



Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com



COVID-19 Rapid Communication

COVID-19 outbreak and cancer radiotherapy disruption in Italy: Survey endorsed by the Italian Association of Radiotherapy and Clinical Oncology (AIRO) [☆]



Barbara Alicja Jereczek-Fossa ^{a,b,1}, Matteo Pepa ^{a,1}, Giulia Marvaso ^{a,b,*}, Alessio Bruni ^c, Michela Buglione di Monale e Bastia ^d, Gianpiero Catalano ^e, Andrea Riccardo Filippi ^f, Pierfrancesco Franco ^g, Maria Antonietta Gambacorta ^h, Domenico Genovesi ⁱ, Giuseppe Iatì ^j, Alessandro Magli ^k, Luigi Marafioti ^l, Icro Meattini ^{m,n}, Anna Merlotti ^o, Marcello Mignogna ^p, Daniela Musio ^q, Roberto Pacelli ^r, Stefano Pergolizzi ^j, Vincenzo Tombolini ^q, Marco Trovò ^k, Umberto Ricardi ^g, Stefano Maria Magrini ^d, Renzo Corvò ^{s,t}, Vittorio Donato ^{u,v}, on behalf of the AIRO (Italian Association of Radiotherapy and Clinical Oncology)

^a Division of Radiation Oncology, IEO, European Institute of Oncology, IRCCS; ^b Department of Oncology and Hemato-Oncology, University of Milan, Milano; ^c Radiotherapy Unit, Department of Oncology and Haematology, University Hospital of Modena, Modena, Italy; ^d Department of Radiation Oncology, University and Spedali Civili Hospital, Brescia; ^e Radiation Oncology Center, IRCCS Ospedale Multimedica, Sesto San Giovanni/Castellanza; ^f Department of Radiation Oncology, Fondazione IRCCS Policlinico San Matteo and University of Pavia, Pavia, Italy; ^g Department of Oncology, University of Turin, Torino; ^h Department of Radiation Oncology, Università Cattolica del Sacro Cuore, Roma; ⁱ Radiation Oncology Unit, "SS Annunziata" Hospital, "G. D'Annunzio" University, Chieti; ^j Radiation Oncology Unit – Department of Biomedical, Dental Science and Morphological and Functional Images, University of Messina, Messina, Italy; ^k Department of Radiation Oncology, Udine General Hospital, Udine, Italy; ^l Division of Radiotherapy, Azienda Ospedaliera di Cosenza, Cosenza, Italy; ^m Radiation Oncology Unit, Oncology Department, Azienda Ospedaliera Universitaria Careggi; ⁿ Department of Experimental and Clinical Biomedical Sciences "M. Serio", University of Florence, Firenze; ^o Department of Radiation Oncology, S. Croce and Carle Teaching Hospital, Cuneo; ^p Radiation Oncology Unit, S. Luca Hospital, Healthcare Company Tuscany Nord Ovest, Lucca, Italy; ^q Department of Radiotherapy, Policlinico Umberto I "Sapienza" University of Rome, Roma, Italy; ^r Department of Advanced Biomedical Sciences, Federico II University, Napoli, Italy; ^s Department of Radiation Oncology, IRCCS Ospedale Policlinico San Martino, Genova, Italy; ^t Health Science Department (DISSAL), University of Genoa, Genova, Italy; ^u Radiation Oncology Division, Oncology and Speciality Medicine Department, San Camillo-Forlanini Hospital, Roma; and ^v President of AIRO (Italian Association of Radiotherapy and Clinical Oncology), Italy

ARTICLE INFO

Article history:

Received 27 April 2020

Received in revised form 30 April 2020

Accepted 30 April 2020

Available online 12 May 2020

Keywords:

COVID-19

Italy

Survey

Radiation oncology

AIRO (Italian Association of Radiotherapy and Clinical Oncology)

ABSTRACT

Italy experienced one of the world's deadliest COVID-19 outbreaks and healthcare systems had to instantly reorganise activity. The Italian Radiation Oncology Departments adapted numerous solutions to minimize the disruptions. Information technologies, treatment prioritization and implementation of hypofractionation and protection procedures allowed balancing between cancer patient care and patient/healthcare workers safety.

