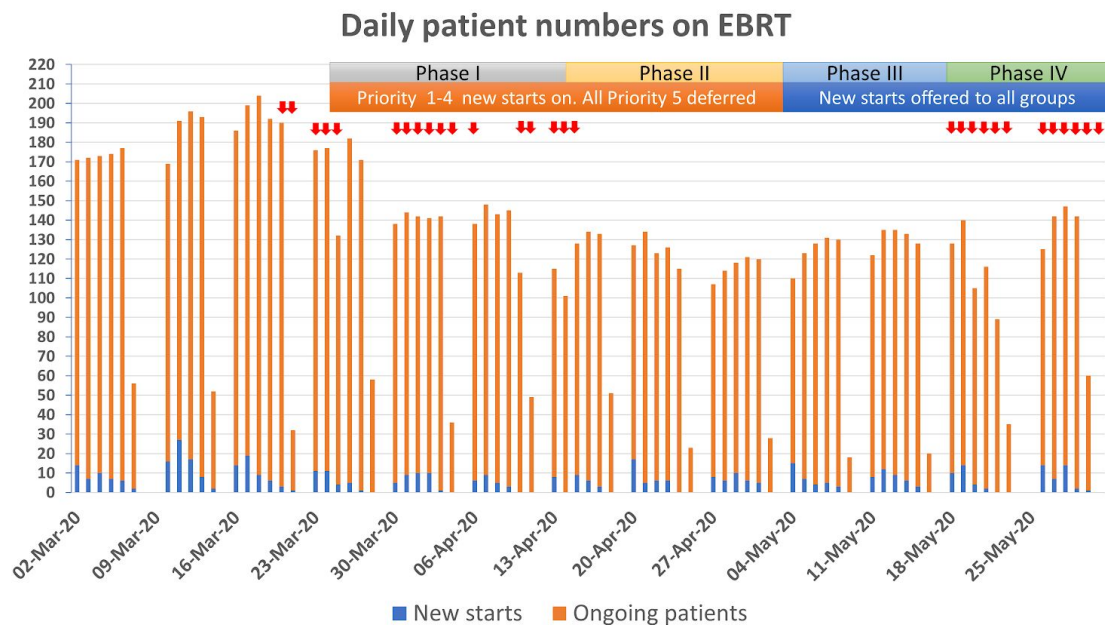


Figure 1: Figure: Daily patient numbers on external beam RT and treatment downtime.

(Legend - the blue and orange stacked bars represent new treatment starts and ongoing patients respectively. The red arrows represent days when a full day downtime affected at least one of our four linear accelerators. The panels represent the phases of lockdown and our treatment start policy)

Priority group-wise patient population planned for RT during the lockdown

Table 1: Patient characteristics and treatment techniques utilized in patients who were scheduled to radiotherapy during the lockdown period

Priority Levels	1 (N=126)	2 (N=18)	3 (N=14)	4 (N=46)	5 (N=101)	Total (N=305)
Cancer Site						
CNS	12 (9.5%)	0 (0.0%)	0 (0.0%)	1 (2.2%)	7 (6.9%)	20 (6.6%)
Head Neck	63 (50.0%)	0 (0.0%)	0 (0.0%)	7 (15.2%)	0 (0.0%)	70 (23.0%)
Lung	20 (15.9%)	9 (50.0%)	0 (0.0%)	22 (47.8%)	0 (0.0%)	51 (16.7%)
Breast	0 (0.0%)	4 (22.2%)	0 (0.0%)	5 (10.9%)	72 (71.3%)	81 (26.6%)

Upper GI Tract	7 (5.6%)	0 (0.0%)	1 (7.1%)	2 (4.3%)	0 (0.0%)	10 (3.3%)
Lower GI Tract	1 (0.8%)	0 (0.0%)	11 (78.6%)	1 (2.2%)	0 (0.0%)	13 (4.3%)
Hepatobiliary System	0 (0.0%)	0 (0.0%)	2 (14.3%)	1 (2.2%)	0 (0.0%)	3 (1.0%)
Male Genital System	0 (0.0%)	1 (5.6%)	0 (0.0%)	0 (0.0%)	10 (9.9%)	11 (3.6%)
Female Genital System	10 (7.9%)	1 (5.6%)	0 (0.0%)	1 (2.2%)	5 (5.0%)	17 (5.6%)
Urinary System	0 (0.0%)	2 (11.1%)	0 (0.0%)	3 (6.5%)	3 (3.0%)	8 (2.6%)
Hematolymphoid	11 (8.7%)	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	12 (3.9%)
Sarcomas	0 (0.0%)	1 (5.6%)	0 (0.0%)	2 (4.3%)	4 (4.0%)	7 (2.3%)
Miscellaneous	2 (1.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.7%)
Stage Group						
Stage I-II	30 (23.8%)	0 (0.0%)	1 (7.1%)	1 (2.2%)	32 (31.7%)	64 (21.0%)
Stage III-IV	76 (60.3%)	17 (94.4%)	13 (92.9%)	41 (89.1%)	55 (54.5%)	202 (66.2%)
Not Staged as per AJCC	20 (15.9%)	1 (5.6%)	0 (0.0%)	4 (8.7%)	14 (13.9%)	39 (12.8%)
Radiotherapy Technique Used						
3DCRT	29 (25.4%)	4 (22.2%)	11 (84.6%)	9 (22.0%)	48 (63.2%)	101 (38.5%)
IMRT / VMAT / Tomotherapy	83 (72.8%)	0 (0.0%)	2 (15.4%)	1 (2.4%)	27 (35.5%)	113 (43.1%)
Conventional (palliative)	0 (0.0%)	14 (77.8%)	0 (0.0%)	30 (73.2%)	0 (0.0%)	44 (16.8%)
TBI	1 (0.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.4%)

