The current SARS-CoV-2 pandemic situation has significantly affected the normal activity of healthcare systems. Measures for controlling the spread of the virus include keeping patients and workforce safety procedures in radiotherapy (RT) centers where there generally a close contact during treatment delivery [1–4] (Table 1).

Patients with cancer are particularly fragile in this COVID-19 crisis. On the one hand, their survival will depend most frequently on tumor aggressiveness and appropriate treatment for it; on the other hand, continuous visits to the hospital will expose them to an increased risk of becoming infected [5], so they are “swimming against the tide” and are in real need for medical advice and special care [6]. Radiation treatment is part of the integral cancer treatment and about 50% of all patients who are diagnosed with cancer require radiotherapy at some point in their treatment [7]. Our experience during the crisis has focused on four different aspects: patient and staff safety, implementation of alternative radiotherapy schedules, psychological approaches, and establishment of a COVID-19 multidisciplinary team (MDT).

Since the beginning of the outbreak, Spain could not do massive testing due to the lack of Polymerase-Chain-Reaction (PCR) tests. Therefore, COVID-19 MDT was created to handle positive or suspected positive patients and workforce, individualizing case assessment and collecting all the incident report form. Hyofractionated-based schemes minimize the time that the patient stays at the center [8]. Furthermore, RT can be used as a temporal bridge to avoid chemotherapy immunosuppression. Psychological care may help patients to overcome the fear of infection and keep patients on treatment [6].

From our point of view, the workforce could also be extremely impacted. Our psycho-oncology team and an external online coaching assistance has been implemented to support our patients and staff. Procedures were implemented even before the state of alarm in Spain was declared on the 13th of March, when the incidence of COVID-19 began to rise in our country.
Patient safety perspective

Standard protective measures have been implemented across all national units; staff are being instructed to use face masks, hand washing with soap, and alcoholic solutions, also, to avoid close contact with patients and maintain appropriated distances. Daily cleaning and disinfection of the areas is reinforced. Moreover, patients are instructed to call in case of suspicious symptoms and they pass through a robust triage process when arriving to clinic in order to rule out fever or respiratory problems. These steps maintain a clean circuit for patients in avoiding the risk of viral spread. A patient’s treatment priority needs to be established on a patient-by-patient basis according to different factors; tumor type and staging, intention-to-treat, general patient status and potential RT schedule approach. Tumor categorization protocols have been established to determine priority for RT delivery. Five categories have been determined, mainly based on tumor histology: rapid access (<14 h or in the same day), A category (<5 days), B (>5 and <10 days), C (<4–6 weeks), D (>6 weeks). With this, patients with high priority, i.e. lung cancer, will start treatment in a period no longer than 5 days, while lower-priority patients may have their treatment delayed for more than 6 weeks or even wait for the pandemic to resolve in particular cases.

Based on tumor categorization, treatment decision for patients with suspicious or confirmed SARS-CoV-2 infection was made by a virtual COVID-19 MDT. The Board made an evaluation about each patient’s clinical condition, estimating the risk versus the benefit of whether receiving treatment, delaying it, or making modifications to minimize mortality and morbidity. The MDT was also in charge of ensuring clean circuits and staff close contact management.

This committee was constituted by a General Manager, Operations Performance Manager, Legal Counsel, Head of Human Resource, Head of Physics, Chief Medical Officer (CMO), and Deputies of CMO in Medical and Radiation Oncology.

The procedure for COVID-19 MDT evaluation was started by the treating physician or center coordinator by presenting a brief summary, where the past medical history of the patient or staff member was highlighted, evolving symptoms related to COVID-19 such as first symptom and date, close contacts during the infection time, and protection equipment used at that time. For patients, information about the kind of treatment, number of sessions administered, and intention of the RT was also added. Joint decisions were in accordance with the guidelines of the Government Health Authorities [9].

When the Board decided that the patient should receive RT despite of COVID-19 infection, strict safety measures are implemented. Staff are instructed to use personal protective equipment (PPE) including gloves, N95 mask, goggles, hood covers, impermeable surgical gown, and shoe covers. COVID-19 patients are treated at the end of the day when there are no other patients in the unit, and the treatment room is carefully disinfected afterwards.

MDT decisions have led to the creation of an epidemiological database for COVID-19 in our centers [10]. Furthermore, an officially internal report was generated in each case to compile the final decision and for legal backing. The internal report form of the COVID-19 MDT included the initial summary presented to the board, options debated, actions needed, final decision and the signatures of all the members of the team.