© 2020 Elsevier B.V. All rights reserved. Radiotherapy and Oncology xxx (2020) xxx–xxx

[☆] The Editors of the Journal, the Publisher and the European Society for Radiotherapy and Oncology (ESTRO) cannot take responsibility for the statements or opinions expressed by the authors of these articles. Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds or experiments described herein. Because of rapid advances in the medical sciences, in particular, independent verification of diagnoses and drug dosages should be made. For more information see the editorial "Radiotherapy & Oncology during the COVID-19 pandemic", Vol. 146, 2020.

* Corresponding author at: Division of Radiation Oncology, IEO European Institute of Oncology IRCCS, Via Ripamonti, 435, Milan, Italy.

E-mail address: giulia.marvaso@ieo.it (G. Marvaso).

¹ Co-first authors.

Since 20th February 2020, Italy has been experiencing one of the deadliest COVID-19 outbreaks in the world, with 197,675 people tested positive as of 27th April 2020 and 26,644 deaths occurring in two months [1]. The whole country was put in total lockdown since the 9th of March 2020 and only essential services were permitted (the citizens were allowed to go out only for essential job or healthy issues).

The Italian healthcare system has been overwhelmed by the emergency, and so did the radiation therapy (RT) facilities. Considering that RT treatments are indicated in about 50% of cancer patients [2], Italian Radiation Oncology Departments had to fully reorganise their activity trying to find a hypothetical trade-off between the risk of cancer progression in case of RT interruption and the likelihood of SARS-CoV-2 infection in case of RT initiation or continuation. Although cancer patients are frequently frail and immunocompromised [3], RT is a life-saving treatment and should not be delayed or interrupted if possible [4]. Since the beginning of the COVID-19 outbreak in Italy, the Italian Association of Radiotherapy and Clinical Oncology (AIRO) has put any effort to produce and continuously update a guidance document with detailed instructions for Italian radiation oncologists on how to rapidly and safely cope with the ongoing pandemic [5]. The present study, based on a digital survey administered to the Directors of the Italian Radiation Oncology Departments through the AIRO mailing list, is aimed at identifying the strategies that the Italian RT facilities have implemented to face this unprecedented emergency. The present investigation, performed on a national basis, was preceded by a similar survey conducted in Lombardy, the Italian region in which the pandemic has most massively spread, accounting for approximately half of all Italian cases and deaths [6]. Therefore, national and Lombardy survey results will be also compared.

Materials and methods

An online questionnaire (32 multiple-choice questions) via Google Forms, based on the first COVID-19 reports [7–11], and on the former investigation carried out in Lombardy [6], was administered to the 176 Directors of Italian Radiation Oncology Departments, members of the AIRO, between the 6th and 16th April 2020. The questionnaire included general queries and sections dedicated to clinical and out-patient activities, patients and staff management (text of survey available in [Supplementary Materials](#)). For some questions, more than one answer were allowed. Figures have been created using Microsoft Excel Bing Maps, Bing © GeoNames, HERE, MSFT.

Results

Out of the 176 contacted Directors of the Italian RT facilities, 125 (71%) anonymously responded to the survey.

General information

Responding centres were equally divided into public facilities and university or private hospitals. Twenty per cent of responders worked in Lombardy, the most populated Italian region (10 out of 60 million Italians live in Lombardy). Regarding the dimension of the centres, 79 (63.2%) treat less than 1000 patients/year, 34 (27.2%) between 1000 and 2000 and the remaining 12 (9.6%) more than 2000. Approximately 80% of RT facilities are active in hospitals equipped with an emergency department. Within few weeks from the outbreak, 85 structures (68%) became COVID-19 centres, requiring immediate reorganisation of the entire facility. Few Radiation Oncology Departments (less than 15%) had in-patients and/or day hospital wards, which were converted into COVID-19 wards in less than half of the cases.