SRS/SRT	1 (0.9%)	0 (0.0%)	0 (0.0%)	1 (2.4%)	1 (1.3%)	3 (1.1%)
---------	----------	----------	----------	----------	----------	----------

Radiotherapy Treatment Delivery Problems

Table 2: Showing the results of radiation delivery in patients treated during the lockdown period

	1 (N=214)	2 (N=19)	3 (N=29)	4 (N=48)	5 (N=119)	Total (N=429)
Radiation Break or Interruption						
Yes	3 (1.4%)	0 (0.0%)	0 (0.0%)	1 (2.1%)	4 (3.4%)	8 (1.9%)
Duration						
Median (days)	2	NA	NA	1	3.5	2.5
Reason for Radiation Break						
Toxicity	1 (33.3%)	0	0	0 (0.0%)	0 (0.0%)	1 (12.5%)
Patient unable to come	1 (33.3%)	0	0	0 (0.0%)	3 (75.0%)	4 (50.0%)
Physician Recommended	1 (33.3%)	0	0	1 (100.0%)	0 (0.0%)	2 (25.0%)
Equipment Breakdown	0 (0.0%)	0	0	0 (0.0%)	1 (25.0%)	1 (12.5%)
Radiation Incomplete						
n	2 (0.9%)	0 (0.0%)	0 (0.0%)	2 (4.2%)	2 (1.7%)	6 (1.4%)
Ongoing RT after 31st May	48 (22.4%)	0 (0.0%)	3 (10.3%)	1 (2.1%)	34 (28.6%)	86 (20.0%)
Reason why radiation incomplete						
Disease Progression	0 (0.0%)	0	0	1 (50.0%)	0 (0.0%)	1 (16.7%)
Patient unable to come	0 (0.0%)	0	0	1 (50.0%)	1 (50.0%)	2 (33.3%)
Physician Recommended	0 (0.0%)	0	0	0 (0.0%)	1 (50.0%)	1 (16.7%)
Patient Died	2 (100.0%)	0	0	0 (0.0%)	0 (0.0%)	2 (33.3%)
Overall Treatment Time Prolonged by more than 3 days						
n	5 (3.0%)	0 (0.0%)	1 (3.8%)	1 (2.2%)	7 (8.4%)	14 (4.2%)

Multivariable Logistic Regression Modelling

The objective of the logistic regression modelling was to evaluate the factors which predicted a deviation for the pre-COVID treatment protocol. We considered several factors that could result in such a deviation. For radiotherapy and systemic chemotherapy different deviations were considered.

For radiotherapy, the protocol deviations considered were:

1. Radiation indicated but not started
2. Radiation indicated and started but with deferral
3. Priority level 1 patients starting RT more than 6 weeks after surgery / last day of chemotherapy
4. Patients with OTT > 3 days over the planned duration of RT.
5. Patients whose treatment was not completed.

The predictor factors assessed were age, gender, stage, comorbidities, and priority levels.

For chemotherapy, the protocol deviations considered were:

1. Chemotherapy deferral
2. Any change in chemotherapy schedule in terms of drug dose or interval modifications
3. Chemotherapy incomplete

The predictor factors assessed were age, gender, comorbidities, cancer site, and chemotherapy intent.

Multivariate analysis was done using logistic regression, where the presence of any deviation was considered as the independent variable. Model predictors were added linearly and no interactions were assumed. Odds ratios, 95% confidence intervals, and p values are presented. A p-value of <0.05 is considered statistically significant.

Results of Multivariable Modelling of Factors predicting Radiotherapy Protocol deviations

Table 3: Showing univariate analysis of factors predicting deviation from radiotherapy protocol.