Staff safety perspective

Early identification of staff at risk of infection is mandatory; we consider staff members at risk who have COVID-19 related symptoms, or those in close contact with positive patients. Staff at risk of infection are replaced with back-up teams [10]. The decision as to whether to replace the worker is determined by the COVID-19 MDT. Through the MDT implementation, a rational decision-making process is established, which makes staff feel cared for.

In order to guarantee the operation of our centers and the continuity of patient treatments, several back-up teams have been created. These support teams are made up by at least one Radiation Oncologist, a receptionist, a nurse and two radiotherapists. These staff members work from home by making patient review consultations over the phone. Staff members have remote access to our electronic medical reports, as well as to patient history and treatment planning software. As volume delineation can be performed remotely, planners and physicists are working from home. In addition, these teams are ready to go to any center that requires help or to replace usual equipment. Moreover, the staff on quarantine can work from home doing patient remote follow-up, data entry, or telephone and/or video consultations. In this COVID-19 era, oncologists have adapted to these new ways of communicating and working, which will probably stay until the end of this crisis.

COVID-19 impact in our radiotherapy units

Safety measures have been implemented from the 2nd of March across the 17 national centers, six of them located within different hospitals, and across 224 staff members, including physicians, nurses, physicists, radiotherapists and administrative personnel. Among the staff, only 18% developed a confirmed or suspicious COVID-19 infection and had to quarantine. Diagnosis was confirmed in seven members by PCR.

Since the implementation of COVID-19 MDT back on March 7th, 36 suspected cases were discussed and 21 out of those 36 were diagnosed with COVID-19 by the PCR test. In addition, 7 out of the 21 corresponded to workforce and the 14 remaining were patients under treatment. Unfortunately, 15 out of the initial 36 suspected cases could not be tested due to the lack of available tests in Spain, 11 were staff members and four were patients. These cases were immediately isolated in quarantine due to high clinical suspicion.

Out of the 1208 patients treated during this period, 18 patients were suspicious of SARS-CoV-2 infection and 14 of them were confirmed by the PCR tests. Four had symptoms suggesting infection, those were considered to be potentially infected from the safety point of view and could have their RT treatment normally following our COVID-19 protocols. 11 out of 14 patients (78%) with confirmation of infection were able to finish RT. However, three patients had to discontinue RT and were admitted to the hospital with worsening condition of the COVID-19 infection confirmed with positive PCR. One patient out of the three died due to infection-related complications.

Table 1

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have healthy workers to continue the unit running</td>
<td>- Back-up teams:</td>
</tr>
<tr>
<td>2. Avoid the spread of the virus</td>
<td>- Quarantine workers with symptoms since early symptoms were detected</td>
</tr>
<tr>
<td>3. To have patients coming to clinic as less as possible</td>
<td>- PCR testing for workers with symptoms</td>
</tr>
<tr>
<td>4. Treat patients already infected by COVID-19</td>
<td>- Implementation of clean circuits</td>
</tr>
<tr>
<td>5. Joint decision making about infected staff or patients</td>
<td>- Safety measures; PPE, disinfection,</td>
</tr>
</tbody>
</table>

| | |
| | Timing |
| | - Establishment of MDTs to determine exposure risks and procedures |

Spanish risk framework across 17 Radiation Oncology centers during COVID-19

- PCR testing for workers with symptoms |
- Hypo fractionated treatments |
- Delay patients when feasible |
- Safety measures; PPE, disinfection, |
- Establishment of MDTs to determine exposure risks and procedures |
Despite the limitations in time and number of infected cases, our findings suggest that evaluation case-by-case and accepted norms of cancer care delivery have been transformed out of necessity.

To sum up, the rapid implementation of these safety measures in our units has allowed us to continue treating cancer patients successfully. Introduction of priority staging systems, patient-by-patient case discussion and staff safety measures are mandatory. With a fast evolving landscape, where governmental indications may vary from day-to-day, management operations have also been implemented consistently: by the implementation of MDTs, with expertise not only in the Radiation Oncology field, but also from the legal, epidemiological, human resources, and economical perspective to improve workflow models and make decisions to protect both healthcare providers and patients. Priority stage systems, patient-by-patient case discussion and centers providing clean circuits are mandatory in this situation. However, isolation will end soon in our country and we expect a rebound of patients during the following months to come, due to delayed diagnosis. Therefore, we are anticipating strategies to set our departments up for this short-term future, in terms of avoiding collapse and growing waiting lists.

Conflict of interest

None to disclose.

CRediT authorship contribution statement


References