Management of clinical and outpatient activities

The management of the emergency was mainly (88.8%) coordinated by the Director of the department, but the Health Directorate was also involved in 46 (36.8%) centres. In the difficult quest for a compromise between necessity of RT treatments and risk of infection, most centres were compelled to reorganise their therapeutic and outpatient activities, following the available institutional indications (Table 1). One of the most widely implemented strategies included the extensive use of hypofractionated regimens (92, 73.6%). This approach was most frequently adopted by large centres (>500 patients/year) compared to smaller institutions (75.9% vs 58.8%), regardless of their academic profile. Rescheduling of the patients waiting lists (prioritization) was also carried out in 78 facilities (62.4%) but did not affect first out-patient consultations, which continued to be ensured almost everywhere. On the other hand, virtually all responders had to cancel routine follow-up examinations and maintain only those with high priority (high risk of recurrence, acute RT-induced toxicity, etc.). To guarantee the continuity of care, in 78 centres (62.4%) telematic consultations were activated. Even though no centres closed, the emergency inevitably brought some repercussions on the overall clinical activity volumes of the interviewed centres (Fig. 1d), as 38 (30.4%) reduced their workload by 10–30% and 11 (8.8%) by 30–50%.

Management of patients and clinical practice

In order to limit the access of positive or suspect patients in the Radiation Oncology Departments, one to three levels of triage to check health status and suspect contacts were adopted. The first-line screening, consisting in phone interviews, was adopted in 61 centres (48.8%); the second-line control, consisting in a checkpoint at the main hospital entrance, was available in 68 facilities (54.4%) and was mainly carried out by nurses. Approximately 75% responders also opted for a further level of triage at the entrance of their Radiation Oncology Department. Regardless of the modality (telephonic or in situ), the triage procedures consisted mainly of interviews on symptoms, even if a significant proportion of centres also declared to ask about possible suspect contacts and to measure body temperature and oxygen saturation. The patients allowed to access the Radiation Oncology Department had to follow strict measures. Most patients were compelled to wear a surgical mask (123, 98.4%), to respect inter-personal distance measures (118, 94.4%) and could not be accompanied (95, 76%). Cleaning of rooms and surfaces was also a widely adopted countermeasure (106, 84.8%). Interestingly, 76 centres (62.3%) had no confirmed COVID-19 positive patients during ongoing treatment, and 32 centres (26.2%) had three or less. The majority of cases was reported in Lombardy and northern Italy in general (Fig. 1a). Positive patients were mostly affected by lung or head and neck cancers. In case of positive patients, approximately two out of three centres opted for suspending the treatment, while the remainder decided to safely continue the remaining RT sessions. In case of a positive patient, for whom the treatment was suspended, and who resulted negative after two consecutive swabs, about half centres stated they would start or continue the treatment immediately. Other responders were more cautious and would wait for additional 14 or even 30 days. Only a minority (five centres) declared their intention not to treat at all the COVID-19 positive patients with RT. Less than half responders had patients with documented contact with COVID-19 positive individuals and opinions were divided whether to treat this category of patients or not, with or without special precautions.

Management of personnel

In virtually all facilities, some basic protections, such as surgical masks and gloves, were provided indiscriminately to any type of

Table 1
How COVID-19 outbreak has changed the clinical practice of Italian Radiation Oncology Departments.