Protocol Deviation	No (N=119)	Yes (N=68)	Total (N=187)	p value
Age				0.375
Mean (SD)	55.487 (15.717)	53.441 (14.022)	54.743 (15.116)	
Range	8.000 - 84.000	6.000 - 77.000	6.000 - 84.000	
Gender				0.002
Male	72 (60.5%)	25 (36.8%)	97 (51.9%)	
Female	47 (39.5%)	43 (63.2%)	90 (48.1%)	
Comorbidities				0.956
Yes	60 (50.4%)	34 (50.0%)	94 (50.3%)	
No	59 (49.6%)	34 (50.0%)	93 (49.7%)	
Stage Group				0.953
Stage I-II	21 (17.6%)	12 (17.6%)	33 (17.6%)	
Stage III-IV	84 (70.6%)	49 (72.1%)	133 (71.1%)	
Unstaged	14 (11.8%)	7 (10.3%)	21 (11.2%)	
Priority Level				< 0.001
1	48 (40.3%)	23 (33.8%)	71 (38.0%)	
2	17 (14.3%)	1 (1.5%)	18 (9.6%)	
3	8 (6.7%)	3 (4.4%)	11 (5.9%)	
4	32 (26.9%)	9 (13.2%)	41 (21.9%)	
5	14 (11.8%)	32 (47.1%)	46 (24.6%)	

Table 4: Showing the results of the logistic regression for radiotherapy protocol deviation. CI = Confidence intervals, Unstaged = Not staged as per AJCC staging system

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Age	1.09	0.67	1.77	0.73
Gender: Female (vs Male)	1.58	0.69	3.59	0.28

Comorbidities: No (vs Yes)	1.02	0.50	20.9	0.95
Stage: Stage I-II (vs Stage III-IV)	0.42	0.17	1.07	0.07
Stage: Stage Unstaged (vs Stage III-IV)	0.84	0.25	2.79	0.33
Priority Level: 2 (vs 1)	0.09	0.01	0.71	0.02
Priority Level: 3 (vs 1)	0.67	0.16	2.86	0.59
Priority Level: 4 (vs 1)	0.49	0.20	1.24	0.13
Priority Level: 5 (vs 1)	4.08	1.56	10.67	0.004

Results of Multivariable Modelling of Factors predicting Systemic Chemotherapy Protocol deviations

Table 5: Showing the univariate analysis of factors affecting deviations from the pre-COVID protocol for chemotherapy

	No (N=98)	Yes (N=121)	Total (N=219)	p value
Age				< 0.001
Mean (SD)	47.663 (14.198)	58.107 (11.196)	53.434 (13.630)	
Range	8.000 - 73.000	16.000 - 78.000	8.000 - 78.000	
Gender				0.016
Male	44 (44.9%)	74 (61.2%)	118 (53.9%)	
Female	54 (55.1%)	47 (38.8%)	101 (46.1%)	
Comorbidities				0.001
Yes	46 (46.9%)	83 (68.6%)	129 (58.9%)	
No	52 (53.1%)	38 (31.4%)	90 (41.1%)	
Cancer Site				0.023
Breast	40 (40.8%)	30 (24.8%)	70 (32.0%)	
CNS	12 (12.2%)	10 (8.3%)	22 (10.0%)	
GI	5 (5.1%)	12 (9.9%)	17 (7.8%)	
Head Neck	10 (10.2%)	15 (12.4%)	25 (11.4%)	
Lung	20 (20.4%)	45 (37.2%)	65 (29.7%)	
Others	11 (11.2%)	9 (7.4%)	20 (9.1%)	
Systemic Therapy Intent				< 0.001
Curative	58 (59.2%)	37 (30.6%)	95 (43.4%)	
Palliative	40 (40.8%)	84 (69.4%)	124 (56.6%)	

Table 6: Showing the results of the logistic regression for chemotherapy protocol deviation. CI = Confidence intervals, Unstaged = Not staged as per AJCC staging system. This does not include concurrent chemotherapy.

Variable	Odds Ratio	Lower 95% CI	Upper 95% CI	P-value
Age	3.16	1.74	5.75	< 0.01
Gender: Female (vs Male)	1.31	0.51	3.35	0.57
Comorbidities: No (vs Yes)	0.70	0.36	1.39	0.31
Site Group: CNS (vs. Breast)	3.23	0.82	12.72	0.09
Site Group: GI (vs. Breast)	1.80	0.44	7.26	0.41
Site Group: HN (vs. Breast)	2.71	0.72	10.15	0.14
Site Group: Lung (vs. Breast)	1.26	0.41	3.85	0.69
Site Group: Others (vs. Breast)	0.80	0.21	3.11	0.75
Treatment Intent: Palliative (vs. Palliative)	2.79	1.34	5.82	< 0.01