	Adopted measure	No. centres (%) (All centres: N = 125)		
Out-patient visits	No changes	7 (5.6%)		
	Non-urgent follow-up visits cancelled	115 (92.0%)		
RT treatments	First visits cancelled	2 (1.6%)		
	Telematic visits	78 (62.4%)		
	No substantial changes	20 (16.0%)		
	Pts treatment planning list rescheduling	78 (62.4%)		
	Promoting home cures	46 (36.8%)		
	Promoting short treatments / hypofractionation	92 (73.6%)		
	Positive/suspected pts treated in dedicated time slots	37 (29.6%)		
Clinical activities (overall)	No reduction	35 (28.0%)		
	<10% reduction	40 (32.0%)		
	10%–30% reduction	38 (30.4%)		
	30%–50% reduction	11 (8.8%)		
	50%–70% reduction	1 (0.8%)		
Periodic controls on LINACs	>70% reduction	–		
	No changes	112 (89.6%)		
RT wards conversion*	Changes in daily controls	8 (6.4%)		
	Changes in weekly controls	5 (4.0%)		
	Changes in monthly controls	4 (3.2%)		
	Yes	6 (37.5% ^{**})		
Responsible for outbreak management in the Radiation Oncology Department	No	10 (62.5% [†])		
	RT director	111 (88.8%)		
	RT task force	20 (16.0%)		
	Health Directorate	46 (36.8%)		
PPE	Occupational medicine office or other bodies	15 (12.0%)		
		ROs	RTTs & Ns	Others [#]
	Surgical mask	118 (94.4%)	115 (92.0%)	124 (99.2%)
	FFP2	62 (49.6%)	68 (54.4%)	10 (8.0%)
	FFP3	12 (9.6%)	14 (11.2%)	1 (0.8%)
	Disposable gowns	79 (63.2%)	100 (80.0%)	11 (8.8%)
	Overhead cap	63 (50.4%)	76 (60.8%)	6 (4.8%)
	Overshoes	38 (30.4%)	46 (36.8%)	2 (1.6%)
	Goggles or visors	73 (60.0%)	88 (70.4%)	9 (7.2%)
	Gloves	115 (92.0%)	118 (94.4%)	80 (64.0%)

List of abbreviations: DH: day hospital; FFP2, FFP3: protection class 2 and 3 filtering facepieces (FFPs); LINAC: linear accelerator; N: nurse; PPE: personal protective equipment; pt: patient; RO: radiation oncologist; RT: radiation therapy; RTT: RT technician.

* RT wards/DHs converted into COVID-19 centres.

** percentage refers to the number of centres equipped with RT in-patient wards or DHs.

personnel not in direct contact with patients. Most significant results are in bold.

personnel, while more sophisticated personal protective equipment (PPE), such as protection class 2 filtering facepieces (FFP2), was a prerogative of personnel in close contact with patients, such as physicians, nurses and RT technicians (Table 1). As far as meetings are concerned, only minorities decided to keep or, conversely, to cancel all of them indiscriminately (four, 3.2% vs 16, 12.8%, respectively) and about half responders opted for virtual solutions. To limit overcrowding, *working from home* solutions were permitted to a large proportion of personnel not in direct contact with patients (61 centres, 48.8%). Only few centres extended this modality also to sanitary staff (14, 11.2%), preferring turnover (64, 51.2%) or recovery of hours or holidays (44, 35.1%). Of note, in one centre, the risk of infection between operators and patients was reduced by defining two working teams who never meet each other and by extending the working time. These measures had some impact on the linac quality assurance procedures, as in 13 centres (10.4%) (10 treating less than 2000 patients/year and three more than 2000 patients/year) some changes occurred (Table 1). Forty-five per cent of centres had one or more staff persons in quarantine (any COVID-19 related absence), and 11 of them (8.8%) had more than five units off. The total number of units of personnel in quarantine reflects the number of reported cases of COVID-19 positive patients in the region (Fig. 1a/b). Physicians and RT technicians were most fre-

quently infected, followed by nurses, medical physicists and other personnel. In 20 centres (16.0%), mostly located in Northern Italy (Fig. 1c), the medical staff was deployed elsewhere to cope with the emergency and dislocated either in COVID-19 wards, triage checkpoints, task forces or other Radiation Oncology Departments, requiring a daily effort in the large majority of cases. Considering the possible psychological and emotive repercussions brought by the emergency, in approximately half of the centres psychological support for personnel and/or staff was activated. As mentioned above, the AIRO community has quickly faced the emergency by producing a public guidance document for the Radiation Oncology Departments indicating how to manage the emergency. The utility of this document is confirmed by the fact that 116 centres (92.8%) consulted the document and found it useful.

Discussion and conclusion

The present study points out how the Italian Radiation Oncology Departments have rapidly and efficiently coped with the disruption brought by the COVID-19 pandemic. Overall, the results are in line with those previously observed in Lombardy [6], even if some differences exist. As expected, being Lombardy the region

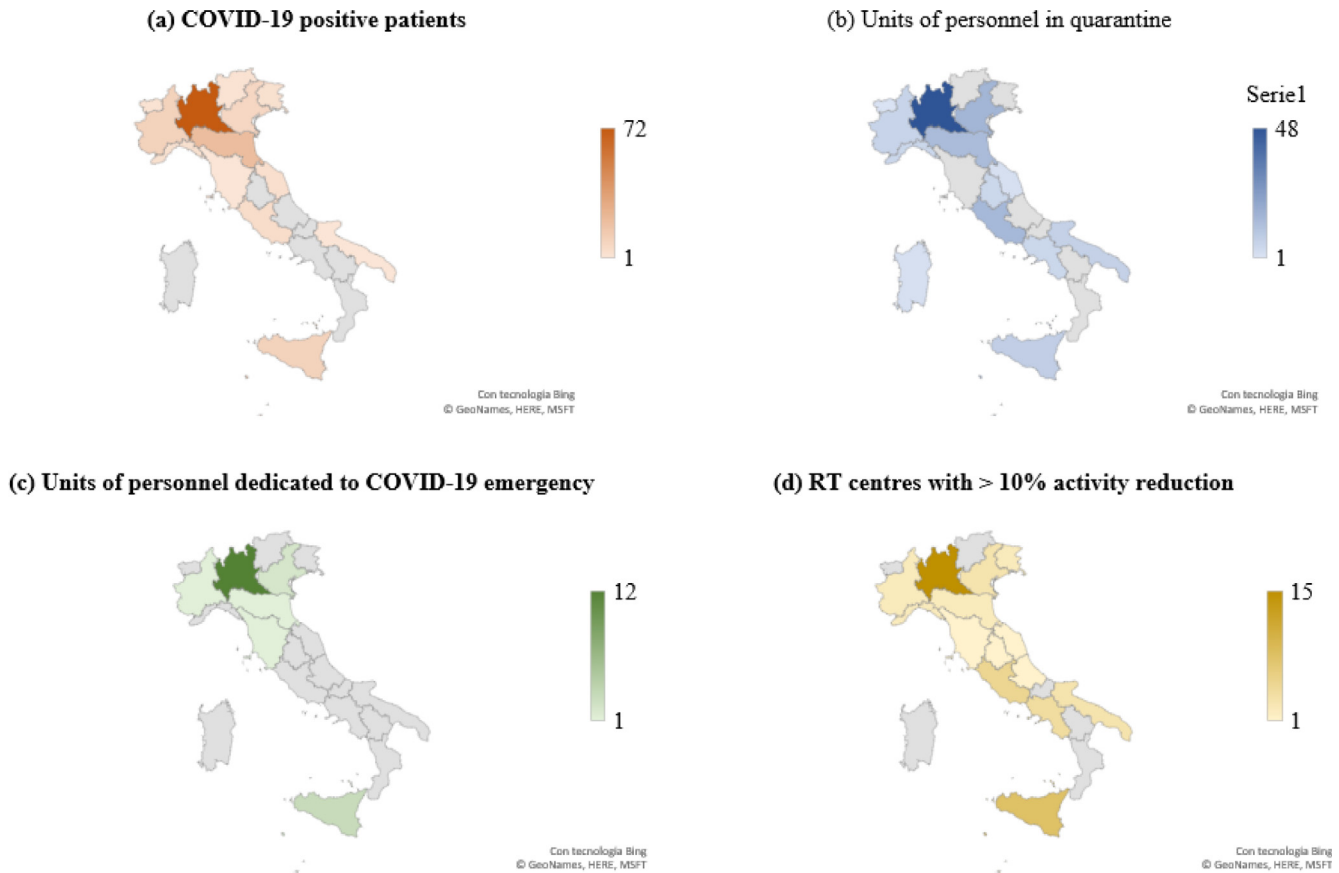


Fig. 1. Total number of COVID-19 positive patients in the Radiation Oncology Departments (a), units of personnel in quarantine (any COVID-19 related absence from work) (b) units of personnel dedicated to COVID-19 emergency (outside Radiation Oncology Department) (c) and RT centres with more than 10% activity reduction (d) by region. NB: Light gray means no cases. In case 5 to 10 or more than 11 were selected, the lower limit of the interval was considered as actual number of cases, so the map underestimates the total number of cases.

with the higher rate of infection, the proportion of centres reporting cases of positive patients was higher here compared to Italy as a whole (15/31, 48.4% vs 46/125, 36.8%). Nevertheless, despite the entity of the pandemic in Italy, the total number of positive patients and units of personnel in quarantine was relatively low. This fact can be ascribable to efficacy of triage procedures and, more in general, to all adopted measures. On the other hand, despite the reasonably higher probability of coming into contact with positive patients, the facilities in Lombardy had, on average, less PPE in use than the Italian average. As an example, FFP2 and FFP3 provision to personnel in contact with patients was approximately two and three times lower in Lombardy than the Italian average, respectively. This could be partly explained by the three-four weeks distance between the two surveys (the Lombardy and national surveys were performed at one and almost two months from the beginning of the outbreak, respectively). In fact, answers from facilities in Lombardy in this new survey are now aligned with the national trend, meaning that Italy as a country is moving in the right direction and PPE supply is improving. The increased awareness can be also due to the raising number of national and international guidelines, to the growing body of literature on the topic and to the detailed disease-oriented recommendations, as those available for prostate [12], lung [13], breast [14], head and neck [15], and haematological malignancies [16]. These documents generally support hypofractionated regimens and shorter schedules and advise to defer the non-urgent treatments. However, the choice of the most appropriate regimen is left to the treating physician on an individual basis, considering cancer-

related and patient-related factors, clinical conditions, machine and staff availability and epidemiological situation of the area. Our study also showed that even though *working from home* solutions cannot entirely replace activities usually carried out in Radiation Oncology Departments, they could represent a valid tool for reducing contacts and for accomplishing office-based tasks, such as remote contouring and planning or scientific writing. Telephonic triage procedures tend to avoid healthcare staff to be in contact with potentially positive patients and the patient to undertake a useless travel if not allowed to enter the hospital. Moreover, telemedicine allows for more flexibility on the side of both the clinician and the patient, as consultations can easily be rescheduled, and meetings can be held from home. In general, the pandemic has demonstrated that information technologies should be more promoted independently from this specific context. In conclusion, our survey showed rapid reaction by the Radiation Oncology Departments to the COVID-19 crisis, demonstrating that use of information technologies, RT prioritization and implementation of hypofractionation and protection procedures allowed balancing between cancer patient care and safety while safeguarding the healthcare staff.

Conflict of interest statement

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

Acknowledgements

The authors wish to thank the all the members of the AIRO for their contribution to this work (full list available in [Supplementary Materials](#)).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radonc.2020.04.061>.

References

- [1] <https://www.nytimes.com/interactive/2020/world/coronavirus-maps.html>. Accessed the 27th April 2020.
- [2] Palazzi MF, Soatti C, Jereczek-Fossa BA, et al. Equipment, staffing, and provision of radiotherapy in Lombardy, Italy: results of three surveys performed between 2012 and 2016. *Tumori* 2018;104:352–60.
- [3] Achard V, Tsoutson P, Zilli T. Radiotherapy in the time of the Coronavirus pandemic: when less is better. *Int J Radiat Oncol Biol Phys* 2020. <https://doi.org/10.1016/j.ijrobp.2020.03.008>. In press.
- [4] Wu S, Zheng D, Liu Y, et al. Radiotherapy care during a major outbreak of COVID-19 in Wuhan. *Adv Radiat Oncol* 2020. In press.
- [5] <https://www.radioterapiaitalia.it/wp-content/uploads/2020/03/v-2-Documento-AIRO-COVID-19-24-03-2020.pdf> Documento di indirizzo per la valutazione e la gestione del rischio dei pazienti e degli operatori nei reparti di radioterapia oncologica in corso di diffusione del COVID-19 . Accessed 17th April 2020.
- [6] Jereczek-Fossa BA, Palazzi MF, Soatti CP, et al. Covid-19 outbreak and cancer radiotherapy disruption in Lombardy, Northern Italy. *Clin Oncol* 2020. <https://doi.org/10.1016/j.clon.2020.04.007>. In press.
- [7] Simcock R, Thomas TV, Estes C, et al. COVID-19: Global Radiation oncology's targeted response for pandemic preparedness. *Clin Transl Radiat Oncol* 2020. <https://doi.org/10.1016/j.ctro.2020.03.009>.
- [8] Filippi AR, Russi E, Magrini SM, Corvò R. Letter from Italy: First practical indications for radiation therapy departments during COVID-19 outbreak. *Int J Radiat Oncol Biol Phys*. 2020 Mar 19. <https://doi.org/10.1016/j.ijrobp.2020.03.007>. In press.
- [9] Kregli M, Ferrara E, Mastroleo F, et al. (2020). Running a Radiation Oncology Department at the time of coronavirus: an Italian experience. *Adv Radiat Oncol* 2020. <https://doi.org/10.1016/j.adro.2020.03.003>. In press.
- [10] Meattini I, Franco P, Belgioia L et al. Radiation therapy during the coronavirus disease 2019 (covid-19) pandemic in Italy: a view of the nation's young oncologists. *ESMO Open* 2020;5(2). pii: e000779. <https://doi.org/10.1136/esmoopen-2020-000779>.
- [11] van de Haar J, Hoes LR, Coles CE, et al. Caring for patients with cancer in the COVID-19 era. *Nat Med* 2020;16:1–7. <https://doi.org/10.1038/s41591-020-0874-8>.
- [12] Zaorsky NG, Yu JB, McBride SM et al. Prostate Cancer Radiotherapy Recommendations in Response to COVID-19. *Adv Radiat Oncol* 2020. <https://doi.org/10.1016/j.adro.2020.03.010>. In press.
- [13] Combs SE, Belka C, Niyazi M, et al. First statement on preparation for the COVID-19 pandemic in large German Speaking University-based radiation oncology departments. *Radiat Oncol* 2020;15:74. <https://doi.org/10.1186/s13014-020-01527-1>.
- [14] Coles CE, Aristei C, Bliss J, et al. International guidelines on radiation therapy for breast cancer during the COVID-19 pandemic. *Clin Oncol (R Coll Radiol)* 2020;32:279–81. <https://doi.org/10.1016/j.clon.2020.03.006>.
- [15] Thomson DJ, Palma D, Guckenberger M, et al. Practice recommendations for risk-adapted head and neck cancer radiotherapy during the COVID-19 pandemic: an ASTRO-ESTRO consensus statement. *Int J Radiat Oncol Biol Phys* 2020. pii: S0360-3016(20)31034-8. <https://doi.org/10.1016/j.ijrobp.2020.04.016>. In press.
- [16] Yahalom J, Dabaja B, Ricardi U, et al. ILROG Emergency Guidelines for radiation therapy of hematological malignancies during the COVID-19 Pandemic. *Blood* 2020. <https://doi.org/10.1182/blood.202006028>. In press.